Brymbo - Coal, Iron and a Fossil Forest

The Blast Pits, Brymbo Colliery (c1860)

BRYMBO
The village of Brymbo in North Wales was well known for its production of iron and steel. Brymbo iron and steel were exported around the globe from the end of the eighteenth century until 1990.

Brymbo lies at the northern extremity of the Denbighshire Coalfield. Coal was mined locally on a significant scale from medieval times. The outcropping coal seams were first worked on the flanks of the deep valley formed along the major fault line of the ‘Bala Lineament’.

British Geological Survey map of the North Wales Coalfield - Coal Measures (Westphalian) shaded grey.

ROCKS IN THE BRYMBO DISTRICT

Section of strata from Minera to Brymbo (BGS)

Colour key; blue = limestone; brown/orange/green = sandstone; yellow/grey = mudstone; black = coal seams

The sequence of Carboniferous rocks found in the Wrexham area. (BGS)
Typical 18th century mining scene; winding coal by horse whim. (Paul Sandby, c1775)

Slide 5

COAL MINING

Coal was important to Brymbo long before the iron industry was established; documents confirm that coal mining was well established by the year 1540. The last coal was raised at the ‘Blast Pits’ in 1915.

Slide 6

The 1812 ‘Section through the Strata at Brymbo Colliery’ depicts shafts and various coal seams along with the blast furnaces and foundries of the Brymbo Iron Works.

Slide 7 new version

Smelt Colliery, 1960’s. Fireclay is found alongside the coal seams. The fireclay was used at the Caello Brickworks, Brymbo, in the manufacture of furnace and ladle refractories, which were required in the steelmaking process.

Slide 8

Brymbo underground Mining coal and fireclay at the Glascoed mine.

Slide 9

Brymbo Ironworks in the 1860’s. Shows both the No.1 and No.2 furnaces ‘in blast’ with the house of the Boulton and Watt blowing engine in-between. Cast iron pipes were a product of the foundry.
Slide 10

IRON AND STEEL

John Wilkinson bought the Brymbo estate in 1792. Using local raw materials, iron ore, coal, limestone, fireclay and building stone, the Brymbo Iron Works commenced production from the ‘Old No.1’ blast furnace in c. 1796 (L). Steelmaking began in 1885, specialising in engineering steel production from the 1940’s to the closure of the modern plant (R) in 1990.

Slide 11

The ‘Pattern Shop’  Part of the range of late eighteenth century ironworks structures, which are all ‘scheduled ancient monuments’, and all badly needing attention.

Slide 12

REDEVELOPMENT

Part of the sequence of Upper Carboniferous rocks exposed during the redevelopment of the Brymbo Steel Works site. The two lower coal seams, the ‘Brassy’ and the ‘Crank’ Coals are indicated along with the main fossil plant horizons.

Slide 13 new version

Medieval mining (?)  During redevelopment, the removal of the remaining coal in the ‘Two-Yard’ seam revealed evidence of medieval ‘bell-pit’ workings.

Slide 14

THE FOSSIL FOREST
The most impressive fossils; a two-metre high ‘giant club-moss’ (lycopsid) stump rises from shales forming the roof of the Crank Coal seam.

Slide 15 new version

Brymbo tree contrasted with examples found in underground workings in France in the 19th century.

Slide 16 new version

**Excavating** Fossil ‘tree’ stumps were discovered during the recent opencast coal mining on site. Many of the fossils found at Brymbo are in a situation which allows for their conservation. We have identified the positions of more than a dozen ‘giant club-mosses’ along with thickets of smaller horsetails so far in the area set aside for interpretation of Brymbo’s heritage. The fossil site has been acknowledged by experts to be of international importance.

Slide 17

**Top of tree stump exposed in sandstone.**

It is the intention to excavate a cluster of tree stumps to their full height of over two metres.

Slide 18 new version

**COAL FORESTS**

During the Late Carboniferous Period, about 300 million years ago, Wales was on the southern edge of a large continent, near the equator. The climate was hot and wet. There were river deltas
were hundreds of miles across. An ideal environment for the growth of the first rain forests.

Flooding and changes in sea level buried the swampy river delta forests under muddy or sandy sediments. The covered vegetation changed slowly into coal. Over time fresh forests became established and the cycle was repeated to create the many coal seams, which have been worked over the generations in the Brymbo district.

Could we create an extra two slides to go with the text:

Extra slide A – perhaps of a Lepidodendron or fossil thereof

The Carboniferous era forests contained many different types of plants. The ‘trees’ were club mosses (lycopsids). The most common of these ‘trees’ were *Lepidodendron* and *Sigillaria*.

*Lepidodendrons* had distinctive diamond-shaped leaf scars that covered the outer bark. They grew up to 40 metres tall with trunks of up to 2 metres in diameter. Modern descendents are dwarfs by comparison with stems just 1 cm tall.

Extra slide B – perhaps of a sigillaria or fossil thereof

*Sigillaria* had leaves and roots very similar to *Lepidodendron* but their limbs rarely show branching. The tall, columnar trunks of *Sigillaria* lack a scale-pattern, and instead, are generally ornamented with straight, fluted furrows.

These large plants had extensive root systems called *Stigmaria*, from which a profusion of rootlets sprouted from a spiral array of nodes.

**Slide 19 new version**

**BRYMBO FOSSILS**

**Giant Club Mosses**
(Lycopsids)
A dense crown of branching fronds, covered in spikey leaves, topped the trunks of giant club mosses. Many fronds were tipped with spore bearing cones. Other plants, both trees and ground covering vegetation, were characterised by fern-like foliage.

The delta-rivers flooded frequently. The powerful currents ripped foliage from the trees. The loose foliage was lost in the muddy sediments, where today they are found as fossils.

Branching stems from giant club moss; lepidodendron

Slide 20

Giant club moss - Lepidodendron
Branching stem from crown of a tree.

Slide 21

Branch scars. (Ulodendron)
L. Brymbo example
R. Engraving (Schimper)

Slide 22

Foliage Lepidodendron frond.

Slide 23

Bark detail from differing lepidodendron species.
Above; in mudstone below the 2-Yard Coal.
R; in splintery shales in roof of Brassy Coal.

Slide 24

Roots (stigmaria)
Compressed root with rootlets attached; in ‘seat earth’ below the Crank Coal.
Stigmaria casts from sandstone below the 2-Yard Coal

**Slide 25 new version**

**Tree roots**
Roots can extend to great lengths. This example was measured at 8 metres (27 feet) in length. Its total length is longer still as we do not know/found the location of the base of its tree.

**Slider 26**

**Cones** *Lycopsid* frond and spore-bearing cones

**Slide 27**

**Spore bearing cones**

**L.** Cone in ironstone from above the ‘Crank Coal’ seam, Brymbo

**R.** Engraving (Binney) indicating spores.

**Slide 28**

**Megaspores**
Most plants in Carboniferous times propagated from spores, which, being remarkably resistant to decay, are often found in great numbers in the fossil record. One sandstone surface at Brymbo is covered with ‘megaspores’, typically from 0.5 to 1mm in diameter.

**Slide 29 new version**

**Giant Horsetails**
*(Calamites)*
As well as large plants there are many smaller plants present in the forest including tree ferns and *Calamites*, relatives of modern horsetails (opposite).

*Calamites* were prolific during the Carboniferous Period and grew to heights of around 10 metres. They continued to grow as sediments built up around them, occasionally even within the sediment filled hollowed trunks of *Lepidodendron* and *Sigillaria*.

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**Slide 30**

**Calamites**  
Rootstock (L) and leaf whorls, *annularia* (R) from the horsetail, *calamites*

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**Slide 31 new version**

**Seed ferns Medullosales**

The fern fragments in the roof of the Crank Coal were deposited about XXX million years ago.

The most common seed ferns fossils found at Brymbo belong to the genus/family *Alethopteris* and *Neuropteris*. These were trees three to ten metres high with fronds up to seven metres long. *Neuropteris* grew in dense thickets which were self supporting.

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**Slide 32**

**Fish debris**  
A rare tiny fish tooth recovered from splintery shales above the Brassy Coal seam. (The pin-head is 2 mm wide.)

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**Slide 33**

**Animal fossils**
Other than the fish tooth, the first animal fossil found at the Brymbo site was a small crustacean, related to the modern ‘horseshoe crab’, and known as *Euproops*.

**Slide 34**

**Mussel bed.** Bivalve molluscs from shales above the Drowsall Coal, Black Lane Colliery, near Brymbo

**Slide 35**

**Fossil tree.** Sandstone cast of 2-metre stump with roots (*Stigmaria*) attached. This rare fossil, found in May 2008, is being reconstructed within the Brymbo Ironworks site.

**Slide 36**

**THE FUTURE**

The aim at Brymbo is to excavate and conserve as many fossils *in situ* as possible to create an educational resource and visitor attraction complimenting the coal, iron and steel story.

Visitors viewing the standing fossils will be able to follow the evolution of the forest landscapes of the period from lush growth, to inundation, decay and rebirth.

Fine specimens will be selected from an extensive collection of loose material to form the basis of interpretation centre displays.

It is the intention that the life of the Brymbo and neighbouring communities will be enriched by their involvement in the project.