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The Coalbrookdale Coalfield

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HAMBLIN, R.J.O. (1982). The Coalbrookdale Coalfield. *Proceedings of the Shropshire Geological Society*, **2**, 2-4. An overview of the development of Telford New Town through the 1970's which had given rise to many temporary exposures and borehole records with mapping on one 2½ inch map and nine 6 inch maps, leading to revised interpretation of the bedrock geology.

Particular attention is paid to the Coal Measures geology, the history of mining for coal, ironstone and clay. The importance of tectonic evolution is also discussed.

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The development of Telford New Town through the 1970's gave rise to many temporary exposures and borehole records. It was therefore a good tine to look at the available information and make useful comments to the Development Corporation. Telford and part of the surrounding area is mapped on one 2½ inch map and nine 6 inch maps.

The base of the Carboniferous rests unconformably on Silurian Wenlock Shale and begins with the Lydebrook Sandstone, a marine deposit representing the onset of the Carboniferous marine transgression. There then follows a sequence of limestone, sandstone, shales and basalt. Although a subject of debate, it is probable that the basalt is extrusive rather than intrusive even though rubidium-strontium dating places it as Westphalian - this is probably due to a weathering effect.

The Coal Measures were formed in low-lying swamps over a vast area during the Westphalian. These swamps were subject to periodic subsidence and each coal seam represents plant growth established in quiet periods between subsidences.

The Coalbrookdale and South Staffordshire Coalfields are at the southern end of the Pennine Basin which extends through Lancashire, Yorkshire and Staffordshire. Subsidence was more rapid further out in the basin so Yorkshire and Lancashire have thicker sequences than Coalbrookdale or Staffordshire.

Correlation between the Coalbrookdale and Staffordshire Coalfields is based mainly on marine bands as these are the most reliable marker horizons. These bands represent variations in sea level possibly as a result of glaciations during the Carboniferous. The Stinking Marine Band of South Staffs (Pennystone M.B. in Coalbrookdale) is the best marker horizon of all because it is unmistakable through both coalfields containing as it does a rich shelly fauna of *spirifers* and *productids* not found in other marine bands in Coalbrookdale.

In Coalbrookdale the early miners were greatly helped by the tendency for seams to come in groups. Further north the seam split up into a more basinal sequence in which seams are roughly the same distance apart, separated by considerable thicknesses of barren measures, e.g. Thick Coal of S. Staffs becomes the yard, double and top coals of Coalbrookdale.

Fireclays represent the soils on which the 'coals' grew and tend to become thicker nearer the land end of the basin. They lie in a belt five miles wide through the south west side of Coalbrookdale, across to Dudley and Brierly Hill.

As you go up the sequence the coal swamps are transgressing backwards over the land barrier southwards and the coalfield becomes further from the land. Therefore the fireclays move further back over the land and the coal seams move further out into the muddier sequences with ironstones.

After the formation of the productive coal measures there was a period of folding and erosion before the barren Upper Coal Measures were laid down unconformably forming the Simon Fault. This is actually not a fault at all but an unconformity and comes from mining parlance in which a 'fault' meant the point at which the coal suddenly stopped. 'Simon' means an unconformity and the Coal Board refer to the Simon Unconformity which is clearly an excellent use of tautology!

Most of the seams run out into this unconformity and caused a considerable problem

for the early miners. Although it comes at the base of the UCM in Coalbrookdale, this is not so in South Staffordshire where the productive coal measures pass up conformably into Etruria Marl - there is then an unconformity at the base of the Halesowen Formation.

It seems likely that in Coalbrookdale the unconformity comes below the local equivalent of the Etruria Marl but it is not clear whether this means there are two different unconformities in the two coalfields or whether the unconformity goes straight through and the Etruria Marl is of a different age in the two coalfields. There are probably a whole series of local unconformities signifying a very unstable time of considerable local tectonics. One can therefore envisage unconformities developing throughout the Midlands over quite a long period.

In Coalbrookdale the UCM start with the Hadley Formation which is the local equivalent of the Etruria Marl. These are red marls with localised coarse grained sandstones 3-4 metres thick which wedge out within a few hundred metres. The clasts can be up to 10 cm across indicating that the material had not travelled very far and reinforcing the view of very unstable conditions. The Marl sequence is at its thickest at Donington at the northern end of the coalfield. Here it is about 300 metres thick and composed almost entirely of red marls. It is very valuable for brick making and is worked by B1ockleys and previously by the Lilleshall Company. Further south in the Snedshill Brickpit, sandstones occur within the marl and these were ground up with the marl for brick making.

The overlying Coalport Formation represents a return to coal swamp conditions. Although the measures are not very productive, the thin coals were worked in the early days of the coalfield since the sulphurous coals were valuable for the brick industry. The sulphur is in the form of iron pyrites (FeS_2) and burns very slowly - it was therefore very useful for heating the brick kilns which need continuous, steady heat.

The *Spirorbis* Limestone in this formation was also mined. This is a lacustrine limestone formed in temporary lakes and was worked for agricultural lime rather than to provide flux for iron smelting.

The railway cutting at Priorslee has one of the best exposures of one of the thickest sandstones in the Coalport Formation. This is the exact opposite of the sandstone in the Hadley Formation, being fine grained, more regular and continuous over long distances. It can arguably be correlated with the sandstone of the Black Country and can certainly be traced north out of the coalfield. Because of this continuity the sandstone has been given names such as Top Rock. It is typically a greenish buff colour basically caused by organic material. The mudstones below the sandstone are pale grey, pink or blue.

The Tar Tunnel at Coalport is cut into this massive sandstone. The tunnel was originally driven as a canal tunnel but tar was struck and exploited as a marketable medicinal oil. It is a heavy bituminous tar which is assumed to be residue from oil deposits leaked out through the Coal Measures. The volatile parts evaporated away leaving the heavy tar behind. The tar probably originated either in Lower Carboniferous marine deposits of North Shropshire or from the Silurian. The tar leaked out up dip into the sandstone.

At the top of the Coalport Formation are workable brick clays. These are not as high quality as those of the Hadley Formation but they have been worked for common bricks, e.g. at Randlay. The greenish sandstones still occur and the formation is topped by very rubbly soft weathered clays. The top of the formation represents the onset of desert conditions which become increasingly apparent in the Keele and Enville Beds.

The Keele Formation contains red sandstones and mudstones. The base is formed by the Brookside Rock, a massive sandstone similar to the Coalport sandstone. It has various colours, basically reddish but sometimes greenish depending on the oxidation state of the iron. This sandstone is overlain by mudstones which, although hard, weather rapidly because of their silty nature. The colour in the Keele reflects the onset of desert conditions whereas the colour of the Etruria or Hadley Formations in Coalbrookdale is due to formation above the water table in a subtropical coal swamp type climate, with coal swamps still in North Staffordshire. In the Keele there is evidence of more desert-like conditions provided by mud cracks and beds of calcite which represent calcareous soils caused by high evaporation rates. There are very few fossils, a few plants, usually un-identifiable, and a few pulmonate gastropods - *Anthracopupa britannica* being a classic Keele fossil - which lived in temporary freshwater lakes.

The Enville Beds are similar to the Keele but redder in colour indicating a more desert-type climate, but still semi-arid because the sandstones are water lain. During this tine large rivers flowed into the area from the south, but these were temporary and occurred only in the wet season. Reflecting this environment are the characteristic conglomerates which were probably laid in wadis. These are comprised mostly of chert with some limestone and did not travel more than 40 miles. Mapping suggests these conglomerates in Coalbrookdale were derived from the west and they therefore had a different source from those at Enville. Correlation in the Enville Beds is very difficult because there are no reliable fossils. Consequently it is not certain that the Enville Beds at Coalbrookdale are of the same age as those at Enville.

The end of the UCM was marked by another mountain-building episode producing faulting. The structure of the coalfield rejuvenates several earlier fault and fold trends. Many of the NE-SW trending faults are rejuvenated Caledonoid faults. In the north east of the coalfield the sequence of NW-SE faults is effectively Charnian. Whether these reflect a Charnian earth-building period in Precambrian rocks below is speculation but in this coalfield folds and faults come in from every direction. It is therefore a critical area on the junction of Caledonoid folding of Wales, Malvernoid running south and Charnian running SE and across the Midlands - but this is also speculative.

The Malvernoid trend is quite pronounced in the number of N-S faults in the Coal Measures which tend to bend round to join the more dominant Caledonoid NE-SW structures.

Both coals and ironstones were mined in Coalbrookdale, both were of the right mineralogy for the primitive iron smelting of 18th Century. Most of the coals are low in sulphur with a low carbon-hydrogen ratio and therefore burned at a high temperature. The ironstone is siderite ($FeCO_3$) which is easier for smelting than hematite (Fe_2O_3) or limonite. The best seams are the Clod Coal and Crawstone ironstone which are at the base of the sequence in Coalbrookdale. The Crawstone ironstone is a solid sheet of ironstone in contrast to the usual very nodular ironstones in a mudstone matrix such as the Ballstone ironstone. These latter types require the mining of large quantities of material to obtain a usable amount of ironstone.

The longwall system of mining was used in Coalbrookdale from the 18th Century although most coalfields did not adopt it until the late 19th Century. In this method the face is driven perpendicular to the main mine road, progressing along the road with material taken from above and below the seam used to pack the workings behind, thus removing the need for pillars.

Opencasting started in the late 18th Century but only grew rapidly during World War Two. This is now the main method of working coals and fireclays. Shropshire produces over 10% of the nation's fireclays, mostly from low in the sequence in the western part of the coalfield.

An opencast site can be carefully worked to remove nearly all the coal. Overburden is carefully removed and finally swept off with brooms. The earlier underground workings were inefficient. Only medium sized pieces of coal were removed, large pieces were used as props and the slack was left. It is now economic to opencast these old workings for the slack. Opencasting can show clearly faults and other features normally hidden from view.

A LECTURE BY DR. HAMBLIN - PRESENTED TO THE SOCIETY ON 11th NOVEMBER 1981

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