

## GEOLOGICAL TOUR OF THE COUNTRY SOUTH AND WEST OF NOTTINGHAM

Leader:- Dr. F.M. Taylor

Sunday, 7th May 1967

### Introduction

On previous occasions (Taylor, 1964, 1966; Stevenson, 1967) the Society has organised long distance tours in order that members could acquire a general picture of the geology within a 100 mile radius of Nottingham. This excursion was designed to illustrate the great spread of Triassic sediments in the Midlands and their relationship to older and younger rocks. The Geological Systems and Formations referred to on the tour are listed in Table 1. The route can be followed on the Ten Miles to the Inch Geological Map of England and Wales (Geological Survey Map of Great Britain, Sheet 2). One Inch Geological Survey Maps are available for most of the area and are listed at the end of this account.

### The route

Nottingham (SK 577396) to Barrow-on-Soar (SK 575175) via A60 - B675

The City of Nottingham is built mainly on the Lower Triassic Pebble Beds. These rocks outcrop in a number of places and are encountered in the foundations of all the large buildings. On the southern route out of Nottingham, via London Road, only a quick glimpse of these rocks can be obtained, between the derelict buildings near Canal Street. The outcrops here are the eastern continuation of the river cliff exposures, which extend along Castle Boulevard and provide the elevated position for the Castle Rock Museum.

Further south the city is built on the sands and gravels of the floodplain of the River Trent, now restricted by artificial banks on its journey through the city.

After crossing Trent Bridge into West Bridgford (SK 586370) the road rises onto higher level gravels. This village was built originally on the higher (Beeston) terrace but has now been extended southwards on various horizons of the Keuper Marl.

The coach followed the Loughborough Road (A60) southwards, climbing Wilford Hill to the Nottingham Crematorium (SK 579350). The top of this hill is formed by the Hollygate Skerry, a dolomitic siltstone high in the Keuper Marl sequence but below the Tutbury Gypsum.

From this hill, excellent views can be obtained to the west along the line of the Trent Valley including the Wilford Brick Works (SK 569358) in Keuper Marl and the Cotgrave Skerry; the University (SK 540380), a graben of Keuper Marl; and, further round to the south, the Lower Lias and Rhaetic outliers of West Leake Hills (SK 533282), Gotham Hill (SK 530310) and Radcliffe-on-Soar, now indicated by a massive Power Station (4529).

Continuing along the A60, and the outcrop of the Keuper Marl one notes the high incidence of rose-tree nurseries and away to the east the main escarpment of the Rhaetic and Lias. This escarpment gradually swings round to an east-west strike getting closer as one passes through Bradbourne (SK 585311) and Bunny (SK 583295).

As the road rises towards the escarpment there is an excellent view into Bunny Quarry (SK 580285) at the brickworks south of Bunny. Large masses of gypsum can be clearly seen in the quarry face and the old mine workings for the Tutbury gypsum are now being uncovered at the base of the quarry.

The road then climbs steeply onto the Lower Lias. For the next few miles the higher ground is

Table 1 - Formations seen or commented on during the tour

| <u>System</u>       | <u>Series</u>                 | <u>Formations</u>  |
|---------------------|-------------------------------|--|
| JURASSIC<br>(Lower) | Lias<br>(in part)             | ( Marlstone sandstones<br>( Middle Lias shales<br>( Lower Lias shales, including at the base, the<br>( Hydraulic Limestones  |
|                     | ( Rhaetic<br>(<br>(<br>(<br>( | Rhaetic shales and limestones<br><br>( Tea Green Marls<br>( Red Marls with gypsum, including the<br>( Tutbury Gypsum<br>( Red Marls with skerry beds, including the Mapperley  |
| TRIAS               | ( Keuper<br>(<br>(<br>(<br>(  | ( Plains Skerry near the base<br>( Lower Keuper Sandstones and Waterstones<br>( Basement Beds<br><br>( Upper Mottled Sandstones<br>( Pebble Beds<br>( Lower Mottled Sandstones |
| ? PERMIAN           |                               | ( Hopwas Breccia (age uncertain)<br>( Moira Breccia (age uncertain)  |
| CARBONIFEROUS       |                               | ( Barren Red Measures<br>( Coal Measures<br>( Millstone Grit<br>( Carboniferous Limestones   |
| DEVONIAN            |                               | Old Red Sandstones   |
|                     | ( Ludlow<br>(<br>(<br>(       | ( Upper Ludlow Shales<br>( Aymestry Limestones<br><br>( Wenlock shales<br>( Wenlock Limestone<br>( Wenlock shales  |
| SILURIAN            | ( Wenlock<br>(<br>(           |  |
|                     | ( Llandovery<br>(             | Hughley Shales   |
| ORDOVICIAN          |                               | Calcareous sandstones and shales   |
| CAMBRIAN            |                               | Quartzites, sandstones, shales   |
| PRE-CAMBRIAN        |                               | Intrusives, volcanics and various sediments,<br>metamorphosed to a greater or lesser extent  |

made up of Lias and the valleys are cut through the Rhaetic into the Keuper Marl. Down-wash from the Lias and drift deposits tends to obscure the solid geology. Just north of Hoton (SK 574225) a fault brings up the Keuper Marl to the south and this formation continues as far as Barrow Hill (SK 582194), where once again the road climbs back onto the Lias. A possible concealed coalfield beneath the Mesozoic rocks of this area has recently been suggested by Spinks and Strauss (1965), but this idea has not yet been tested. Across the Soar Valley to the southwest there are excellent views of Charnwood Forest.

At the roundabout in the centre of Barrow-upon-Soar (SK 575175) members were pleased to note the fine concrete Plesiosaur set in a plinth.

#### Barrow-on-Soar and Quorn (SK 561163) to Whitwick (SK 436160) via B591 and B587

From Barrow the road quickly drops down into the Soar Valley. A floodplain is evident, if only from the raised cat-walks bordering the road. The village of Quorn is built on a high terrace of the Soar. It is only on the far south of the village that the Keuper Marl again appears on the higher ground.

At Woodhouse Eaves (SK 530147) the route approaches the more rugged country of Charnwood Forest. The purple roofing slates here were obtained from a nearby quarry (SK 528152) in the Pre-Cambrian Swithland Slates. The first Pre-Cambrian rock outcrops seen (Slate Agglomerate) form a sharp ridge to the north of the road. The road climbs steeply with rocks clearly visible, particularly on the north side, until the summit at Beacon Hill (SK 510148) is reached.

The party stopped for a time at this point to examine the Beacon Hill Hornstones and to see the panoramic view of the Charnwood Forest area from the viewpoint. It can be seen that there is a series of hills with steep valleys between. In the main the hills are made up of Pre-Cambrian rocks and the lower ground is occupied by the Trias. The Trias rests unconformably on different types of Pre-Cambrian rock as can be seen in many localities (Bosworth, 1912). From Beacon Hill, the effect of the unconformity can clearly be appreciated. Space is not available here to describe the view in detail but readers may consult a new pamphlet on Charnwood Forest published by the Leicester Lit. & Phil. Soc. (Green et al., 1966).

From Beacon Hill to Whitwick ridges of Pre-Cambrian rocks form the most prominent features in the landscape. Details of the geology of this interesting area have been published by Watts (1947) and Marshall (1948). New exposures were cut by the motorway at Copt Oak (Taylor, 1965b). The road rises steadily until Bardon Hill (SK 460136) is passed, when the view to the south and west is opened up. This reveals the southern part of the Leicestershire Coalfield, with pit heaps around Coalville (SK 430140) and Ibstock (SK 406100). The Coal Measures of this area are bounded to the east by the Thringstone Fault, which throws them down against the Pre-Cambrian rocks of Charnwood Forest. The Coal Measures and the boundary fault are concealed by an unconformable cover of Triassic sediments.

Descending now towards Whitwick, the large quarries (SK 445160) north of the road are being worked in intrusive quartz felspar porphyries of Pre-Cambrian age.

#### Whitwick and Cole-Orton to Ashby via B587, A512 and A453

In Whitwick the coach was stopped in the main street at an obstruction caused by a trench which exposed the red sandy littoral facies of the Keuper Marl. Leaving the village in a northerly direction, the Thringstone Fault is now to the east and Coal Measures underly the Trias. Taking the unclassified road to Cole-Orton (SK 403174), the route enters the exposed northern part of the Leicestershire Coalfield. Pit heaps and road subsidence are the surface expression of coal mining in the area. On the higher ground, as at Cole-Orton Hali (SK 390173), the Coal Measures are overlain by a thin cover of Waterstones.

Ashby-de-la-Zouch (SK 356167) to Tamworth (SK 208040) via A453

The route continues across the exposed coalfield as far as Measham (SK 335121), where it crosses the outcrop of the Lower Permian (? Lower Triassic) Moira Breccia and Marl. Crossing the River Mease, the road climbs rapidly onto Waterstones, which thicken rapidly westwards. Near the cross-roads at No Man's Heath (SK 296090) a prominent feature, made up of a sandstone in the Keuper Marls occurs on the left. At Seckington, (SK 260074) a few miles further on, the rather silty Keuper Marls are exposed in an old roadstone marl pit. To the south the position of the Warwickshire Coalfield is revealed by the old coal tips. The route crosses the northern end of this coalfield near Statsford Hall (SK 237066).

Tamworth - Shifnal via A5

The route continued on Triassic rocks to the north and west of Tamworth to Hopwas (SK 180050). This locality is famous for a breccia, usually considered to be of Lower Permian age. An attempt was made to see this breccia in the old gravel pits immediately north of the village of Hopwas. The stratified gravels of an old river terrace were examined but the underlying breccia was not seen in situ although blocks of it were found in the pit.

The prominent feature of Hints Hill (SK 163041) (with television mast) was then skirted to join the A5. A road cutting (SK 160032) exposes Pebble Beds which comprise the greater part of the hill. The Hopwas Breccia underlies these Triassic deposits.

The route now continued westwards along the A5 across the Triassic basin between the Warwickshire and Cannock coalfields. In addition to the Hints Hill exposure referred to above, two exposures were seen in passing, one near Lawton Grange, Wall (SK 111059), where the beds at the base of the Lower Keuper Sandstones were exposed in the foundations for the re-aligned and widened A5 and the second at Muckley Corner (SK 080064) where sandpits in the Upper Mottled Sandstones occur south of the A5. The higher ground to the north is composed of the Lower Keuper Sandstones.

The presence of the South Staffordshire and Cannock Coalfield is indicated by the colliery tips, the ample signs of subsidence, an opencast coal site near Norton Canes (SK 015075) and the increased urbanisation of Brownhills (SK 050055) to the south and Cannock (SJ 980100) to the north. The position of the faulted boundary is not easy to see on the ground as it is obscured by drift and buildings but it is situated immediately east of Chasewater (SK 035075). The traverse of the coalfield was completed at Longford (SJ 967090), where Pebble Beds lie unconformably on top of the Coal Measures.

The long traverse of the next Triassic basin now commences. The Cannock Chase coalfield boundary fault on its west side is crossed at the two reservoirs (SJ 940100) adjacent to the A5. The surface expression of the fault was seen in the sandy cuttings for the M6 just beyond the reservoirs. The cuttings (SJ 930100) exposed the Upper Mottled Sandstones. Beyond, at Gailey (SJ 917106), rising ground brings in the Lower Keuper Sandstones and at the River Penck (SJ 895108) basal beds of the Keuper Marls overly the Lower Keuper Sandstones. A thin layer of these Marls forms the undulating country to Weston (SJ 800109) where the Lower Keuper Sandstones are again encountered. Indications of this rock can be seen in the local walling stone at Weston, obtained from nearby quarries.

Beyond Weston, the topography is more varied and vegetation indicates a return to sandy soils. The underlying rocks now belong to the Lower Trias. At Crackley bank cross-roads (SJ 759109) the coach turned off the A5 for Shifnal (SJ 750077) on the B4379. The same road is taken beyond Shifnal and then the B4380 for Madeley (SJ 700043) and Ironbridge (SJ 671033).

## Shifnal to Much Wenlock

Just before Madeley the presence of open-cast coal sites (SJ 710050) indicates the route has now left the Trias and is back again on Upper Carboniferous rocks. The junction in fact is thought to occur near The Wyke (SJ 733066) just outside Shifnal but drift deposits tend to obscure the junction. At Madeley we are within the Shropshire Coalfield with characteristic urbanisation. Beyond Madeley the road descends steeply into the Ironbridge Gorge (SJ 671033) cut by the River Severn as an overflow channel when its route to the west was blocked by ice at the close of the ice-age. The existence of ironstone nodules in the Coal Measures led to the establishment of an iron industry and one of the famous products of this age is the Iron Bridge which still spans the gorge but which is now closed to vehicles.

Reluctantly we left this industrial archaeological relic and continued along the gorge floored by Middle Coal Measures until, south of Coalbrookdale, the route crossed onto Lower Palaeozoic rocks. The Coal Measures here rest unconformably on Wenlock shales and limestones. The gorge widens out to the west and river terraces can be seen on the sides of the valley. Just before Buildwas we turned off on the B4378 towards Much Wenlock, passing sand and gravel pits in the terrace deposits. The first sight of the Wenlock Limestone was on the old Farley Quarry (SJ 632018). A convenient nearby hostelry provided refreshment for the lunch stop.

## Much Wenlock, Church Stretton and Shrewsbury

The limestone ridge is crossed immediately north of Much Wenlock (SJ 625000), where extensions to an old quarry have exposed many fossiliferous beds. We now proceeded towards Church Stretton (B4371). A stop was made at Stretton Westwood (SJ 598985) to examine the limestone in the quarries of the main ridge. The cream coloured limestone occurs in beds of irregular thickness with interbedded shale. Nodular beds were common. The limestones contained many fossils principally coral, brachiopods, trilobites and bryozoans. The dip of the beds was to the south-east and in this direction one could see the parallel escarpment formed by the younger Aymestry Limestone.

Then started perhaps the most scenic part of the tour. The road (B4371) towards Church Stretton runs initially along the crest of the Wenlock limestone scarp. Views can be obtained northwards through gaps (faulted) in the Aymestry Limestone to the Devonian outliers of the Clee Hills. To the north, extensive views are obtained across the Hughley Valley to the Upper Cambrian areas of Sheinton (SJ 610040) and Cressage (SJ 590041) and the Ordovician country of Church Preen (SO 541981) and Cardington (SO 505952). Beyond are the Pre-Cambrian ridges of the Lawley (SO 495975) and Caer Caradoc (SO 478954). The road descends the escarpment edge and passes by Rushbury (SO 513919), Hope Bowdler (SO 482938) and Helmeth Hills (SO 453936). As the road descended towards Church Stretton (SO 453936) excellent views were obtained of the Pre-Cambrian mass of the Long Mynd and the Cardingmill Valley. It had been intended to visit a quarry in Church Stretton to examine some of the volcanics of the Long Mynd but time was short and the bus was ordered northwards along the A49 towards Shrewsbury. The views of the volcanic rocks on Caer Caradoc and the Lawley are now more impressive and as the valley begins to widen the ridge of Pre-Cambrian rocks swings away to the north-east. At the end of the ridge the upstanding mass of the Wrekin (SJ 629080) could clearly be seen.

South of Leebotwood (SO 475965) the road imperceptibly crosses onto the Upper Coal Measures of the Shrewsbury Coalfield. Close to the above locality Coal Measures rest unconformably on Pre-Cambrian beds. A ridge of Pre-Cambrian rocks can be seen west of the road just south of Bayston Hill (SJ 488089), and in Bayston Hill exposures of the Pre-Cambrian Bayston Hill Volcanics can be seen along the roadsides. As roads are widened and walls built these exposures are gradually diminishing in size. The volcanic rocks are brought up by a fault but almost immediately the Coal Measures unconformity is again crossed and the road drops into Shrewsbury.

On the route through Shrewsbury something was seen of this historic town situated in a fine defensive position almost completely surrounded by the River Severn. The route north passes the main entrance guarded by the Castle and close by the wall was seen the statue of Charles Darwin outside the old school which he attended as a boy.

#### Shrewsbury to Whitchurch via A49

North of Shrewsbury, little could be seen of the faulted junction between the Coal Measures and the Lower Mottled Sandstone, or of the higher Triassic beds of Battlefield (SJ 518168).

Further north the topography becomes more varied and at Grinshill (SJ 520234) there is a thick well cemented conglomerate at the junction of the Upper Mottled Sandstone with the Lower Keuper Sandstone. A fault running parallel with the A49 shifts the escarpment formed by this rock so that it appears further north on the east side of the road.

Near Brocklehurst a stop was made to examine the Lower Keuper Sandstone at a roadside exposure (SJ 555281). The road continues northwards but the escarpment formed by the Lower Keuper Sandstones swings to the north east. The road crosses into the extensive Cheshire-Lancashire Triassic basin. The upper beds (Keuper Marl) are largely covered by glacial deposits and little can be seen of them. The full sequence must be crossed quickly, for at Prees Green (SJ 569306) Rhaetic and Lower Liassic rocks have been proved in a borehole, and at Prees (SJ 554335) a substantial feature marks the position of the harder Middle Liassic sandstones. This outlier of Liassic rocks is very small and at the A49/A41 junction (SJ 556380) we were again on Upper Triassic rocks.

#### Whitchurch to Stone via A525 and A51

Whitchurch was the most northerly point reached on this tour for the route now turned eastwards towards Nottingham. From Whitchurch to Woore (SJ 730403) via Audlem (A530, A525) little can be seen of the solid geology. The ground is largely covered by glacial deposits. The terrain is quite irregular with many ridges of drift (moraines) possible drumlins and river valleys cut down rapidly and steeply into the soft material. The most easily recognised feature was the Woore Moraine.

The position of the Wilkesley bore-hole was indicated on the route to Audlem. It was this bore-hole which encountered very thick Keuper Marl rocks with two series of saliferous deposits each over 1000 feet thick.

The eastern margin of the Cheshire Basin, crossed at Woore, was marked by the outcrops of Lower Keuper Sandstones. Little could be seen of these however, or of the Bunter Sandstones at Pipe Gate (SJ 743406) or the Barren Coal Measures of the southern extremity of the N. Staffs. coalfield at Willoughbridge (SJ 740400). Beyond the road junction at Blackbrook (SJ 770388) a large feature can be seen to the north made up of Bunter Sandstones which cuts the road at Perth Hill (SJ 788390). The top of the hill has a small capping of Lower Keuper Sandstone. Exposures of the Bunter Sandstones are now fairly common on the road to Stableford (SJ 816387).

The road now follows a broad sand filled valley (with main line Electric Railway) to Hatton where a prominent Victorian building turns out to be a Pumping Station obtaining water from the Bunter Sandstones.

The A525 now climbs the hill to Long Compton (SJ 858363) and the bridge crosses the M6 motorway. The Motorway, like the electric railway follows a drift filled valley. To the north the M6 passes through Keele Park which was the scene of much slipping whilst the road was being constructed.

To the north-west are Swynnerton Old Park (SJ 8340), Hanchurch Hill (SJ 840400) and Butteron Park (SJ 830425), in which are exposures of the Swynnerton Dyke, one of the few examples of igneous rocks cutting Lower Triassic rocks. Swynnerton Hall is thought to be built on the same rock.

On the road down to Darlaston (SJ 886355) numerous fine exposures of the Bunter Pebble Beds can be seen. The excursion continued along the A34 to Stone.

#### Stone to Derby via B5037 and A50

From Stone to Uttoxeter the route lies mainly on Keuper Marl covered by extensive glacial drift deposits giving a very irregular hilly terrain. The glacial deposits are usually coloured red by included Triassic material.

From Uttoxeter to Derby one can obtain glimpses of the River Dove and its terraces. From the bridge over the River Dove (SK 105344) the road climbs to Doveridge (SK 120341) and to the highest terrace of the Dove-Trent system, the Hilton Terrace. Except for two steep drops to the floodplain terrace, the road continues on the Hilton Terrace as far as Sudbury (SK 160320). From Sudbury the road is mainly on the lower or Beeston Terrace and occasional glimpses of the higher terraces can be seen to the north. Along this stretch of the road, views to the south show a river cliff mainly of Keuper Marl. We noted the gypsum mine at Fauld (SK 181285) and the castle at Tutbury (SK 211290), built on and including the Tutbury Gypsum. Beyond Foston (SK 190318) and Hatton (SK 216309) the road drops to the floodplain and provides a long level straight road to Hilton (SK 245307), where a short climb takes it back to the highest terrace.

From Hilton, the road (A516) continues on the higher terrace, descending to the floodplain level just before Etwall (SK 270320) which is situated on a small outlier of the highest terrace. Between Etwall and Derby little can be seen of the underlying Keuper Marl or the Mickleover glacial boulder clay.

Through Derby the road descends to the floodplain level of the River Derwent, at present being excavated (Feb. 1968) to provide a better east-west route through the city.

#### Derby to Nottingham via A52

East of Derby the A52 climbs out of the Derwent Valley, leaving the terraces and returning back onto the Keuper Marl. The road follows more or less a strike-section at about the level of a prominent Skerry bed about 60 feet above the base of the Keuper Marl (i. e. Mapperley Plains Skerry). The road descends into valley sections near to Chaddesden (SK 380362) and Ockbrook (SK 420350).

The bridge crossing the M1 was built on a much disturbed outcrop of the lower beds of the Keuper Marl, with many minor faults and folds. On the east side of the Erewash Valley Waterstones outcrop, the top beds of which contained abundant crude oil (Taylor 1964). An east-west fault through the Toton Lane, Chilwell, roundabout (SK 495631) again brings back the Keuper Marl. A fine exposure (SK 501371) of Pebble Beds can be seen east of the road, the outcrop faulted against Keuper Marl. Some evidence of the lowest sandy beds, the Mottled Sandstones, can be seen at the Bramcote roundabout (SK 505379) although this exposure is now becoming covered with vegetation.

Just beyond the Priory Inn (SK 527382) the Waterstones briefly appear in the correct sequence above the Pebble Beds in the side of the road. Mining subsidence, (note the boundary wall of Wollaton Park and the fence on the other side of the road, then emphasises the position of the Clifton fault bringing back to the surface, on the east side, the Lower Triassic, Mottled Sandstones. Pebble Beds occur at the top of Adams Hill (SK 540389).

These rocks continue at outcrop into Nottingham, the road climbing out of the Leen Valley over the Main Pebble Beds escarpment into the centre of the city.

Thus a circular tour was completed, a journey of 240 miles, in ten hours. A vote of thanks was proposed to the leader, guide and courier.

F.M.T.

#### REFERENCES

- BOSWORTH, T. O. 1912. The Keuper Marls around Charnwood. Leics. Lit. & Phil. Soc., 129 pp., 43 text-figs.
- GREEN, F. C. et al., 1966. Footpaths in Charnwood Forest. Trans. Leics. Lit. & Phil. Soc., Vol. 60, pp. 1-19, 10 text-figs.
- MARSHALL, C. M. et al. 1948. Guide to the Geology of the East Midlands. University of Nottingham. 111 pp., 1-1, - 7-5 text-figs., 7 plates.
- SPINK, K & STRAUSS, P. G. 1965. A possible Coalfield east of Loughborough. The Mining Engineer, No. 58, July 1965, pp. 581-590, 2 text-figs.
- STEVENSON, P. C. 1967. Excursion to Rutland, Northampton, the Fens and the Wash. Mercian Geologist, Vol. 2 No. 1, pp. 107-108.
- TAYLOR, F. M. 1964. An oil seepage near Toton Lane, Stapleford, Notts. Mercian Geologist, Vol. 1 No. 1, pp. 23-30.
1964. Geological Tour of the East Midlands. Mercian Geologist, Vol. 1 No. 1, pp. 67-68.
1965. The Geology of the M.1 Motorway in north Leicestershire and southern Nottinghamshire. Mercian Geologist Vol. 1 No. 3, pp. 221-229, text-fig. 1, Plate 14.
1966. Geological tour of the southern Peak. Mercian Geologist Vol. 1 No. 3, pp. 267-274, Plate 17.
- WATTS, W. W. 1947. Geology of the ancient rocks of Charnwood Forest, Leicestershire. Leicester Lit. & Phil. Soc.

#### Geological Survey (G.B.) Maps. One inch to one mile (New Series)

122 Nantwich; 123 Stoke-upon-Trent; 125 Derby; 126 Nottingham; 138 Wem;  
139 Stafford; 140 Burton-upon-Trent; 141 Loughborough; 142 Melton-Mowbray;  
152 Shrewsbury; 153 Wolverhampton; 154 Lichfield; 155 Atherstone;  
166 Church Stretton.