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Field Meeting Report: Geological sites in the vicinity of Telford, led by David C Smith, 22nd August 2009

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ROSENBAUM, M.S. (2009). Field Meeting Report: Geological sites in the vicinity of Telford, led by David C Smith, 22nd August 2009. *Proceedings of the Shropshire Geological Society*, **14**, 47–55. A number of geologically interesting sites in the vicinity of Telford were visited in order to demonstrate the diversity of features recorded within designated RIGS. The sites included: Blockleys Brick Pit (Upper Carboniferous), St George's Church Oakengates (Upper Carboniferous), St Michael's Church Lilleshall (Cambrian; Upper Carboniferous), Duke of Sutherland's Monument Lilleshall (Uriconian Precambrian; Upper Carboniferous), Colliers Side Quarry associated with Lilleshall Limestone Mines (Upper Carboniferous), and Great Bolas (Permian/Triassic unconformity).

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INTRODUCTION

The field excursion, led by David C Smith, met at the car park outside Blockleys Brick Pit, Trench Lock, New Hadley on August 22nd, 2009 [SJ 6837 1227]. The purpose was to introduce members to the wide variety of geological features outcropping in the vicinity of Telford and the role of RIGS designation in their recognition and management. Many of the sites visited were on private land, which means permission is required to access the exposures.

LOCALITY 1: Blockleys Brick Pit, Trench Lock, New Hadley [SJ 683 117]

The visit commenced with an overview of the designated SSSI, located in a former working face of the quarry [SJ 6830 1180] and now protected from further excavation (Figure 1). This is to be conserved at the termination of extraction on site. The section revealed a typical section through the Hadley Formation, at the top of the Middle Coal Measures, the local equivalent of the Etruria Marl Formation of North Staffordshire. The exposure reveals mudstone passing up through a fossil soil horizon into a coal seam, possibly associated with the overlying Main Sulphur Coal unit of the Coalport Formation (Upper Coal Measures).

The main southern face of the pit was then visited, exposing spectacular esplayed sandstone horizons and channels for which the site has been designated as a RIGS [No. 838; SJ 6845 1175] (Figure 2). The thickness of Upper Carboniferous Hadley Formation sediments exposed is approximately 34 metres. The mudstone is mainly purple-brown, in places mottled. Sharp erosional bases can be seen cutting into the underlying mudstone reflecting channelling by flood waters from a relatively close upland source (Figure 3). The rock is Etruria-type mudstone with espleys, which comprise a fine conglomerate with angular fragments of Uriconian igneous material, feldspar, sandstone and shale clasts in a matrix of angular coarse sand (Figure 4). Espleys are lenticular channel-fill deposits, 30-40 m wide and commonly aligned NW/SE. Overlying the Hadley Formation are grey mudstones representing the seat earth of the Main Sulphur Coal.

The sediments here are representative of alluvial fans at the margin of a basin of deposition (Figure 5). Such marginal deposits in the Hadley Formation are virtually confined to this part of Telford. This site is the only one where they can be clearly demonstrated and is thus of outstanding importance for interpreting the geological history of the Late Carboniferous in Britain.

The characteristic orange colour of water draining from the deeper levels of the pit were discussed. They are the result of bacterial growth within acid mine water flowing from abandoned shafts (over twenty of which have been encountered within the pit). The oxidation of iron pyrites within the Coal Measures mudstones is responsible for the acidity. Two mine water issues could be seen discharging direct into the drainage channels.

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Figure 1. The designated SSSI at Blockleys Brick Pit located in a former working face of the quarry [SJ 6830 1180] and now protected from further excavation. The section reveals a typical section through the Hadley Formation (the local equivalent of the Etruria Marl Formation) at the top of the Middle Coal Measures, exposing mudstone passing up through a fossil soil horizon into a coal seam (thin black bed; top right).

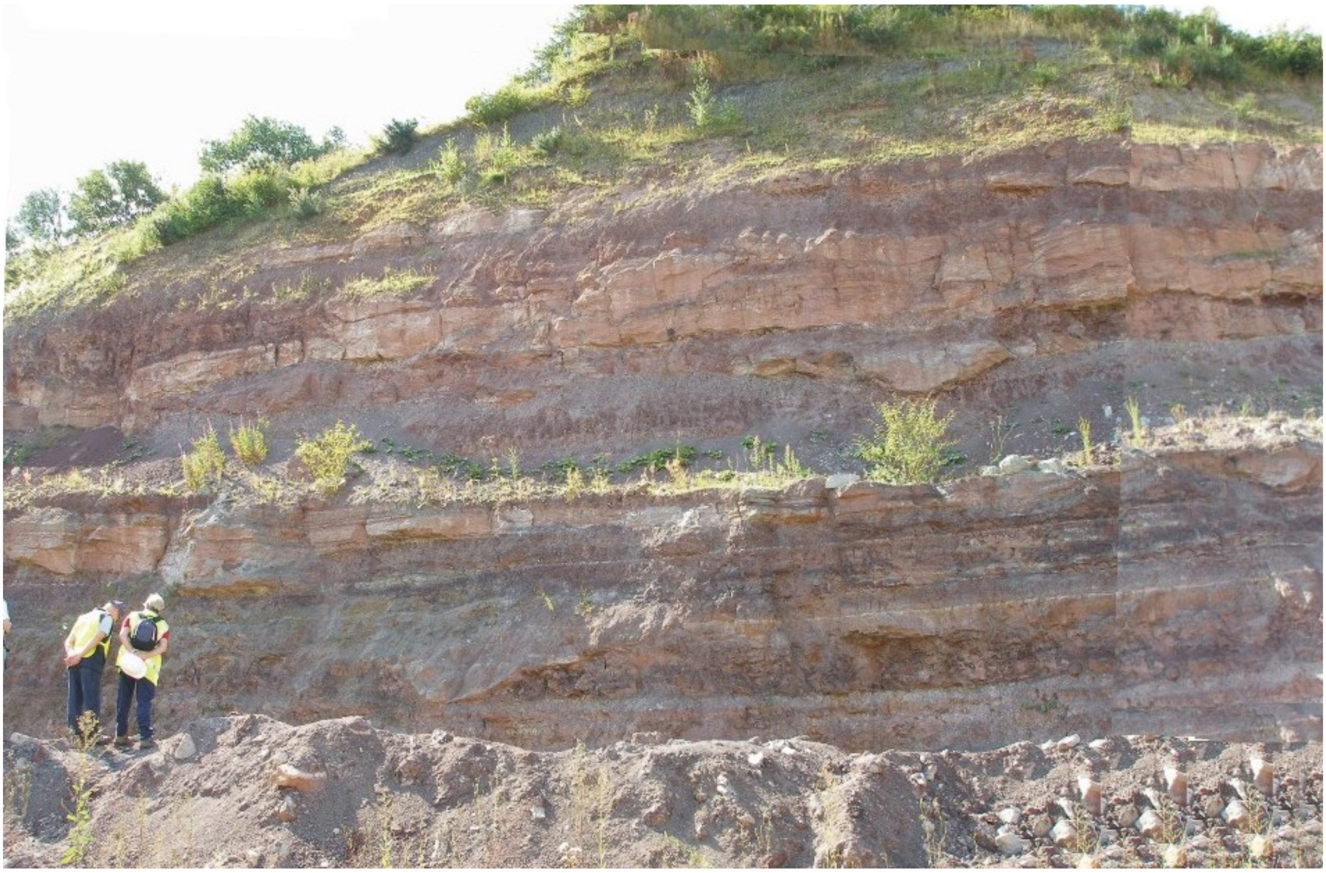

Figure 2. The main southern face of Blockleys Brick Pit [SJ 6845 1175], exposing spectacular esplayed sandstone horizons and channels for which the site has been designated as a RIGS [No.838].

The now disused part of the workings between Hadley Road and the main railway line were then visited [SJ 680 116]. This has recently been backfilled and, once compaction has stabilised, will be developed for new housing. The party was able to see the settlement and pore water pressure monitoring devices. It was also able to appreciate the on-going influence of groundwater. This was seen flowing into the site beneath the cover of superficial glacial sediments, causing spring sapping and gulley erosion, and from deep within the Coal Measures, rising through fissures and old mine workings into the deeper levels of the site (Figure 6).

Figure 3. The main southern face of Blockleys Brick Pit [SJ 685 117], exposing a pale grey esplayed sandstone channel.

Figure 4. Polymict conglomerate characteristic of the sediment within the esplayed sandstone channels such as shown in Figure 3.

Figure 5. Sun cracks and red oxidised iron colouration within mudstones of the Hadley Formation, typical of alluvial sedimentation.

Figure 6. The now disused part of the workings between Hadley Road and the main railway line [SJ 680 116]. The on-going influence of groundwater can be appreciated with seeps flowing into the site beneath the cover of superficial glacial sediments, causing spring sapping and gulley erosion. Water inflow is also occurring from deep within the Coal Measures, rising through fissures and old mine workings into the deeper levels of the site.

LOCALITY 2: St George's Church, east of Oakengates [SJ 7093 1090]

A chance finding of a cone-in-cone specimen at Locality 1 (Figure 7) and coincidence with lunchtime led the group next to a lunch stop by St George's Church, conveniently located next to the cricket ground where a match was in play! St George's Church was erected in 1861 as a monument to the 2nd Duke of Sutherland. Newman & Pevsner (2006) states that the church building stone was sourced from Sutherland's own quarries at Lilleshall, using limestone, repeating the view by Scard (1990). However, the group found that all the external rubble stonework was of sandstone, not limestone, largely typical Upper Carboniferous brown sandstone with dressings of Permian Grinshill Sandstone. Careful reading of Pevsner suggests that the limestone may be used internally, but this could not be confirmed since the building was locked at the time of the visit.

However, the main reason for visiting St George's was because of the decorative use of Coal Measures nodules along the top of the church boundary wall, facing the main road (Figure 8). These have been recovered from underground coalmine workings and display very well preserved cone-in-cone structures. These enigmatic features have an appearance similar to a stack of narrow ice-cream cones, both in section and in plan (Figures 9 and 10). They exhibit clear chatter marks along the sides, indicating episodic growth. Along their base is often found a red chert nodule. Their formation is thus associated with early (diagenetic) growth of siliceous nodules within the mud. As overburden stress increased so the nodules were able to concentrate the overburden load. Although the nodules were strong enough to support the weight, the nearby mudstone was not and began to fail, creating the characteristic cone structures. Such phenomena can be reproduced in rock mechanics testing as drilled rock cores are loaded to failure. The cone angle is a function of the cohesion and frictional properties of the rock strength.

Figure 7. Cone-in-cone structures found within the Hadley Formation at Blockleys Brick Pit [SJ 685 117]. Note the red chert nodule at the base.

Figure 8. Decorative use of Coal Measures nodules along the top of the church boundary wall, St George's, Oakengates. These have been recovered from underground coalmine workings and display very well preserved cone-in-cone structures.

Figure 9. Plan view of cone-in-cone structures, St George's, Oakengates.

Figure 10. Side view of cone-in-cone structures, St George's, Oakengates.

LOCALITY 3: St Michael's Church, Lilleshall [SJ 7285 1530]

The old settlement of Lilleshall is founded on an outcrop of Cambrian Comley Sandstone. However, this is only poorly exposed at the edge of the tarmac by the roadside, just southeast of the churchyard [SJ 7288 1526] where it was seen to be a brown sandstone with a distinct greenish hue, possibly due to glauconite (indicating shallow water deposition) (Figures 11 and 12). Although not visited on this occasion, a slightly larger exposure is known to occur within a bank by the footpath just to the northwest, and has been designated as a RIGS [No.908; SJ 7275 1535].

The building stone for St Michael's Church comprises red and buff sandstones of Upper Carboniferous age. One type of buff sandstone drew particular attention, several blocks of which contained prominent elongated white crystals. Close examination revealed these to be of barytes (Figures 13 and 14). The overall appearance of the sandstone was reminiscent of the Big Flint Rock, a thick non-marine sandstone unit. The occurrence of barytes is also seen within the younger Permian sandstones such as at Grinshill, and is likely to be the result of groundwater circulating through the bedrock at the margins of the saline basin developed hereabouts during the Permo-Triassic.

Figure 11. Cambrian Comley Sandstone poorly exposed at the edge of the tarmac by the roadside, just southeast of St Michael's churchyard, Lilleshall [SJ 7288 1526].

Figure 12. Close-up view of Comley Sandstone at exposure in Figure 11.

Figure 13. Block of buff sandstone of Upper Carboniferous age, reminiscent of the Big Flint Rock, in the wall of St Michael's Church, Lilleshall, containing prominent elongated white crystals of barytes.

Figure 14. Close-up view of barytes in Figure 13.

LOCALITY 4: The Duke of Sutherland's Monument, Lilleshall [SJ 729 158]

The Duke of Sutherland's Monument is a 21 m high local landmark which stands on top of Lilleshall Hill, erected in honour of the 1st Duke of Sutherland, in 1839. The Monument itself is constructed of Upper Carboniferous (Middle Coal Measures) sandstone (Figure 15), said to have been quarried at Red Lake, east of Ketley, Telford [SJ 685 107], from which transport would have been possible throughout by canal.

The Monument is founded on a rocky promontory created by an inlier of Precambrian (Uriconian) felsic tuffs of albite-bearing rhyolite. These volcanic ashes are generally thinly bedded, indicating deposition in water from pyroclastic fall deposits ejected from a nearby volcano, probably in an island arc setting. Some units are more thickly bedded and show signs of autobrecciation (Figure 16). The volcanics have since been metamorphosed to create a strong flint-like rock, but a crude E-W cleavage is apparent in some exposed faces.

These volcanics represent the most northerly Uriconian rocks outcropping along the Church Stretton Fault System, and the hill has been designated as a RIGS [No.910; SJ 729 158].

Figure 15. Block of Upper Carboniferous (Middle Coal Measures) sandstone, part of the plinth for the Duke of Sutherland's Monument, Lilleshall.

Figure 16. Autobrecciation of rhyolite tuff within the Uriconian inlier of Lilleshall Hill; bedding is steeply to the left.

LOCALITY 5: Colliers Side Quarry, Lilleshall [SJ 735 165]

Lower Carboniferous limestones of Tournasian (Lower Dinantian) age occur in a faulted inlier that dips steeply east, north of the village of Lilleshall, in an area locally known as "the Slang". These beds were extensively worked for limestone for iron smelting and mortar production in the 18th and earlier part of the 19th centuries, but a major groundwater incursion in 1860 effectively closed the workings. The steep dip meant that workings had to be developed underground, on the pillar and stall system, leaving pillars approximately 9 m square supporting cavities between some 9 m across. Workings extended to depths in the region of 75 m below ground level.

The group visited the open quarry workings at Colliers Side, subsequently deepened by underground extension down the dip of the limestone beds. However, it should be noted that the quarry is now partially flooded, the water is deep, the rock faces have large overhangs in an unsafe state, and vegetation is dense, making the area quite dark and dangerous. Nevertheless the exposures are important since these represent the only Tournasian limestones in the region, and thus this part of the quarry has been designated as a RIGS [No.911; SJ 734 165]. The exposure reveals nodular (concretionary) micritic limestones with thin red mudstone partings.

Limestone exposures *in situ* are otherwise poor, limited to small scrapings along roadsides and within private gardens (Figure 17).

Extracted blocks of limestone have been employed for building stone and garden ornaments around the village. Occasionally other local lithologies have been used. A notable curiosity is rosettes of barytes within sandstone, of quite different habit to the barytes seen in the wall of St Michael's Church (Figure 18, *cf.* 13 & 14).

The underground workings beneath the village were in a parlous state when investigated in the early 1990s and thus a major remediation project was undertaken in 1995-96 to backfill them with industrial waste (crushed PFA and cement). A monument commemorating these works stands by the bus shelter [SJ 7319 1570] (Figures 19 and 20).

Figure 17. Exposure *in situ* of rubbly limestone from the Jackie Parr Limestone Formation in a garden wall, Lilleshall.

Figure 18. Large rosette of barytes employed as an ornamental feature in a garden wall, Lilleshall.

Figure 19. Block of coral-bearing Tournasian Limestone extracted from the nearby mineworkings, now standing by the bus shelter in Limekiln Lane, Lillehall. The block commemorates the backfilling of the mine voids 1995-96.

Figure 20. Close-up view of corals within Tournasian Limestone block shown in Figure 19.

LOCALITY 6: Great Bolas [SJ 644 211]

To the north of Telford, on the southern bank of the River Tern, is exposed a dramatic, highly irregular, contact between Permian and Triassic sandstones.

The contact itself is characterised by a white cemented (probably calcareous) conglomerate which rests on a highly irregular eroded surface, possibly the wall of a former wadi, cut into the lower aeolian Bridgnorth Sandstone Formation (Figures 21 to 24). The alluvial cross-bedded, channelled sandstones above belong to the Kidderminster (Pebble Bed) Sandstone Formation. This site has been designated as a RIGS [No.1380; SJ 644 211].

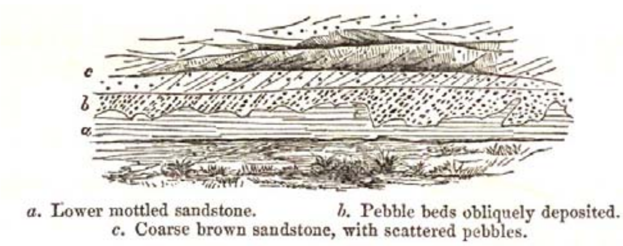

Figure 21. Permian/Triassic unconformity exposed at Great Bolas. This is the section published as Figure 13 by Hull (1869, p.36).

Figure 22. Permian/Triassic unconformity exposed at Great Bolas, at approximately the same locality shown in Figure 21. Alluvial cross-bedded, channelled sandstones above belong to the Kidderminster (Pebble Bed) Sandstone Formation, overlying the aeolian Bridgnorth Sandstone Formation beneath.

Figure 23. Close-up view of Triassic calcareous conglomerate infilling a wadi eroded in Permian aeolian Bridgnorth Sandstone at Great Bolas.

Figure 24. Detailed view of the Triassic calcareous conglomerate infilling the wadi shown in Figure 23, revealing a variety of well rounded pebbles of diverse lithology.

ACKNOWLEDGEMENTS

The author would like to thank the leader and participants of the field excursion, all of whom made valuable contributions by their observations and searching questions throughout the day.

Disclaimer - The information contained in this account has been prepared from notes taken during the field meeting. Its sole aim is to provide a record of what was seen and provide an insight into the diversity of geology outcropping in the vicinity of Telford. It should not be used for any other purpose or construed as permission or an invitation to visit the sites or localities mentioned.

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