

## Manchester Geological Association

### Saturday 10<sup>th</sup> December 2011 – A Look at the Triassic

Travelling westward on the M56 the Palaeozoic rocks of the Manchester area are soon left behind for the Mesozoic ones of Cheshire as the hills of Runcorn, Frodsham and Helsby come into view. These rocks are part of what is known as the Cheshire-Shropshire basin, a segment of a larger fault system formed in a rifting event in the early Triassic, when the area was subject to a very different climate to that of today – a very hot and arid one. The rocks preserve a number of environments – river beds, sand dunes, salt pans – which later in their history became mineralised with copper ores. Surprisingly, for such a hot, dry region, traces of life are also preserved.

13.30 – 14.15 Triassic Cheshire: An Overview

Fred Owen, Manchester Geological Association

14.15 – 15.00 The Alderley Edge Mines – Nigel Dibben, Derbyshire Caving Club

15.00 – 16.15 Extended Coffee Break to include a visit to Manchester Museum

16.15 – 17.00 Chirotherium and the Triassic Environment

Dr. Geoff Tresise, National Museums Liverpool

#### **Triassic Cheshire: An Overview**

**Fred Owen, Manchester Geological Association**

The Triassic is usually combined with the Permian period and referred to as the ‘Permo-Triassic’. This is because of the close similarity between their geography and climatic conditions, difficulty in establishing criteria for delimiting formal stages in the fossil record and being able to fix an accurate date to distinguish between the two periods. The Permian terminated with the catastrophic mass extinction which resulted in the loss of over 95% of marine species and 70% of land families. The base of the Triassic is now regarded as the initiation of the recovery from this catastrophe, 251 Ma, by the first occurrence of the conodont, *Hindeodus parvus*, in Meishan, China.

For the purposes of this presentation ‘Cheshire’ will broadly cover the area of the Cheshire Basin. During the Triassic Britain was located in the continental hinterland of the Pangea supercontinent, about 20° north of the equator, in a hot, arid climate dominated by a relatively low lying desert landscape. The palaeogeography and tectonics of Britain will be described, along with how the major Caledonian and Variscan Orogenies influenced Basin evolution and the source of the sediments, which large braided rivers transported, to provide the Basin infill. The Permo-Triassic sediments lie unconformably on Carboniferous basement rocks over most of the area but over much older, Ordovician and Silurian, rocks to the southwest. To the east and southeast they are downthrown against the Carboniferous along a series of faults.

The Cheshire Basin is a north-south half-graben, 100 km long and 55 km at the widest. It covers over 3500 sq km and formed in an extensional rift setting associated with the break up of Pangea and the opening of the North Atlantic. It is deepest to the east and southeast, where it is bounded by the Red Rock-Bridgemere-Wem Faults, and shallows to the west and north where it is bounded by the Upper Carboniferous of the Clwyd Mountain range and the

Lancashire coalfields respectively. A horst forms the prominent Mid-Cheshire Ridge, well known for the Sandstone Trail from the Helsby and Overton Hills in the north to Peckforton and Beeston castles in the south. The Basin stratigraphy will be explained and interpreted in terms of the changes in the prevailing Triassic environment. Outcrops at several locations, including Helsby, Frodsham, Lymm and Styal will illustrate these changes.

Mention will be made of the industrial exploitation of the significant resources with which the Basin is endowed, including a thriving chemical industry based on salt and the sandstone, which forms the second largest aquifer in the country. The potential for hydrocarbon sources and mineral deposits, eg copper, lead and zinc, are associated with the tectonic history of the Basin and the presence of salt in the sediments.

The Triassic lasted 52 Ma, ending with another mass extinction before the Jurassic at 199.6 Ma. Younger sediments from all other periods, except the Quaternary, are absent in Cheshire. Finally, brief mention will be made that the Cheshire landscape seen today is largely dominated by the last glaciation.

#### References:

- Plant, J A, Jones, D G, and Haslam H W 1999 'The Cheshire Basin. Basin evolution, fluid movement and mineral resources in a Permo-Triassic rift setting'. BGS, Keyworth, Nottingham
- Toghill, P. 2000 'The Geology of Britain, an introduction' Swan Hill Press.
- Ogg, J G, Ogg, G and Gradstein 2008 'The Concise Geologic Time Scale', Cambridge University Press
- Eagar, R M C and Broadhurst, F M 1991 'Geology of the Manchester Area' second edition. Itineraries VIII to XI. Thompson, D B. GA Guide No.7

### **The Alderley Edge Mines, Nigel Dibben, Derbyshire Caving Club**

The copper, lead and cobalt mines at Alderley Edge have been exploited by man from at least the Bronze Age with carbon-dated evidence from 1950 BC. Shortly after the 43 AD invasion, the mines were visited and made more accessible by the Romans. The next recorded period of mining was in the late 17<sup>th</sup> century shortly after the Crown monopoly on precious-metal mining had been relaxed. The largest volume of ore extracted was in the 19<sup>th</sup> century when new methods of processing were developed. Mining ceased in the early 20<sup>th</sup> century.

The geology of the Edge has had a significant impact on the mining and its current state of preservation. In common with some other sites around the Cheshire-Shropshire basin, Alderley Edge is uplifted above the Cheshire Plain making mining considerably less costly than in many other parts of the UK because of the natural drainage available. The other key advantage for Alderley Edge lies in the method of deposition and re-deposition of ores which has left the most concentrated deposits near the current land surface.

The talk will explain the geology behind the mineralisation at Alderley Edge and the way in which this has influenced, over time, the ores extracted, the mining techniques and the processing of the ores into valuable metals.

## **Chirotherium and the Triassic Environment**

**Dr. Geoff Tresise, National Museums Liverpool**

The footprints called '*Chirotherium*', because of their resemblance to human hands, were found in Triassic sandstones from Germany in 1834 and Cheshire in 1838. As no bones or other fossil remains were found in either locality, the track maker's identity was a mystery. Marsupial mammals were first suggested but in 1842 Richard Owen confidently identified the prints as those of labyrinthodont amphibians. In the twentieth century, it was suggested that pseudosuchian reptiles were more likely to have been the track makers and this view was confirmed with the discovery in Switzerland of the skeleton of *Ticinosuchus ferox*.

British geologists have traditionally regarded the Triassic landscape as being that of an arid desert with little or no vegetation. Conversely the German view has been of a semi-arid environment with a sparse but varied vegetation. Recent research on the Wirral Peninsula has provided support for the German interpretation.