THE UPPER PERMIAN OF YORKSHIRE

Leader: D.B. Smith — Friday, July 5th - Sunday, July 7th, 1968

Report prepared by Dorothy M. Morrow, in association with Denys B. Smith

This joint meeting, arranged by the Yorkshire Geological Society, was attended by a party of members of both Societies and also by others who were members of either one or the other Society. The party assembled at York for the weekend excursion, in which it was planned to visit Upper Permian beds between Ripon and Doncaster. On the Friday evening, the Leader showed slides describing the palaeogeography of the area and the localities to be visited.

The Table below summarizes the rocks investigated:-

Bunter Sandstone	Evenly bedded fine grained brick red silty sandstone with thin beds of dark red mudstone. The lower beds grade into:
Permian Upper Marl	Dull dark red silty mudstones with thin beds of fine grained brick red sandstones. Contains the Upper Anhydrite, 20 - 50 feet above the base.
Upper Magnesian Limestone	Mainly thin bedded hard silt - and fine-sand grade sub-littoral carbonate with thin beds of green, grey, red, lilac and purple mudstone. Generally sparsely fossiliferous but locally composed almost entirely of the alga Tubulites permianus and the lamellibranchs Liebea squamosa and Schizodus schlotheimi. Plants are locally abundant. The rock is partly oolitic around Ripon and Sherburn-in-Elmet and partly oncolitic further south. It is widely finely cross-laminated and channelled and locally partly de-dolomitised. There are extensive collapse structures, due to solution of sulphate in underlying strata.
Permian Middle Marl	Dull dark red and grey silty mudstones with interbedded sulphates (anhydrite at depth passing into gypsum towards the outcrop) and subordinate thin dolomites. The marls are widely contorted due to solution and mobility of the sulphate beds. The deposit is interpreted as a playa type deposit of a wide backreef lagoonal zone.
Middle Magnesian Limestone	Mainly oolitic, soft white dolomite. Rare beds of soft green mudstone present, with two thin parallel mudstone beds at the base (Hampole Beds). Interpreted as a shallow water shelf/lagoon deposit grading eastwards into an off-shore subaqueous bar facies.
Lower Magnesian Limestone	Composed mainly of algal-ooliths, oncolites and stromatolites in the upper part, and of granular non-oolitic carbonates in the lower part. Patch-reefs common at all levels in shoal areas, rare or absent elsewhere. The lower part locally contains many mudstone partings. Abundant lamellibranchs in shoal areas.

Older Permian beds including the Permian Lower Marl, the Marl Slate, Basal Permian Sands and Basal Permian Breccia were not seen on the excursion.

Saturday, 6th July

The party, travelling by coach, first visited Wetherby Station (SE 398483). The Station is now disused and the cutting shows an exposure of the first carbonate phase of the English Zechstein. This consists of 45 ft. of level bedded, finely oolitic dolomite, a further 20 ft. of which is hidden beneath the floor of the cutting. The bedding of these carbonates is parallel, an almost invariable characteristic of the Lower Magnesian Limestone. The exposure shows fine details of channel bedding, ripple marks, small burrows and other indications of shallow water intertidal conditions, in rocks made up of fine ooliths composed of pure dolomite with a little interstitial calcite. This is the standard facies, containing no reefs. These beds thin north-westwards against a rising land surface.

Further along the cutting, north of the A 659 road bridge (398485), about 30 ft. of the upper beds of the Lower Magnesian Limestone are exposed. These beds, still remarkably horizontal, were stated to be predominately algal stromatolites, pisolites and oncolites.

Newsome Bridge Quarry, North Deighton (SE 379515) This pretty, disused quarry displays the unconformity between the underlying Plumpton Grit (Namurian) and the upper (algal) beds of the Lower Magnesian Limestone. The lower oolitic beds (and the rest of the older Upper Permian beds) of the Lower Magnesian Limestone are missing. The surface of the Plumpton Grit was said to be part of a pre-Upper Permian peneplain, which has an irregular surface here but has a more regular surface to the west nearer the Permian shoreline. Scattered purple-stained quartz pebbles are found in places above the unconformity and large blocks of Carboniferous sandstone are incorporated into the lowest Permian beds, indicating a turbulent environment.

The main features of this exposure is a medium-sized patch reef, which caps a small hill (probably formerly an island), on the surface of the unconformity. The reef has a small polyzoonal core but is mainly composed of algal stromatolites. It passes laterally into and is overlain by level-bedded oncolitic dolomite.

Grimbald's Crag, Knaresborough (SE 362558) The party first descended to the bed of the River Nidd near the weir (SE 364558). At this point, due to progressive overlap, the whole of the first cycle carbonate is absent and the Namurian sandstones are overlain directly by the Middle Magnesian Limestone. At the base of the Permian beds lie 10 to 15 ft. of well bedded oolitic dolomite and this is overlain by the wedge-bedded oolite, of a type generally characteristic of the middle Magnesian Limestone in central Yorkshire. Lamellibranchs were collected from near the river level, but they are rare in the overlying beds.

In the crag itself, the unconformity was pointed out beneath thick wedge-bedded dolomite. Fossils are rare at this point. The oolite is believed to have accumulated in the form of elongate sub-aqueous dunes, as much as 30 ft. high. The rock has many interesting petrographical features. It appears as a good oolite in thin section, but this detail is not apparent in hand specimen. It contains as much as 10% of quartz, which has selectively replaced some of the dolomite and also forms authigenic overgrowths. Some felspar and detrital calcite are also present. All these crystals show as dark spots in the dolomite.

Immediately above the unconformity are some interesting dome-like structures, still being investigated. The leader suggested that these structures may be injection complexes formed over springs, sand volcanoes, or, possibly, stromotolite structures.

The Nidd Gorge, Knaresborough (SE 346566) At the bottom of the gorge, in the Castle Grounds, another exposure of the Middle Magnesian Limestone was seen resting unconformably on the Plumpton Grit. Here again, above the unconformity lies a oolite-sand bar facies, with wedge bedding units 20 - 30 ft. thick. Immediately above the unconformity there is a reddish bed, 6 - 8 inches deep, of detritus from the Namurian beds below.

On the route to the next locality, the leader described the geology of the area through which the coach travelled. Around Burton Leonard, dune bedded Middle Magnesian Limestone is 150 ft. thick, giving rise to a rolling topography not unlike the Chalk country.

Monkton Moor Quarry, Wormald Green (SE 307653) This enormous quarry is exploiting the Middle and Lower Magnesian Limestones. The party first walked over the undulating limestone pavement veined with gypsum (the top surface of the Middle Magnesian Limestone) to see the Permian Middle Marl, at a bank at the S.E. corner of the quarry.

In the quarry, the Middle Magnesian Limestone is only 18 ft thick. The dune bedding is absent and there is only a little wedge bedding. The dolomite is more or less entirely oolitic, with a few thin clay beds and a few poorly preserved fossils.

Beneath the Middle Magnesian Limestone, and separating it from the Lower Magnesian Limestone at the base of the quarry, lie the Hampole Beds. Only a few inches of these beds are present here, but the typical 'sponge-cake' or 'birds-eye' structure could be seen. These beds were said to mark the top edge of intertidal flats, the two mudstones indicating the beginning of subsequent reinudation. Mudcracks indicated periodic dessication.

From Wormald Green to Ripon, further features of the geology were pointed out. These included sink-holes through the Bunter Sandstone, near Ripon.

Quarry Moor, Ripon (SE 308692) The excellence of this exposure compensated for the fact that it was situated at the far side of an evil-smelling corporation rubbish tip. The party were eventually rewarded by seeing the fine section at the top of the Middle Magnesian Limestone, capped by Permian Middle Marls. In these beds, solution of sulphates has led to great irregularities in the bedding: and to a large extent the upper beds are now dedolomitized and contorted, whereas the beds below are regular. There are also sags in the bedding where the evaporites have been dissolved out.

The upper beds of the dolomite showed wonderful algal laminations.

Ripon Parks, Ripon (SE 313739) At this locality, the party saw a newish exposure of part of the Upper Magnesian Limestone in the roadside. These beds displayed the characteristic shallow water sedimentary structures. Here and in other localities, a unique fossil assemblage comprising the alga Tubulites permianus and the lamellibranchs Liebea squamose and Schizodus schlotheimi is found. This area is subject to subsidence as a result of solution of the evaporites in the Permian Middle Marls below. The leader read out an interesting contemporary account of the initiation of a sink-hole and then led the party to see an excellent example in a nearby field. The day was completed by a visit to Fountains Abbey, after which the party returned to York.

Sunday, 7th July

Copley Lane Quarry, Sherburn-in-Elmet (SE 481348) In this large quarry, in the Upper Magnesian Limestone, there is also a few feet of the Permian Upper Marl. The Billingham Main Anhydrite is missing and it was thought that it had been dissolved out.

A huge collapse structure, which stops at the level of the base of the drift could be seen in the quarry face. The limestone beds are broken and the cavity filled by the Permian Upper Marls. The structure was described as a 'fossil' sink hole, since it must have developed prior to the deposition of the drift.

The main mass of the Upper Limestone, over 40 feet thick, is almost a pure white dolomite containing ooliths and shells, with ripple marks and other evidence indicating shallow water conditions. Above the white beds are a few feet of brownish-grey thin-bedded and flaggy dolomites. Above these again are thin beds of purple or green quartz-rich mudstones, overlain in turn by dolomite with a concretionary appearance. At the top, there are three or four feet of lilac and grey dolomitic mudstones which are capped by the Permian Upper Marls. At the base of these marls there is striking evidence of cryoturbation.

New Micklefield (SE 445325) The arrival of 33 cars amongst the backyards of this Yorkshire mining village resulted in a turn-out of the entire population in considerable excitement, and an interested outer circle of spectators watched the examination of the exposure. The old quarry face is cut in wedge-bedded Middle Magnesian Limestone and there is an excellent section of the Hampole Beds, with its characteristic structures. The Hampole Beds overlie a slight discontinuity which may indicate a period of erosion.

The Wentbridge Cutting and Quarry (SE 487178) The exposures here consist of Lower Magnesian Limestone resting uncomfortably on Westphalian sandstones, about 250 ft. above the Top Marine Band of the Coal Measures. The Limestone, mainly dolomitic, is generally oolitic and locally, near the base, extremely shelly. In the quarry the Permian rocks include a large polyzoan reef, with bedded limestones beneath it. The latter contain the lamellibranchs Schizodus and Bakevellia, usually as external or internal molds. Higher beds could be seen to pass into the reefs or over the top, with characteristic primary dip.

South Elmsall (SE 483115) An old quarry close to the village exposes the higher part of the Lower Magnesian Limestone. The quarry face sections a reef consisting of polyzoa and bivalves at the base and stromatolites at the top. Good specimens of weathered oncolites could be collected from the side of this quarry.

Because some members of the party were leaving the excursion at this point, the President of the East Midlands Geological Society moved a vote of thanks to the leader and to the Secretary of the Yorkshire Geological Society for the arrangements. The majority of the party continued to the next exposure near Cadeby.

Cadeby Quarry (SE 5200) The Steetley Company's quarry exposes nearly the whole of the Lower and Middle Magnesian Limestones, with the well-marked Hampole Beds in between. In the Lower Magnesian Limestone there are patch reefs all round the quarry. As at South Elmsall, polyzoan-bivalve assemblages in the core of each mass are surrounded and overlain by algal stromatolites. Above the Hampole Beds are buff coloured wedge-bedded dolomites. The Hampole Beds exhibit their characteristics structures. Plant remains were found in some beds.

Sprotbrough (SE 534015) This quarry also showed the junction between the Lower and Middle Magnesian Limestone but here, as opposed to the last exposure, it was possible to examine the Hampole Beds at the junction 'in situ'. The Hampole Beds were much thinner here than in the Steetley Quarry, only a short distance to the west. A feature of the exposure is the squeezing up of the Hampole clays into the overlying beds, in places filling joints and vertical cracks, in places producing dome-like structures.

It was generally agreed that this should be the last exposure and, after congratulating the leader, Mr. D.B. Smith, the party made their way home individually.

D.M.M. and D.B.S.

REFERENCE

SMITH, D.B. 1968. The Hampole Beds etc., Procs. Yorkshire Geol. Soc., Vol. 36. pp. 463 - 467, text-figs. 1 - 2, Plate 18.