

## GEOLOGICAL TOUR OF THE SOUTHERN PEAK DISTRICT

Leader:- Dr. F.M. Taylor

Sunday May 2nd, 1965

Fifty members of the Society attended the Southern Peak District General Excursion, the second of a series of such excursions designed to illustrate the geology of the East Midlands. It was intended that the country to the north and west of Nottingham would be visited on this occasion, so that a comparison could be made of the geology to be found to the east and west of the Derbyshire limestone country.

The region is mainly composed of Carboniferous rocks, with overlying representatives of the Upper Permian and Lower Triassic Formations. The formations and horizons mentioned on the excursion and in this text are listed in the Table below.

TABLE 1

Sequence of formations and horizons

<u>West</u>	<u>East</u>	
Pebble Beds at Leek and Ashbourne	Pebble Beds            ) Mottled Sandstones    )	Lower Triassic
(No Upper Permian)	Middle Permian Marls        ) Lower Magnesian Limestone   ) Dolomitic Siltstones        ) Basal Breccia                )	Upper Permian
-unconformity-	-unconformity-	
Coal Measures of the Potteries	Top Hard Coal Group        ) Waterloo Coal Group        ) EII Coals                    ) Clay Cross Marine Band     )	Middle Coal Measures
Syncline and Goyt Trough, not seen on this excursion.	Clay Cross Soft Coal        ) Deep Soft Coal Group        ) Deep Hard Coals            ) Tupton Coals and Rock     ) Black Shale Coal            ) Kilburn Coal and Rock     ) Wingfield Flags             ) Alton Coal and Marine Band )	Lower Coal Measures

<u>West</u>	<u>East</u>	
1st Grit (High Moor Grit)	Thin Coal	) Lower
Pot Clay Marine Band	Crawshaw Sandstone	) Coal
2nd Grit	Gastrioceras subcrenatum Marine Band	) Measures
3rd Grit (Roches Grit)	Rough Rock	)
4th Grit	Belper or Chatsworth Grits	) Namurian
5th Grit	Ashover Grits	) or
Crowstones	Kinderscout Grit	) Millstone
Churnet Shales	Mam Tor Sandstones	) Grit
P zone limestones, shales	Edale Shales	)
D <sub>2</sub> zone very thin	P zone limestones and shales	)
	D <sub>2</sub> zone (thin at Wirksworth but	) Avonian
	thickening rapidly beyond Cromford)	) or
D <sub>1</sub> zone Waterhouses Limestone	D <sub>1</sub> zone with <u>Cyrtina septosa</u>	) Carboniferous
	horizon	)
S zone very thin or absent	Older limestones, not	) Limestone
C <sub>2</sub> zone. Weaver Beds	exposed at the surface.	)

Fold Axes affecting this area

<u>West</u>	<u>East</u>
Goyt syncline	Erewash and Langley Mill anticline
High Moor Anticline (Macclesfield Forest)	Ripley and Alfreton Synclines.
The Minns Anticline	Crich, Ashover and Hardstoft anticlines
Bosley Synclines	Stanton - Chesterfield Synclines
Biddulph Syncline	Brimington anticline.
Astbury Anticline	
Lask Edge Anticline	
Rudyard Syncline	
Roaches Anticline	

The character of the excursion closely followed that set by the first of the series (Taylor 1964). The geology of the region was described from the coach, only selected quarries and view points being visited. The excursion was designed to introduce members of the Society to the area and to encourage members to visit the localities again, when details could be noted. No attempt was made at a comprehensive survey of the area.

The route is best followed with reference to O. S. maps One Inch to One Mile Nos. 110, 111, and 112, together with the corresponding Geological Survey maps, Nos. 125, 112, 110 and 123. The Chapel-en-le-Frith sheet (111) is about to be published and will make a useful additional guide.

The first part of the tour covered the Perno-Trias rocks west of Nottingham, exposed irregularly along the A.610 to Nuthall. At Canning Circus, Nottingham (SK 564401) exposures of Pebble Beds were seen at the road side, the remains of old road widening schemes. As the road descends



Members of the East Midlands Geological Society examining and discussing the elaterite (top left) and D<sub>1</sub> Limestones of Windy Knoll Quarry, near Castleton, Derbyshire. Council members in the picture are Mr. P.H. Speed (with pipe); Mr. R. J. A. Travis (shoulder strap); and at bottom right, Mr. E. Taylor, the Treasurer, and Dr. F.M. Taylor (with hammer). The President, Mr. P.C. Stevenson (in hat) is examining a specimen of elaterite.

(Photo: F. N. Hoskins)



to the River Leen, Mottled Sandstones are seen now only in temporary exposures, at Bobbers Mill (SK 550411). Westwards the route crossed Permian rocks, mainly the Lower Magnesian Limestone, although a number of faults cause local complications particularly in the Cinderhill area. The Magnesian Limestone was seen at the road cutting at Cinderhill Colliery (SK 532439) and at the sides of the road to Nuthall (SK 515455). Here the M.1. crosses the A.610 and the resultant numerous excavations have helped to fill in details of local geology.

From Nuthall the direct route (A.611) was taken to Alfreton. Initially the road continues to cross the Magnesian Limestone but descends on to the Middle Coal Measures beyond Watnall (SK.495465). The Magnesian Limestone escarpment continues northwards, the road northwestwards. (Waring 1965 p.202-fig. 1).

Coal mining activities were soon indicated by the presence of Moor Green Colliery (SK. 480479). The Top Hard Coal Seam at this colliery is 340 feet below the surface, indicating the presence of high Middle Coal Measures at outcrops in the Moor Green area. Beyond the Reservoir, the old Willey Lane Pit (SK. 479501) proved the same seam at 546 feet. These high horizons of Coal Measures are maintained to the Annesley Woodhouse (SK. 474527) cross roads, where the route turns westwards, across the strike of the beds which are dipping east. Changes of geological horizon are now rapid, as shown by the features of the sandstone beds. The Top Hard Rock and Coal are crossed at Selston. The old Selston Pit (SK. 458528) worked the Deep Hard Coal and Deep Soft Coal and lower seams, whilst the Hobsic opencast coal site (SK. 455535) worked the Waterloo Coals and Ell Coals, possibly also the Top Hard Coal, at the surface. The Deep Hard and Deep Soft Coals outcrop along the Erewash Valley. As the river is crossed, however, dips begin to change direction. Initially very low inclinations are recorded but dips to the west are encountered climbing the hill into Somercotes. The younger rocks are again encountered as the axis of the Alfreton Syncline is approached. Eventually the Top Hard Coal was again crossed as the coach entered Alfreton (SK. 413558). One of the many faults in this area, the Main Ridge Fault, was recently exposed in the basement of the Midland Bank, King Street. As the coach turned northwards along the A.61, the nose of the pitching Alfreton Syncline was followed, giving initially E - W outcrops and a descending sequence.

At the bottom of the hill, the view to the west includes the Crich Tower (SK. 542554) on the skyline, indicating the position of the Crich axis which brings the Carboniferous Limestone to the surface. The effect of this axis aligns outcrops once again northwest to south east; and east of the road the opencast coal site of the 2nd Ell Coal, now restored, (SK. 408570) can be detected. From Crich to the A. 61 dips are to the east and can be as high as 30°, the whole succession down to the limestone occupying only a very narrow outcrop.

The Deep Soft Coal is 116 ft. below the surface at Shirland Colliery (SK. 399580) and outcrops just to the west of the main road through the village. As the road turns to the west, a descending sequence is rapidly traversed until the outcrop of the Tupton Rock is encountered at Higham (SK. 390593). At this point the road turns north again and runs along the crest of the rock to Clay Cross. The influence of the Ashover anticline controls the outcrops, and the axis can be detected from a view point looking west across Amber Valley. The sandstone escarpments have steep dip slopes to the east except for the opposed escarpment of Cocking Tor, which forms the skyline to the north west, being identified by the Cocking Tor Quarry cranes. Immediately below the view point is the opencast site of the Tupton Coal; the winding gear for a small adit mine was seen to the north (SK. 390611). Turning to the east side of the road, a series of exposures in the Tupton Rock was examined.

The coach continued into Clay Cross (SK. 391634), where the Tupton Coal is recorded at 127 feet below the surface and the Black Shale Coal at 308 feet. At Old Tupton (SK. 390652), the Tupton Coal Group is indicated by the presence of blocks of Cockleshell Limestone in the dry stone walls. At New Tupton (SK. 390660), a large fault downthrows the sequence to the north, giving higher Lower Coal Measures. Outcrops of the Clay Cross Soft Coal, probably occurring as two distinct coals, the

Sitwell and Chavery Seams, are on the east side of the road, at the Avenue Colliery and Coking Plant (SK. 391679; Taylor and Howitt, 1965). These horizons are followed into Chesterfield.

Entering Chesterfield, the crooked spire of the church, a famous landmark situated on the Deep Hard Rock, is seen. For the first time, outcrops are affected by an east-west axis passing through Chesterfield, but since it pitches to the east, our route (A.619) to Baslow crossed the nose of the syncline and a descending sequence was followed. Thus the Tupton outcrops at the Ashgate Road (SK. 369709), the Ashgate and Black Shale Coals at Upper Moor (SK. 356706), and the Brampton Seam at Belmont (SK. 345705). Sandstones of the Wingfield Flags Group form the main features around Wadshelf (SK. 315708). Old workings in the Norton, Forty Yard and Alton Seams can be seen as the road descends to Stonelow Bridge (SK. 288716). The Crawshaw Sandstone forms an impressive feature just below this bridge and an old quarry occurs close to the road. Below the sandstone occurs the Gastrioceras subcrenatum Marine Band, the marker horizon for the base of the Coal Measures. The Chatsworth Grit forms the next major feature with the Reticuloceras superbilingue Marine Band occurring in Jumble Coppice (SK. 269721).

It would seem then, that Baslow (SK. 251723) is built on the last remnant of the Ashover Grit, for to the north a sandstone at a lower horizon, the Kinderscout Grit, increases in prominence. From Baslow the road, (A. 623), continues northwards to Calver Sough. The river follows a prominent gap between two sandstones, one of which, to the east of the road, trends north-south, whilst the other on the west strikes northeast-southwest. The first escarpment is formed by the Chatsworth Grit, with possibly the Kinderscout Grit at its base; the second is possibly the Kinderscout Grit but more likely a sandstone within the Edale Shales, occupying a position similar to the Mam Tor Sandstones noted below.

On Crossing the bridge at Calver (SK. 248745), the highest Carboniferous Limestone (Eyam Limestones) can be seen at the extreme eastern edge of Longstone Edge, which also trends northeast-southwest. The change of strike of the beds below the Chatsworth Grit can only be explained by an early Namurian structure, not affecting the later R-zone beds.

After touching the boundary of the Limestone and Edale Shales, the route diverges from this boundary, following the A. 622 to Grindleford, and the excellent escarpments of Froggatt Edge and Millstone Edge (Chatsworth Grit). Very fine views of the Gritstone country west of Sheffield can be obtained to the east of the road, whilst on the west side the Kinderscout Grit extends westwards to Hucklow Edge.

At Hathersage (SK. 232816), the coach turned on the A.625 towards Castleton. West of Bamford the valley opens out towards Hope (SK.171835) with the Mam Tor Sandstones forming Win Hill, Lose Hill, and the landslip-scarred mass of Mam Tor. To the south, Bradwell Dale marks the junction of the Carboniferous Limestone, (D<sub>2</sub> and P<sub>2</sub> zones) and the Namurian shales. (E. zone). The northern margin of the limestone is seen as the coach approaches Castleton (SK. 150830) and continues on to the Winnatts Pass (SK. 140828). The surfaces which can be seen extending down into the valley are dip slopes of the fringing reef limestones, with dips in places in excess of 30°. The reef limestones can be seen in Cave Dale (SK. 150827), Cow Low Nick (SK. 141823), the Winnatts, and Treak Cliff (SK. 134832). Extending westwards into the main limestone area are well-bedded limestones, almost horizontal. As the coach passes along this northern fringe, older limestones of the D<sub>1</sub> subzone are seen.

On reaching the junction of the A. 625 with the Sparrowpit road (B. 6061), a stop was made to visit Windy Knoll Quarry (SK. 125830) (Plate 17). The elaterite, neptunian dykes and D<sub>1</sub> limestones were examined and Mr. R. J. A. Travis gave a summary of the cavern formations of the area, the entrance to Windy Knoll Cave being close to the quarry. The nature of the Mam Tor Sandstones could be seen on the scar of the landslip. The sandstone feature continues westwards as Rushup Edge.

The junction of the Reef Limestones and the main shelf limestones was followed along the

Sparrowpit Road. At Eldon Hill the Cyrtina septosa fossil bed, a marker horizon in the D<sub>1</sub> sub-zone, occurs close to the road (SK. 116818) and in the quarry (SK. 114816). At the entrance to Perry Dale, the junction of the limestone with the shales is on the north side of the road, and is marked by a swallow hole (SK. 099813) which takes the streams off the shales and down through the limestones. From Sparrowpit, the road (A. 623, 624) continues to the south following the western margin of the limestone to Buxton. Nothing much can be seen of the extensive outcrops of igneous rock which occur within the limestone to the north east of Buxton at Waterswallows. (Moseley 1965, p.283).

The western margin of the limestone continues south of Buxton. In the vicinity of Burbage (SK. 043724), a north-south fault separates the limestones from high beds of the Namurian. From Axe Edge (SK. 039704) (A. 53) a good view of the western margin of the limestone can be obtained as far as Chrome Hill (SK. 070674) and Parkhouse Hill (SK. 080670), which are formed by steeply dipping, very fossiliferous reef limestones. A link road crosses to the Congleton Road (A. 54). At the road junction (SK. 021709) Lower Coal Measures in the centre of the Goyt Syncline occur. The main part of this syncline is to be found to the north, but the effect of the fold is felt far to the south. This structure is the first of a series of folds, some very tight indeed, proved in rocks extending down from the base of the Coal Measures to the base of the Namurian. Continuing along the Congleton Road, the features seen dip into the Goyt Syncline. These include the Reves Edge Rock (SK. 013698), underlain by a coal, and the less impressive Dane Bower Grit (SK. 005705) (Rough Rock). Further west these beds bend over to the west at Shutlingsloe and Hammerton Knoll (SJ. 976697 & SJ. 964674), forming the High Moor Anticline, a rather broad structure with low dips. Periodically, views can be obtained to the south east and to the impressive feature of the Roches (SK. 000640).

Travelling westwards towards Wincle Cross and the Leek - Ashbourne road, the outcrops seen assume a north - south strike. These include Cophurst Edge (SJ. 952691) (Roches Grit), with its much quarried crest, and the two sharp anticlinal ridges of Croker Hill (SJ. 933676) with radio mast, and to the south of the road, that of Bosley and Wincle Minns (SJ. 941665). All these latter features are composed of the crowstones, quartzites at the base of the Namurian. Now the road descends to Bosley Reservoirs (SJ. 920660), excavated in Boulder Clays at the eastern edge of the Cheshire Plain. Glimpses of this plain were obtained as the coach descended the hill, but the view is not as extensive as that obtained from parallel routes to the north.

At the cross roads (A. 54/A. 523) a quick look north to Whitemoor Hill Quarries (SJ. 915679) revealed the lowest of the Crowstones. Continuing westwards, towards Congleton the irregular nature of the drift-covered Cheshire Plain was appreciated, with its masses of boulder clay and sand deposits, the geology being further complicated by the terraces of the River Dane. Dominating this area to the south is a hill standing several hundred feet above the Congleton area, known as The Cloud (SJ. 903636); it forms the northern termination of the Biddulph Syncline. The Cloud is made up of a number of sandstones, the most prominent being the Roches Grit, with the High Moor Grit forming the skyline.

Because of the drift covered nature of the Cheshire Plain little could be seen, en route, of the junction of the Carboniferous and Triassic deposits. It can be seen at the North Rode Viaduct (SJ. 896657), where the two Systems are brought together by the Red Rock Fault.

From Congleton, the northern end of the Biddulph syncline was traversed by taking, first of all, the A. 527 road towards Biddulph; then the left turn at Mossley (SJ. 877619) for Rushton; and eventually the Macclesfield - Leek road. Along this route the structure of the syncline is superbly set out, the effect of the southerly pitching axis and the steep dips being displayed by the sandstone outcrops.

Descending towards Rudyard Lake, views of the next fold (anticline) to the east were seen, extending from Ashmore House (SJ. 914608) towards Lask Edge (SJ. 915571). Further east the Macclesfield - Leek road (A. 523) is seen flanked by Rudyard Lake to the west and a fine escarpment (? 4th Gritstone) dipping to the east. This road was joined at Ryecroft Gate (SJ. 939616) and the route followed towards

Leek; the road eventually turns to the east down the dip-slope of the gritstone. The view to the east is into the axis of yet another syncline. Dips beyond the axis are westerly and older rocks outcrop, but there are still further complications beyond the ridge of Gun Hill (SJ. 969615) before the Carboniferous Limestone is encountered in the Dove Valley (SK. 129604).

Our route however, turned south-east along the strike of the Carboniferous Beds, following an old valley now filled with Triassic Sandstones and Pebble Beds. At first these red pebble beds occur in irregular patches, but they thicken southwards and form two impressive cuttings on the road entering Leek, one on the north side of the River Churnet and the other as the road climbs up towards the church. A stop was made on this part of the road (SJ. 984564) to examine the Pebble Beds. The coarse, soft sandstones are dark red in colour and contain numerous pebbles of many different sizes, shapes and compositions. It was noticed with regret that the cutting was being lined with concrete blocks; a local Councillor saved the Town a consultant's fee by enquiring from the party its collective opinion regarding the weathering of the rock face and the possible effect on the factories perched immediately on the edge of the cutting.

Our encounter with the Trias was brief, for by leaving Leek on the Ashbourne Road (A. 523) we quickly passed back on to Namurian strata. Little is known about the details of this area, except that lower and lower horizons of the Namurian were crossed until the Carboniferous Limestone was seen south of the road at Cauldon Low (SK. 078488) and the boundary of the Namurian and Avonian crossed at Waterhouses (SK. 083502). Churnet Shales can be examined in the banks of the River Hamps and the highest limestones, P. Zone, in the road and old railway cuttings (SK. 085501) east of the bridge. A stop was made at Brownend Quarry (SK. 091502), to see the Waterhouses Limestone (D<sub>1</sub>) and the Weaver Beds (C<sub>2</sub>). The absence of the S zone and the steep dip (75°) of the beds evoked some considerable discussion. Continuing towards Ashbourne, the southwest edge of the limestone was seen at the Weaver Hills (SK. 095464) and as the road descends towards Mayfield the Trias/Carboniferous Limestone unconformity was crossed.

In order to keep to the southern margin of the limestone, the Kniveton-Carsington Road (B. 5035) was taken out of Ashbourne. Again the route crossed ground the geological details of which are little known. Nothing much can be seen of the Trias/carboniferous Limestone unconformity, but isolated rounded hills made up of dark limestones, presumably of P zone age, occur north of Ashbourne, suggesting that its nature is irregular. These beds can be examined in the stream sections in the neighbourhood of Kniveton (SK. 210503). Between this village and Carsington (SK. 252533), excellent views were obtained northwards to the dolomitised limestone north of Bradbourne and Brassington, i. e. the Rainster Rocks (SK. 215548). To the south, Namurian sandstones give gentle dip slopes to the north. From Hopton towards Wirksworth (SK. 288509), the road runs along and crosses the P. zone/D<sub>1</sub> limestone boundary and the southernmost mineral vein of Derbyshire, the Yokecliffe Rake.

The junction of the P. zone limestones and shales, and the D<sub>1</sub> limestones was examined close to the footbridge (SK. 288511) over the Cromford Road out of Wirksworth. Sufficient fossil evidence was found to indicate the age of the underlying limestones, the junction being particularly well displayed on the east side of the road, but the age of the overlying dark limestones had to be accepted since diagnostic fossils were not obtained from them.

The edge of the limestone was followed to the bridge (SK. 280521) marking the position of the High Peak Railway, where it was intended to stop to examine the character of the local P zone reef limestones, immediately underlying Namurian Shales. However, time was getting short and the coach was directed along the Whatstandwell road instead. This Road climbs to the foot of the Black Rocks (SK. 295525), (? Ashover Grit) and then traverses the very broad Alderwasley syncline. Views of the Crich Stand Limestone (SK. 342554) (D<sub>2</sub>) quarry, with the Tower above, indicated the position of the Crich Anticline, this time seen from the west side, before the route joins the Derwent Valley. The river,

running southwards, has cut through the Chatsworth or Belper Grits and flows along a strike section towards Ambergate, the beds assuming a more obvious easterly dip to the south as the effect of the Crich anticline and local faulting becomes less. This easterly dip is well seen along the road from Ambergate to Ripley, (A. 610).

After passing through the second railway bridge, the paired escarpment of the Belper Grits sweeps down to the road and the quarry to the south, Ridgeway Quarry (SK. 359512), exposes the highest gritstone of the area, which is probably the Crawshaw Sandstone at the base of the Coal Measures. A visit to this quarry would have located the underlying shales and sandstone (? Rough Rock), the question marks indicating that the all-important Gastrioceras subcrenatum marine band has not yet been found in the Ambergate area. The steep dip at the quarry further emphasises the structural complexity of the area, with its many faults.

The next rocks seen are those at the quarry of the Butterley and Blaby Brick Works (SK. 360517). This very fine quarry exposes Lower Coal Measures probably about the vicinity of the Upper Smalley Coal and below the Alton Marine Band. A coal, seen in the southern part of the quarry, is involved with a number of small faults. At the base of the quarry is a ganister and fireclay horizon, the shales and sandstone between being involved in a text-book example of a wash-out structure.

After passing under the canal bridge (SK. 360521), the country north to Crich was viewed, showing excellent north-south features. West of the canal is the dip slope of the Chatsworth Grit. Higher rocks seem to be faulted out for the next features are caused by the hard beds of the Wingfield Flags. On the south side of the road the General Refractories' Quarry (SK. 362520) used to expose the Alton Coal and Marine Bed, but now the fossils can only be obtained from the tips. Higher shales are still exposed, with a thin bed containing Lingula sp.

As the next road cutting was approached, the feature of the Kilburn Rock was seen to the north and the rock exposed in the cutting itself. The effect of the easterly dip was shown by the rapidity by which marker horizons are passed on the road to Ripley; the feature of the Tupton Rock and in succession the open case coal sites for the Tupton Coal (SK. 376514), Deep Hard (SK. 384513) and Deep Soft Coals, the latter occurring on the lower slopes of Hartshay Hill (SK. 390511), on both sides of the road. The Clay Cross Marine Band must now be crossed, though it has not been located, and also the lowest coals of the Middle Coal Measures, for Ripley is mainly built on the Sandstones above the Top Hard Coal Group.

As on the outward journey, the length of traverse of this group of Middle Coal Measures is increased by the effect of shallow folding (the Ripley syncline and its associated Langley Mill (SK.451471) anticline to the east). Eventually, at Kimberley (SK. 497448), the low escarpment of the Upper Permian Rocks was seen cutting across the road, marking the unconformity of the Permian and Carboniferous. The road is built on the dip slope of the Magnesian Limestone. This completed our circuit, the outward route being joined at Nuthall.

This long traverse over the Middle Coal Measures serves to emphasise one of the main differences between the areas to the east and west of the limestone. On the west side, the limbs of the north-south folds are much steeper and the crests of the more numerous folds, closer together, giving a tighter fold pattern. The limestone is only seen at one very small inlier (Astbury, SJ. 865595) to the south of Congleton. On the east side the folds are broader, becoming increasingly so to the east with axes trending northwest-southeast, so that similar horizons are maintained over wide areas. Larger limestone inliers occur at Ashover and Crich.

It was also noted that reef limestones, although most fully described in the literature from northern outcrops, occur pretty well right round the limestone outcrop and can be of all ages from C<sub>2</sub> zone to P zone.

The excursion arrived back in Nottingham with most members determined to revisit the region at a later date. In this respect, at least, the excursion seemed to have been successful.

F. M. T.

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