

PROCEEDINGS OF THE YORKSHIRE GEOLOGICAL SOCIETY
VOL. 36, PART 1, NO. 2, PP. 23-33, 9TH JUNE, 1967

FIELD MEETINGS

North Derbyshire. 20th to 22nd May, 1966.

Leaders: I. P. Stevenson, M.Sc. and M. Mitchell, M.A.

The headquarters for the meeting were at the Lee Wood Hotel, Buxton, where forty-five members and friends assembled on Friday evening, 20th May, to hear an introductory talk by the leaders on the geology of the area.

On Saturday, 21st May, the party met at the Lee Wood Hotel and travelled by private cars to Topley Pike (103724). Here thin-bedded, rather dark limestones with irregular lenses of porcellanous limestone typical of the S₂ Subzone were examined. The base of the Topley Pike section yields the brachiopod *Daviesiella* in some abundance. The relations with the overlying Chee Tor Rock (D₁) were pointed out, the latter forming crags above the less prominent S₂ beds. A stop was made near Calton Hill to point out the features due to the Upper Miller's Dale Lava on both sides of the Taddington Anticline. The party then proceeded to Raven's Tor (150732) to see the Lower Miller's Dale Lava and overlying Miller's Dale Beds, the latter forming a cliff. Minor channelling at the base of the Miller's Dale Beds was seen. After a halt near Hargatewall (113755) to see features due to limestone partings in the Upper Lava the party continued to the junction of Hay Dale and Dam Dale (118773). Here massive Chee Tor Rock overlies thin-bedded, darker, S₂ limestones. A coral band with *Dibunophyllum bourtonense* φ occurs at the top of the dark limestones and also 11 feet below the top, indicating that the zonal and lithological divisions are not quite coincident. Some 160 feet of S₂ limestones were seen, the lower beds bearing *Daviesiella* sp. and with lenses and bands of pale, porcellanous limestone. To the north of this section there is a lateral passage into pale, crinoidal limestones.

Contact phenomena due to a large dolerite sill were seen near Damside Farm (116787). The limestones overlying the sill are here extensively marmorized and also show some silicification with the development of "nodules" of silica. Lunch was taken at the Devonshire Arms at Peak Forest. At Perry Dale a brief traverse of the western end of the apron-reef was made and the presence of a wall-like mass of algal limestone noted. The much-quarried area around Peak Dale was then visited. The section at Duchy Quarry (094768) showed the uppermost hundred feet of the Chee Tor Rock, fine-grained and massive with several potholed surfaces,

indicative of breaks in sedimentation, algal bands and two main horizons with *Davidsonina septosa* (respectively some 25 feet and 60 feet from the top). Above the quarry the outcrop of the Lower Lava, here thin, was pointed out and the overlying fossiliferous beds at the base of the Miller's Dale Beds examined. Sections in several quarries hereabouts have yielded a rich D_1 coral-brachiopod fauna, some of which was seen. Higher horizons in the Miller's Dale Beds were then examined in Holderness Quarry (083782). These included the Dove Holes Tuff, some six feet thick resting on a potholed surface of limestone. In the nearby section north of the Bull Ring the Lower *Girvanella* Band (basal D_2) was seen, resting on D_1 . About twenty feet higher *Saccaminopsis* was found in some abundance. The northern end of the section (079786) showed a reef-knoll of crinoidal limestone, some fifty feet up in D_2 .

The day concluded with a visit to Messrs. Hughes Brothers' Waterswallows Quarry to examine the section in a large dolerite sill. The irregular base of this had been reached in places and some altered vesicular lava was present between the sill and the underlying limestone.

On Sunday, 22nd May, the first stop was at a roadside quarry (112816) opposite Eldon Hill to see limestones of back-reef facies. The party then visited Windy Knoll Quarry (126830) to see D_1 limestones with Neptunian dykes of D_2 or P_2 age and the well-known elaterite deposit. The cave at this locality was also seen and the unconformable relationship of the Edale Shales to the limestone demonstrated.

At Treak Cliff the wall-like algal reef on the crest of the hill (134830) was examined and collections made from the highly fossiliferous fore-reef limestones. Masses of purple fluorite ("Blue John") were seen in an old open working near the Treak Cliff Cavern. Owing to the good offices of Dr. T. D. Ford the party paid a short but interesting visit to the latter and Dr. Ford described the geology of the cavern. The next halt was made at the foot of the Winnats where a typical exposure (140827) of Beach Beds (rolled-shell limestones) overlying the apron-reef was seen. Farther southeast the site of the Speedwell Vent was pointed out and an exposure of its agglomerate (143825) examined.

The main features of the well-known Pin Dale section were demonstrated from a distance. Here D_2 limestones, dark at the base and with the Lower *Girvanella* Band, overlie pale D_1 limestones. The latter and also the lowest part of D_2 can be seen to pass laterally into apron-reef limestones which have yielded a P_{1b} fauna in their uppermost part. Typical open workings on Dirlow Rake were also

seen and the development of silica blocks (considered to be due to the weathering of a preferentially-silicified bed) adjacent to the vein pointed out.

Lunch was taken at the Shoulder of Mutton Inn, Bradwell. After lunch the President called upon Dr. T. D. Ford to propose a vote of thanks to the leaders; the response of the members was both warm and appreciative. The remainder of the day was spent examining the section in Bradwell Dale. Here high D_2 limestones with the *Orionastraea* Band are overlain by a large flat-reef developed in the Eyam Limestones (P_2). A strong unconformity develops at the base of the latter at the northern end of the section, cutting out at least thirty feet of beds including the *Orionastraea* Band.

Stainmore and Kirkby Stephen. 8th to 10th July, 1966.

Leaders: I. C. Burgess, B.Sc. and B. Owens, B.Sc., Ph.D.

The headquarters of the meeting were at the Garbridge Hotel, Appleby, where thirty-two members and friends assembled on the evening of Friday, 8th July, to hear a short introductory talk by the leaders on the geology of the area.

On Saturday morning, as the party travelled by private coach to Argill Bridge (NY/8253 1280), the leaders pointed out the salient features of the Pennine escarpment. The purpose of the day's excursion was to examine the Millstone Grit Series and Coal Measures rocks of the Stainmore outlier. The rocks of the Millstone Grit Series, over 1,500 feet thick, are almost continuously exposed in Mousegill Beck. Recent work on the fauna and on the spores from this section¹ has shown that beds of E_1 , E_2 , R_1 and G_1 ages are present, and there is additional spore evidence to suggest the presence of R_2 ; no evidence has been found of the intra-Namurian unconformity formerly believed to be present in the area. At least a thousand feet of Coal Measures are present in the outlier. The lower part of the sequence, up to the *Carbonicola pseudorobusta* "mussel" band, is seen in both Mousegill and Argill becks; the upper "productive" Coal Measures are only seen in Argill.

The Great Limestone was examined at the junction of Argill and Mousegill becks, where it shows the effects of the sub-Permian dolomitization which affects most of the limestones in the outlier. The party then proceeded up Mousegill Beck. The Little Limestone was seen in a small crag on the north bank of the beck, resting

¹ OWENS, B. and I. C. BURGESS, 1965. The stratigraphy and palynology of the Upper Carboniferous outlier of Stainmore, Westmorland. *Bull. Geol. Surv. Gt. Br.* No. 23, 17-44.

on reddened sandstones of the Coal Sills; farther upstream, the Crow, and Lower and Upper Stonesdale limestones were also examined. The Upper Felltop Limestone crops out south of Stricegill Farm, and the leaders here pointed out that the thick, medium to coarse-grained sandstone underlying this limestone is the same as that which caps the escarpment from Iron Band to Black Tawthwaite, two miles to the north-east, and may well be the same as that which forms the summit of Cross Fell.

The members then continued upstream to the High Wood Marine Beds, the local equivalent of the Botany Limestone, of high E_2 age, where twenty minutes' collecting demonstrated the variety (though not abundance) of the fauna of these beds. From there, the party walked over the almost continuous section through the overlying strata up to the Peasah Wood Limestone. The fauna of the fossiliferous shales above this 1-foot bed of limestone includes *Posidonia corrugata* (R. Etheridge jun.), suggesting an E_2 age. The presence of the H Zone has not been proved in the outlier.

The fauna of the Mousegill Marine Beds, 70 feet above the Peasah Wood Limestone, includes *Homoceras henkei* H. Schmidt, of basal R_1 age, and some time was spent collecting from these beds; goniatite fragments were obtained from the lowest marine shale, as well as brachiopods and lamellibranchs. Some excitement was caused by the discovery by members of a small oil seepage at this locality.

The stream was then followed up to a small bridge (NY/8366 1244) above which the Swinstone Middle Marine Band crops out; this is the local equivalent of the *Gastrioceras cumbriense* Marine Band. The fauna in this area is rich in brachiopods and lamellibranchs. Goniatites are uncommon, but several fragments were obtained, and also one poorly preserved *Gastrioceras*, probably *G. cumbriense* Bisat, discovered by Dr. G. A. L. Johnson on the north bank in a nodule from a horizon three feet above the base of the band.

After lunch, the party continued upstream across strata of Lower Coal Measures age to Swinstone Bridge, where poorly preserved *Carbonicola* cf. *pseudorobusta* Trueman were obtained from ironstone nodules in crushed shale. From there, the party struck out across country to Argill Beck, joining it near the base of the Coal Measures. After a short walk upstream, over the same beds as had been seen in Mousegill, the leaders pointed out the position of the outcrop of the *C. pseudorobusta* "mussel" band previously noted.

Old workings on the north bank mark the position of two coals higher in the sequence. Between these is a 2-foot cannel coal which

is exposed in the stream, but when traced up the bank, passes laterally into red and white shale. After some discussion, the members agreed that this was probably due to the coal having been burned *in situ*.

The topmost 200 feet of the Lower Coal Measures are exposed in a continuous cliff section. Several coals are present, and two "mussel" bands. Some time was spent examining the lower of these (the Argill Shell Bed) and in searching (unsuccessfully), in a small gully on the south bank, for specimens of *Lingula* around the probable position of the mid-*modiolaris* Marine Band, underlying the higher of the "mussel" bands. Middle Coal Measures strata, including another "mussel" band, were seen in Argill Beck below and above Gillbank footbridge. The youngest strata present belonging to the *A. similis*-*A. pulchra* Zone were formerly exposed in the scar of a landslip (NY/8400 1366). Recent movement of this slip has destroyed the sections, and at the time of the excursion had almost completely dammed Argill Beck. Sixty yards above the footbridge, members crossed the Stainmore Boundary Fault, which here throws red-stained Coal Measures sandstone against yellow sandstones of the Carboniferous Limestone Series underlying the Cockleshell Limestone. Farther upstream, at the horizon of the Scar Limestone, the tight folds which run parallel to the Boundary Fault were examined.

The party then walked across the fields to the Punchbowl Inn, stopping on the way to see a short section in Crag House Gill, where the *C. pseudorobusta* "mussel" band and overlying beds (at present concealed by alluvium in Argill Beck) were well exposed. After tea at the inn, the party returned by coach to Appleby.

On Sunday morning the members assembled at The Sands in Appleby, then travelled by car to Kirkby Stephen. The purpose of the excursion was to examine the Permo-Triassic sections in the River Eden. In this area, two brockrams occur in the Permo-Triassic sequence. The lower, of Penrith Sandstone age, infills hollows in the pre-New Red Sandstone landscape; the upper is a northward-thinning wedge intercalated in the St. Bees Shales. Between the brockrams are beds equivalent in age to the Hilton Series, which include dolomitic limestone containing fossils of Upper Magnesian Limestone age.

The cars were left in Kirkby Stephen, and the party walked first to Frank's Bridge (NY/7764 0874) where Penrith Sandstone with bands of brockram is exposed in the river cliff. Unlike the previous day the morning was overcast, and at this point a persistent drizzle began, which was to continue for the rest of the day. The

members sought shelter under the bridge for a short while, and Mr. Burgess gave a résumé of the geology of the area. The first section that the party examined extends some 1,500 feet upstream from Frank's Bridge, and is the most complete in the area. Above the Penrith Sandstone are about 35 feet of poorly exposed sandstones and mudstones, followed by 7 feet of poorly fossiliferous dolomitic limestone, which was seen in the north bank of the river. The overlying St. Bees Shales are about 70 feet thick, with the Stenkrith Brockram, here 15 feet thick, near the base. The shales are in turn succeeded by the St. Bees (Bunter) Sandstone. Some time was spent searching for fossils in the limestone, and several poorly preserved lamellibranchs were found.

The party then walked along the river bank, first to the junction with Ladhwaite Beck to examine the St. Bees Sandstone, then upstream through a valley cut in this sandstone to Stenkrith Park. Here another section is exposed, extending from the St. Bees to the Penrith Sandstone. The St. Bees Shales are only 10 feet thick, while the Stenkrith Brockram has increased in thickness to over 60 feet and has been extensively quarried for building stone. The base of the Brockram was seen 450 feet above the railway bridge, separated from the Penrith Sandstone Brockram by 15 feet of thinly-bedded sandstones. Mr. Burgess suggested that the absence of the "Magnesian Limestone" in this section was due to a minor unconformity at the base of the Stenkrith Brockram. In the next section, 600 feet farther upstream, the sandstones were reduced to 5 feet in thickness, and were cut out altogether farther south. The members then walked to Wharton Hall, where lunch was taken in the shelter of a hay-barn. After lunch, Dr. Bradford proposed a warm vote of thanks to Mr. Burgess and Dr. Owens; and Dr. Kent took the opportunity to offer the Society's congratulations to Professor Dunham on his appointment as Director of the Institute of Geological Sciences.

The first exposures to be examined in the afternoon were in the cliffs of the river east of Wharton Hall. There the irregular base of the Penrith Sandstone is well exposed, and small outliers at the mouth of Thringill show that the Brockram is in fact banked against a scarp of Carboniferous Limestone. From there the party proceeded to Nateby, by way of the vast quarries in Stenkrith Brockram, south-west of the village, from which much of the local building stone was formerly derived, and then walked back along the main road to Kirkby Stephen where, in view of the steadily deteriorating weather, the excursion was concluded at 2.30 p.m.

Market Weighton and the Howardian and South Hambleton Hills. 16th to 18th September, 1966.

Leaders: P. E. Kent, D.Sc., F.R.S., J. W. Neale, Ph. D., Vernon Wilson, Ph.D.

On Friday evening, 16th September, forty-two members and friends assembled for dinner at Langwith Hall, University of York, Heslington, the headquarters for the meeting; after dinner the leaders gave a brief outline of the geology of the area to be visited.

On Saturday, 17th September, the party left by coach to study the rock sequences to the north and south of the Market Weighton structure. After crossing the relatively level glacial and superficial deposits between the York and Escrick moraines, the feature formed by the latter, and the recent road cutting through it—now unfortunately grassed over and showing no section—were noted and the first stop was made at the pit north-east of Hotham cross-roads. Here, the lowest Jurassic rocks in the area were seen to consist of Pre-planorbis limestones, with many lamellibranchs, overlain by shales of the Planorbis and of the lower part of the Angulata zones. The route continued by way of North Cave to South Cave, where the President demonstrated the following temporary section in the Middle Jurassic Hydraulic Limestone:

Mill Hill, at the south-east corner of main school building (9195 3094)

	<i>ft.</i>	<i>in.</i>
Purplish-grey clay	2	0
Ironstone rubble with traces of ferruginous (oolitic?) limestone	1	6
Dull purplish clay, blotched with blue	3	0
Lighter grey silty clay, ferruginous silt and ironstone, irregularly interbedded	3	6
Hydraulic Limestone:		
yellow-weathering, grey, argillaceous limestone, massive or irregularly bedded. Fish tooth (<i>Hybodus?</i>), <i>Ostrea</i> sp., <i>Pinna</i> sp., <i>Pleuromya?</i> (poorly preserved), echinoid spines, <i>Galeolaria</i> cf. <i>socialis</i>	3	3
Soft calcareous silt (touched); clayey ground below		—

Although field debris is fairly common, sections at this horizon are very rarely seen.

Southwards from South Cave the last trace of the feature made by the Kellaways Sandstone was indicated, and near Elloughton South Quarry a stop was made to point out the position of the storm beach associated with the 50-foot level of Lake Humber, and to view the escarpments of the Lower Lias at Whitton and of the Lincolnshire Limestone at Winteringham on the south side of the

Humber. Although dry, the weather was hazy and throughout the day distant views were disappointing. Turning eastwards the party next visited the big quarry and open-cast working at Melton Bottoms. Starting in the chalk, the party saw the Black Band at the top of the Lower Chalk and some of the pink bands in the latter (a characteristic feature of the Lower Chalk in Yorkshire) before passing down to the thin Red Chalk and Carstone at its base. The Red Chalk yielded a characteristic fauna of *Neohibolites minimus*, terebratulids and occasional lamellibranchs, but no specimens of the characteristic Carstone brachiopods found recently by Mr. Whittam.

The nature and significance of the gap between the Cretaceous Carstone and the underlying blue Upper Jurassic clays was explained before proceeding to an examination of the latter. These clays are all of Oxfordian age and members found the characteristic oyster *Gryphaea dilatata* amongst other fossils. The upper part of this clay yields a characteristic Upper Oxfordian (Amphill Clay) fauna and represents the local equivalents of the thick Corallian grits and limestones developed some miles north of Market Weighton. The exact position of the boundary between these Amphill Clays and the Oxford Clay of Lower Oxfordian age has not so far been satisfactorily ascertained.

Following discussion amongst some members of the fine sections of Quaternary deposits in the top of the section, the party rejoined the bus and proceeded through South Cave, where attention was drawn to the use made of local stone in building. At Eastfield Quarry material thrown out of a pit dug to prove the base of the Oolite was inspected and some idea of the nature of the variable beds penetrated was obtained; the full succession of the Cave Oolite and overlying White Sands was seen and discussed. At Stather's section beside the abandoned Hull and Barnsley railway line an apparently reversed succession showing Cave Oolite on White Sands was demonstrated and explained as due to ice-rafting when the old Lake Humber probably stood at a level of about 170 feet O.D. The party then walked along the railway to Station Quarry, where the White Sands were again seen together with the overlying Kellaways Sandstone, long famous for its ammonites as well as an abundant fauna of other invertebrates, together with fragments of crocodile bone and plants.

Rejoining the bus the party continued northwards, noting the successive disappearance of the various Jurassic rocks beneath the chalk, though with the brief re-appearance of the Cave Oolite about Sancton; lunch was taken at Market Weighton. After lunch the Rifle Butts Pit at Goodmanham was visited. This shows White

Chalk, Red Chalk and Carstone resting on Lower Lias, the rest of the intervening Jurassic rocks and the Lower Cretaceous being absent. This famous section was preserved by the efforts of the Yorkshire Geological Society and now forms a Geological Reserve owned by the Yorkshire Naturalists' Trust Ltd.

At Millington, north of the flat central portion of the Market Weighton structure, the President demonstrated, from material thrown out of recent excavations, that at this point there was still scarcely more than a hundred feet of blue Lias clay intervening between the pale Rhaetic shales below and the Cretaceous Red Chalk, with a remnant of Carstone, above.

Passing over the Chalk outlier at Great Givendale, the route then lay by way of Fridaythorpe and Fimber, crossing the chalk of the Wolds which showed good examples of the characteristic dry valleys. Just north of Wharram-le-Street the party stopped and examined the North Grimston quarries and road section, where the Upper Jurassic rocks return in force on the north side of the Market Weighton structure. Here a full succession of the thick Corallian was seen from the Upper Calcareous Grit Cementstones at the top, through the Coral Rag, Osmington Oolite and Urchin Dirt Beds to the Lower Calcareous Grit at the bottom of North Grimston Hill. South of Market Weighton these rocks are represented by the blue clay of the Melton pit seen earlier.

Westwards from North Grimston some attractive, faulted, mainly Corallian, country was traversed, until Kirkham Abbey was reached. Here the gorge cut by the waters flowing from Lake Pickering to join Lake Humber during a late phase of the Pleistocene was seen. Before returning to York across superficial and glacial deposits, the last stop of the day was made at the big quarry at Welburn crossroads (now a caravan site) where the Whitwell Oolite (the equivalent of the Cave Oolite seen south of Market Weighton) was examined.

On Sunday, 18th September, some 60 people in 24 cars set off northwards across the York moraine and on to Sheriff Hutton, noting topographic features on the way. North of Sheriff Hutton on the ridge of Whitwell Oolite (Millepore Oolite) bounded on the south by the western part of the Castle Howard fault, a stop was made and the geology of the immediate area was outlined. The route then continued north-westwards passing over faulted Middle Jurassic rocks and crossing the Coneysthorpe Fault about a mile before Shackleton, and the northern part of the Brandsby Fault between there and the village of Coulton. In a large old quarry about one mile west of Coulton a sandy facies of the Whitwell Oolite

was seen to be much more arenaceous than the rock at Welburn in the type area of the Oolite near Whitwell. Proceeding northwards the party crossed the faulted Middle Jurassic country to the Corallian rocks about Hovingham before continuing across the western end of the Vale of Pickering to Nunnington on the north. Here the geology of the area was explained from one of the best viewpoints for observing the Coxwold-Gilling fault graben. The features made by the Kilburn-Ampleforth fault on the north side (maximum downthrow about 1000 feet to the south near Kilburn) and the Gilling fault on the south side (maximum downthrow about 500 feet to the north two or three miles west of Gilling) were noted, as was the mass of Kimmeridge Clay forming Agars Bank within the fault trough. The party then walked northwards to the old quarry where the relationships between the Coral Rag and the underlying Osmington Oolite were very clearly displayed.

The classic section in the Nunnington railway cutting described by Blake and Hudleston in 1877 was next examined, from the Upper Calcareous Grit downwards, attention being particularly drawn to the algal structures and large coral colonies in the Coral Rag part of the succession.

The route continued westwards along the line of the Kilburn fault to Wass where lunch was taken. At Bylands Abbey a short meeting was held at which members associated themselves readily with the hearty vote of thanks accorded to the leaders by Dr. Rayner. At this point the history of the glacial drainage channels in this area was outlined before the party drove slowly past the Bylands and Rush Bank spillways to the White Horse above Kilburn. Here the channels were explained in more detail and the solid geology of the area was pointed out.

At Kilburn the party left the cars to walk up Snape Hill. The Upper Lias Jet Shales are no longer exposed, but a fine Corallian section showed Upper Calcareous Grit faulted against Lower Calcareous Grit with a convincing development of fault breccia and slickensiding. The last stop of the day was made at Gleaves Bank Quarry, near Lake Gormire at the foot of the Corallian escarpment, where a large face showed the Dogger, overlain by Lower Deltaic Sandstone; here the Dogger is thicker than is general in this area owing to deposition in a trough in the underlying Alum Shales. The cutting out of the higher Dogger shales, barely seen to the right of the section, is taken as evidence of post-Dogger erosion.

Though the weather was dry during the two days of the meeting, visibility was very disappointing and instead of proceeding to the top of Sutton Bank for a general view of the area, the meeting

was officially closed at Cleaves Bank at 4.0 p.m. Afterwards about a dozen members continued *via* Sutton Bank to the Shaws Gate Quarry in the Hambleton Oolite where the convolution phenomena described by Hemingway and Twombly (1963) caused much interest.