deposits. In places a headland ran out into the sea, and in the bay on either side sand quietly accumulated. Elsewhere a river discharged its waters and deposited mud and silt opposite its mouth. In the purer, quieter water, shell-beds were formed, which consolidated into the Bargate Stone. Farther from the shore lived banks of sponges, whose spicules formed great beds of chert; and still farther to the south were yet deeper deposits, which we only know from fragments in the high level southern drift. Hence lithological similarity is no proof of simultaneous formation. These points were further illustrated from the summit of St. Martha's Hill, where a sketch was given of the physical conditions of the area, as far as the evidence of the Lower Greensand demonstrates it. It was maintained that if we abandon the effort to force a classification of these deposits into an artificial scheme, their story becomes more interesting and more intelligible.

REFERENCES.

Geological Survey Map, Sheet 8 (Drift Edition).
 New Ordnance Survey Map, Sheet 285.
 6-Inch Ordnance Survey Map, Surrey, Sheet 32.

1868. MEYER, C. J. A.—"On the Lower Greensand of Godalming."
Geol. Assoc.

1875. TOPLEY, W.—"The Geology of the Weald." *Mem. Geol. Survey.*

1893.—BOULGER, G. S., and LEIGHTON, T.—"On the Lower Greensand
 . . . between Wotton and Dorking." *Proc. Geol. Assoc.*, vol. xiii,

p. 4.

See also "Record of Excursions." pp. 93-102.

EXCURSION TO THE COUNTY OF SHROPSHIRE,

MONDAY, 30TH JULY, TO SATURDAY, 4TH AUGUST, 1894.

Directors : PROFESSOR C. LAPWORTH, LL.D., F.R.S., F.G.S.,
 AND W. W. WATTS, M.A., F.G.S.

(*Report by R. S. HERRIES, revised by W. W. WATTS.*)

The headquarters of the Association during the whole week were at Shrewsbury, at the George Hotel. Most of the party arrived on Saturday, and on Sunday the majority took the opportunity of driving out to the Breidden Hills, which, though they are partly in Montgomeryshire, and therefore not strictly within the district proposed to be visited, are so closely connected with it geologically, that the Directors in their recent paper on the geology of South Shropshire* have included them in the area

* *Proc. Geol. Assoc.*, vol. xiii, 1894, p. 297. The references in the text, throughout, are to this paper, and the figures in brackets refer to the map, Fig. 1, p. 299.

which they describe. Mr. Watts, who accompanied the party, pointed out the chief features, the Wenlock and Ludlow Rocks of the Long Mountain, the base of the Llandovery Sandstone, the thick contemporaneous lava-flows and associated ash-beds of Moel-y-Golfa, and the great mass of dolerite on which Rodney's Pillar stands, intrusive into shales of Bala age (see Fig. 11, p. 321). Others of the party went over to Wroxeter to look at the remains of the old Roman town of Uriconium, or spent the afternoon in exploring the Abbey and other fine churches, the old houses, and other antiquities, for which Shrewsbury is justly celebrated.

On *Monday, 30th July*, the party proceeded by the 10.20 train to Wellington (1), where they were met by Dr. Callaway, who acted as Director during the day, and by some members of the Vesey Club of Birmingham, the Caradoc and Severn Valley Club, and the Shropshire Archæological Society, to whom the Association had sent a general invitation to join the excursion. The Director first led the way to the Ercal Hill, where the granitoid rocks and associated porphyritic rhyolites were examined, and the junction with the Wrekin quartzite noted (p. 302, and Figs. 2 and 3, p. 303). The next point was the quarry at Lawrence Hill with its fine exposure of rhyolitic ashes of the Uriconian series, penetrated by later dolerite dykes (p. 302). The ascent of the Wrekin (2) was then begun, and, after various halts for refreshment, completed; but, unfortunately, owing to the cloudy nature of the day, nothing whatever could be seen of the really magnificent view. A walk along the long S.W. ridge of the Wrekin (Figs. 2 and 3, p. 303; Fig. 7, p. 309) ended with a steep descent to Primrose Hill, where a red gneissic rock occurs, somewhat similar to that seen at the Ercal. At Neves Castle the carriages were waiting, and, after the party had examined the brook and neighbouring quarry in Comley Sandstone, where some of them obtained a few fragments, which they were content to think were portions of the trilobite *Olenellus*, they proceeded to Charlton Hill (4), where the Uriconian conglomerate was well seen (Fig. 4, p. 304), and thence to Rushton (3), where the schists named after the village were not well exposed (p. 301). The drive was then continued to the Lea Rock (5), many specimens of the very beautiful spherulitic rhyolites being obtained (p. 302), and so on to Walcot Station (6), whence the return was made to Shrewsbury by the 7.5 train.

On *Tuesday, 31st July*, Professor J. F. Blake acted as Director, and the party proceeded by the 10.5 train to Leebotwood (7). They drove first to the village of Comley, the physical features of the district, one of the most beautiful in England, being pointed out on the way. On one side of the valley rise the sharp isolated hills of the Lawley, Caradoc, the Cardington Hills, and Ragleth, while on the other side is the dark mass of the Longmynd, its sides furrowed by numerous "gutters," as these

steep-sided valleys are here called. Comley is situated between the Lawley (8) and Little Caradoc (9), and it was from fragments obtained in a quarry here that Professor Lapworth was enabled to make the first announcement of the discovery of the genus *Olenellus* in these islands (p. 310). Several fragments were obtained by the party, who then proceeded in the carriages to Church Stretton (10), where they dismounted and prepared for a long tramp across the Longmynd. Walking up Carding Mill Glen and the Light Spout Valley, the principal divisions of the Lower or Slate Series of the Longmynd were seen. These are now regarded by most geologists as of Pre-Cambrian age, Professor Blake grouping them with his Upper Monian. When the top of the moorland was reached, the party followed the Port Way as far as Pole Bank, where on the western slopes the conglomerate beds of the Upper or Grit Series were well seen. This Upper Series is considered by Professor Blake to be unconformable to the Lower, and he believes it to be of Lower Cambrian age. Dr. Callaway however, differs from him, and fails to see any evidence of unconformity, regarding the whole as one great series, to which he gives the name Longmyndian. Unfortunately, on the return route by Ashes Hollow to Little Stretton, the party started down the wrong valley, and, when they at last got into Ashes Hollow, it was too late to return to what is regarded as a critical section at Narnell's rock, where according to Professor Blake, an outlier of the newer series rests unconformably on the older. It was impossible, therefore, to thrash out the evidence on the ground, and the party proceeded to Little Stretton, whence they drove to Church Stretton and returned to Shrewsbury by the 6.55 train (see pp. 306 to 308 and Fig. 6; and for a general section of the country visited, see Fig. 10, p. 315).

On *Wednesday, 1st August*, the party went by train at 8.15 to Pontesbury (11), getting a view on the way of various coal workings, and also of Pontesford Hill, an isolated mass at the north end of the Longmynd, which Dr. Callaway has identified as belonging to the Uriconian Series (p. 305). On arriving, the party walked to Nills Hill (12), and examined the quarries in the Stiper Stones quartzite, which forms the base of the Arenig rocks in this district. They then proceeded to a small exposure in a wood a little above Bank Farm, near Minsterley, which shows an outlier of Llandovery rocks, resting unconformably on the Middle Arenig Beds (p. 323). Here many fossils were obtained, including *Encrinurus punctatus*, *Petraia bina*, *Orthis*, *Pentamerus*, *Rhynchonella*, *Tentaculites*, etc. About a mile farther on, at a mine where Barytes is largely worked, the carriages were waiting, and brought the party to Mytton Dingle (14), which they ascended, and were able to collect some fossils from the Mytton Flags, mostly *Obolella*, but *Theca* and *Ogygia Selwynii* were also obtained (p. 317). The drive was continued for some way

parallel with the Stiper Stones, of which, with its curious projecting masses of rock—the Devil's Chair, Cranberry Rock, and the Nipstone Rock—good views were obtained; the route was then westwards towards Shelve, and, the carriages being left, the party walked over the various members of the Arenig Series till they reached the highest, the Stapeley Ashes. On the way, several intrusive dykes of dolerite were noticed, also many scattered boulders of the same material. The Shelve anticline then brings up the older beds again, and close to Shelve Church attention was drawn to a bed of graptolites in the Mytton Flags. The walk was continued to the Roman Gravels mine (15), where many beautiful specimens of calcite, barytes, blende, and galena were collected, and after tea the carriages were rejoined and the party proceeded to Minsterley (13), stopping on the way at Hope (16) to examine some contorted beds of finely-banded ashes interbedded with Hope Shales, and another instance of the Llandovery Beds resting unconformably on the Ordovician Rocks (pp. 317 and 323, and Plates VIII B and IX A). These and other interesting sections seen were photographed by various members of the party. From Minsterley the return was made to Shrewsbury by the 6.55 train.

On *Thursday, 2nd August*, the party went by 8.15 train to Minsterley (13), where they arrived in a deluge of rain that kept them waiting in the station for about two hours. When it at last cleared, the long delay had made it necessary to considerably shorten the programme. A start was made in the carriages for the quarry at Tasgar, east of Fishpool (22), where the Ash Beds of the Stapeley group are well seen, with fossiliferous shales at the base (Plate VIII A.) Here the fossil hunters, who had up till now not had much to occupy them, swooped down on the little exposure of shales like a cloud of locusts, much to the astonishment of a small boy, who was in charge of the quarry. One of the members had equipped himself with a crowbar purchased from the Minsterley blacksmith, and with this weapon he turned out enough trilobites, mostly tails, known locally as butterflies, to satisfy the greed of the collectors. The slopes of Corndon (20) were now ascended, and all the way up blocks of dolerite were noted, and the occurrence of these was attributed to the denudation of the great mass of dolerite owing to the undercutting of the soft shale on which it rests. On descending the mountain on the west side, these scattered blocks were conspicuous by their absence, as the outcrop of the dolerite is here covered by overlying beds of shale, and no undercutting has taken place. A halt was made at a section where the dolerite was well seen resting on the altered Hope Shale. The laccolitic character of the mass was explained, and it was pointed out that Corndon was in the direct line of the Shelve anticline, so that the Stapeley Ashes overlie it to the east at Tasgar,

and to the west at Llanfawr, while the dolerite itself is intruded into the Hope Shales, and it was shown that the movements that caused the anticline were also the cause of the intrusive mass assuming the laccolitic shape (pp. 341 to 343, and Fig. 22). Farther on, the shales which overlie the dolerite were seen, and these also are much altered; and from a spur of the mountain, which, by the way, is just within Montgomeryshire, a magnificent view was obtained, such as no one would have ventured to anticipate in the morning, while waiting at Minsterley for the rain to stop. To the west the fertile Silurian country of the Long Mountain was seen, bounded in the distance by the Welsh Hills, Cader Idris, the Arans, and the Arenigs, with Snowdon still farther away beyond; to the south the hills of Kerry, the Carmarthenshire Mountains, and the Vans of Brecon; to the south-east the Malvern Hills; while far away to the north the high ground of the Peak district of Derbyshire was clearly visible lying behind the hills of Hawkstone and Grinshill. In the immediate foreground was the country which it had been intended to visit but for the rain of the morning, and the party had to be satisfied with what they could see from this point of the various divisions of the Llandeilo and Bala Beds, forming a series of parallel ridges between Corndon and Chirbury (17). These beds were subsequently visited by a few of the party who remained on at Shrewsbury, and it is satisfactory to know that they confirmed the account of Professor Lapworth, who said that in some of the quarries the trilobites were literally swarming up the rocks like black beetles up a kitchen wall. A descent was now made down the slopes of Llanfawr (19) to Priest Weston (18). On Llanfawr the contemporaneous flows of andesitic lava with porphyritic crystals of augite and hypersthene were examined (pp. 318 and 337). From Priest Weston the party ascended Stapeley Hill, passing over the Ash series, and, noting the old stone circle, known as Mitchell's Fold, came down to the Roman Gravels, where they found the carriages waiting, and so returned to Minsterley in time for the 6.55 train for Shrewsbury. (For a general section of the country visited on Wednesday and Thursday, see Fig. 9, p. 314.)

On *Friday, 3rd August*, a visit was paid to Shrewsbury Museum, now housed in the old buildings of the Grammar School, where the Mayor kindly received the party, and the collections, both geological and archaeological, were explained to them by the Librarian, Mr. Phillips, and others. The latter are particularly interesting, including, as they do, nearly all the Roman remains discovered in the course of excavations at Wroxeter. After thanking the Mayor for his courtesy, the party went to the station, and took the 10.5 train for Craven Arms (23), where they were met by the Rev. J. D. La Touche, who was associated with the Directors during the day. The party followed

the Onny River as far as Horderley (24), seeing first the interesting section (Fig. 12, p. 322) where the Trinucleus Shales of the Bala Beds are overlain by the Pentamerus Beds of the Llandovery. The newer series is unconformable to the older one, but, the dip of the two being almost identical, it requires a practised eye and a knowledge of the district to detect the fact. After that, the various members of the Bala series were examined in succession in descending order, fossils being obtained from the Cheney Longville Flags, and the disturbed nature of the beds near the unconformable junction with the Longmynd Rocks, resulting in a good example of a reversed dip, was noted. At Horderley carriages met the party, and brought them back through Craven Arms, and across the outcrops of the Wenlock and Aymestry Limestones to a quarry near Greenway Cross, where the bone bed of the Upper Ludlow was well exposed (p. 328), and large numbers of specimens were obtained by the members. The carriages were left here, and the steep hill of Norton Camp ascended, whence a fine view was obtained over Wenlock Edge, Weo Edge, and the surrounding country, including the Cleve Hills, with Coal Measures and intrusive dolerites. The descent was made to Stokesay, where most of the members went over the Castle, a very picturesque fortified mansion of the end of the thirteenth century, after which they returned to Craven Arms in time for the 6.20 train to Shrewsbury.

On *Saturday, 4th August*, the train was taken at 7.55 for Cressage (28). Walking to Shineton, the party proceeded up the Belwardine Brook (29) to examine a section of the Shineton Shales of the Cambrian, which are probably the equivalents in age of the Tremadoc Rocks. A large number of fossils were obtained here by the members themselves, or bought from the tenant of the neighbouring farm, who brought down a quantity of trilobites, which he had collected from time to time. *Olenus triarthrus*, *Asaphellus Homfrayi*, *Conocoryphe monile*, and *Lingulella Nicholsoni* were obtained among other fossils (pp. 310 and 311.) The party then proceeded to Buildwas Abbey (30), noting on the way the esker-like deposits of glacial sands and gravels (pp. 333 and 334, and Fig. 15), which occur here on both sides of the Severn. At the Abbey Mr. Parker gave an account of the history and architectural features of the monastery. The house was a Cistercian one, and the remains, which include the church, chapter house, and other buildings, are mostly Norman and Transitional in character. Crossing the Severn, an interesting section in the Buildwas Beds of the Wenlock Shale was visited. This forms a small cliff close to the river, and is very full of fossils, mostly small brachiopods, such as *Orthis biloba*, *Orthis hybrida*, and others, as well as small trilobites, corals, and polyzoa (p. 325). The party then took the 1.50 train to Coalbrookdale (32), and examined the railway cutting near the Station, where beds of

Wenlock Shale higher than the Buildwas Beds were seen, and more fossils collected. They then ascended Lincoln Hill (31), whence they obtained a fine view of the Severn Gorge at Ironbridge, and the Wenlock escarpment at Benthall Edge. At the foot of the hill the Wenlock limestone has been largely worked, and many fragments were picked up exceedingly rich in the characteristic fossils, corals, trilobites, crinoids, brachiopods, etc. The Wenlock Limestone is here overlain unconformably by the Millstone Grit, and the Coal Measures come on immediately over that, the Permian and Triassic Beds being seen, overlying all, on the side of the Severn Valley beyond. From Ironbridge Station the party returned to Shrewsbury by the 4.22 train, and then the members dispersed in various directions, thus bringing a very pleasant and successful excursion to an end.

For References, see p. 355.

EXCURSION TO ELSTREE.

SATURDAY, 10TH NOVEMBER, 1894.

Director: REV. PROF. J. F. BLAKE, M.A., F.G.S.

(*Report by the EDITOR.*)

The party assembled at Elstree station just before two o'clock, and the Director led the way at once along the temporary line to the clay tips. He explained that a new tunnel was being made to the east of the existing one in order to complete the quadruple line of railway, but owing to difficulties in connection with the acquirement of land, the clay had to be brought up through a shaft and deposited on the west side of the existing line. The cutting leading to the new tunnel could be seen from this point, but at that distance no stratification could be recognised. Closer examination would reveal a bed of septaria, showing the normal southern dip. The clay in that cutting had yielded him, on a recent visit, a somewhat different fauna from that in the blocks brought out from the tunnel. The excavations would be completed by next March, hence the rather unusual season for this excursion.

The party then spread itself over the ends of the tips, and soon found a number of fossils, not in the best state of preservation, unfortunately. The chief genera found were *Pecten*, *Nucula*, *Teredo* (in wood), *Fusus* (?), *Pleurotoma* (?), *Natica*, *Dentalium*, *Terebratulina* (?), *Ditrupea*, *Nodosaria*, and a fish scale. A heavy fall of rain rendered the clay very slippery, and decided some of the members to continue their fossil hunting in some of the adjacent buildings, where *Nautilus* was found to be abundant. As the daylight faded the members gathered into the station to wait for the 4.53 return train.

NOVEMBER, 1894.