MEMBERS' NIGHT, 2007

The first Members' Night was held on 17th March 2007, when five presentations were made. The instructions to the presenters were simple: *show us your interests and infect us with your enthusiasms*. It is hoped that other members, whether amateur or professional, will take up the baton for future years.

Rock around Orkney

Gerry Shaw

Orkney is largely a remnant of the Devonian Old Red Sandstone continent. While its geology has been studied and interpreted by many, the works of two Orcadians,Hugh Miller in the 19th Century and John Flett Brown in the 20th , are notable.

Hugh Miller was born at in the north of Scotland in 1802, and began life as a quarry worker. He studied fish fossils and recorded his experiences in *The Cruise of the Betsy*, published posthumously in 1858. His main life`s work was to propagate the message of the Free Church, and he edited its journal *The Witness*. Geology was his recreation and he saw the complexities of fossil fish as evidence of the work of a Creator. Moreover as these fossils had existed in ancient times he saw no need for evolution.

John Brown was educated at Stromness primary school, and after a doctorate at Oxford, taught in the USA, before working in oil exploration for BP. He led an Open University field trip to Orkney in summer 2006, which is the basis of this presentation.

The Orkney basin was a large lacustrine basin that developed within a graben after the closure of the Iapetus Ocean. Sediments derived from uplands of the Caledonian orogeny were deposited in the basin, with seasonally varved deposits in the succession above the basement along the Stromness shore; these indicate repeated lake cycles that were probably related to Milankovitch variations in the Earth's orbit. The sediments show evidence of lake conditions including algal stromatolites, with mudcracks as evidence of intermittent desiccation. Devonian lobe-finned and armored fish were preserved by being floated posthumously into deeper water, where they sank to cold, anoxic depths so that decay was inhibited.. The resulting fossils can now be seen in the Sandwick fish bed at Cruaday quarry. Radiometric dating of the sediments (379+/-10 Ma) is provided from a lava flow extruded over the Stromness Flagstones, which is now seen at the base of the Old Man of Hoy.

Gyroptychius*, a lobe-finned fish in Burray museum, Orkney.*

In contrast, the Yesnaby sandstones of the west coast of Orkney Mainland show massive cross-bedding of aeolian sand dunes. These are exposed well in the sea stack of Yesnaby Castle. The flagstones formed an excellent building material for our ancestors, and the houses of Skara Brae and the standing stones of the Ring of Brodgar are two examples of construction 5000 years ago. Moreover, they are a good reservoir rock, and may still contain extensive oil reserves for the modern world.

When Hugh Miller wrote *In the Footsteps of the Creator*, he saw fossils as the work of God. We have the advantages of radiometric chronology, plate tectonics, cladistics and molecular biology which allow us to relate the lobe-finned fishes to the evolution of land vertebrates by natural selection. However it is still marvellous to read such interesting and enthusiastic writing on geology as that produced by Hugh Miller, and to then to view, with a modern perspective, the outcrops on which he worked.

Sea stack of Yesnaby sandstones on Mainland's west coast.

Big Bend, Texas

Alan Filmer

The Big Bend region of south-west Texas, is in the northern part of the Chihuahuan desert and includes National and State Parks. The region is bounded to the south by the Rio Grande following the line of a fault in the Santa Elena limestone downthrown to the north forming spectacular cliffs. Much of the surface geology of the region consists of Cretaceous limestone, intruded by Tertiary rhyolite magmas during Basin and Range extension. They are exposed by faulting and

erosion as seen in the rhyolite domes where they form the crests of the Chisos mountains. Tertiary basalts cap mesas and black basaltic dykes are readily seen crossing the desert as upstanding walls. The landscape is colourful with red and black volcanics contrasting with white limestone. Basement Palaeozoic rocks are seen near the north of the National Park, where steeply dipping beds of chert have been metamorphosed to gleaming white novaculite (see also *Mercian Geologist*, 2005, p133).

Besides geological features that are easily seen, the desert environment provides other attractions: for the botanist there are many species of cactus, lupins and daisies and after winter and spring rains the desert blooms; and for "twitchers" there are avian visitors to the desert from Mexico, and indeed the Road Runner, of cartoon fame, is the distinctive Park emblem.

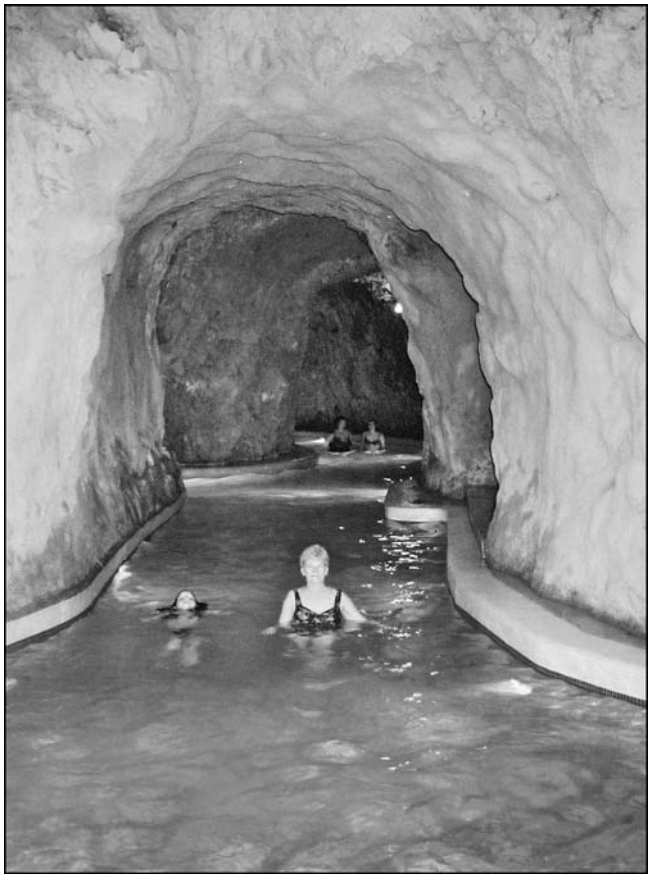
A Geological Visit to Hungary

Tony Morris

Hungary is located in the central part of the Pannonian Basin, surrounded by the Alps, the Carpathians and the Dinarides. It has three principal geomorphological divisions: lowlands consisting of the Great and the Little Hungarian Plains, the Transdanubian mountain range near to the border with Austria, and the North Hungarian Range bordering onto Slovakia. Our excursion with the Hertfordshire Geological Society enabled us to sample some of the complex geology, resultant developments (both social and industrial), and splendid Hungarian hospitality.

With widespread limestone areas, caves and karst scenery are prominent. The Crystal Caves, in Eocene limestone of the Pal Valley, have more than 20 km of passages, and thermal waters are used for public baths in nearby Budapest. The Baradla Cave in north Hungary is in a World Heritage Site of Triassic karst that extends into Slovakia and has more than 270 caves. It is an area of outstanding beauty which is augmented by the plentiful wildlife, particularly the butterflies. Perhaps the most pleasurable of the caves are the Tapolca cave baths on the edge of the Buuk Hills, where visitors swim through caverns half-filled with water that is comfortably warm at 22ºC. The temperature increases to 80ºC in the caves nearer to the thermal centre under the hills. It is not surprising that Hungary's caves and thermal waters have been used for medicinal purposes since the middle ages.

Noteworthy are the preservation of geological sites and quarries as outdoor geo-museums. Bauxite is Hungary's most important mineral, which formed in tropical humid soils which overlay Triassic dolomite, during the Cretaceous, Palaeocene and Eocene. At Gant, south of the Vertes Mountains, the bauxite quarry is preserved as an exhibition site, with laid-out geo-trails and a museum of mining artefacts. Similarly, in the Balaton Uplands National Park a quarry in Pliocene basalt has been used for displays of minerals and the history of quarrying. At nearby Urkut, a former



Swimming in the Tapolca cave baths at 22º C.

manganese quarry is now maintained as a nature reserve, and a representative section of the exposed geological features has been preserved

Geological study has a long history in Hungary, and the Royal Geological Institute was founded in 1869. It is now housed in the Geological Institute in Budapest, a building with an exuberant, if not whimsical, architectural style, which alone is worth a visit without considering its contents!

Potable water from Derbyshire springs

Vanessa Banks

The scene is set with a drought in Derbyshire: *all through these warm August and September nights, from dusk until long after dawn, the queues of farm carts, each with its water barrel and its tired patient horse, have waited for hours by the few springs and wells which have not yet dried up* (Peach, 1933). Similar droughts occurred in 1921 and 1929.

Springs along the Wye valley increase in number towards the east between Buxton and Cressbrook Dale, and although declines can be accounted for by the large seasonal range of the groundwater, 30-50 m being recorded in some boreholes, the more numerous springs to the east are most susceptible to variation. Dewatering the White Peak's lead mine workings, by excavation of soughs, has reinforced the easterly and southeasterly hydraulic gradient of the region.

Key factors in the geology and hydrogeology of the limestone are formational differences and material response to stress. Development of permeability in the aquifers is explained by the inception hypothesis (Lowe & Gunn, 1997), which stresses formational differences. Based on water-tracing experiments, and geochemical and hydrograph analysis, it is suggested that the dominant flow paths in the Woo Dale Limestone are guided by faults and by stylolite-related inception horizons. In the Chee Tor Limestone Member of the Bee Low Limestone Formation there is little evidence for inception-horizon related flow; instead the brittle nature of this formation renders it more susceptible to jointing. Stress relief, where the Chee Tor Limestone is exposed at surface, results in a relatively high hydraulic conductivity, as indicated by dye-tracing experiments. However, at depth, where the joints are tight, the Chee Tor Limestone appears to act as an aquitard.

There is field evidence of inception horizons in the overlying Miller`s Dale Limestone Member (of the Bee Low Limestone Formation), in the Monsal Dale Limestone, and in the Eyam Limestone. Examination of thin sections has identified zones of dolomitization associated with micro-stylolites, and also poikilitic de-dolomitization. It maybe that the replacement calcite is more soluble, and likely to guide cave inception and thus development of the aquifer. Also, associated silicification of the underlying bed renders it an aquitard, with the potential to guide groundwater flow along the overlying inception horizon.

References

Lowe, D.J. & Gunn, J., 1997. Carbonate speleogenesis: an inception horizon hypothesis. *Acta Carsologica,* **26**(2), 457-488.

Peach, L. du G., 1933. Derbyshire Water. *Derbyshire Countryside*, **3**(12), 88

This presentation is based on research in the Limestone Research Group, University of Huddersfield, supervised by Prof John Gunn, Dr Dave Lowe and Dr Alan Dykes; with the permission of the Executive Director of the British Geological Survey (NERC).

Oxford Clay's reptiles and fish

Alan Dawn

For over a hundred years the Oxford Clay around Peterborough and Bedford has been exploited for the manufacture of bricks. Quarrying operations have revealed a rich fauna of large marine reptiles and many fish. In the late 1800s and early 1900s, Charles and Alfred Leeds, farmers at Eye, made extensive collections of fossils, most of which are now in the British Museum of Natural History or the Hunterian Museum in Glasgow.

Peterborough did not then have a museum, and most of the local material has been collected over the last 25 years. Some of this was found by John Phillips soon after the Leeds brothers were active. It includes:

The ichthyosaur *Ophthalmosaurus* represented by an almost complete skeleton, now mounted three-dimensionally for display;

The plesiosaur *Cryptoclidus eurymerus* as an almost complete skeleton with the most complete skull known;

The formidable skull and jaws of Simulestes vorax.

Simolestes vorax, another plesiosaur, that is nearly complete, and with a very well preserved skull;

Pachycostasaurus dawnii, a newly identified species and genus of plesiosaur.

All these are on permanent display at Peterborough Museum together with a complete specimen of *Steneosaurus*, a marine crocodile found by Phillips in 1923. Less complete material that is in store includes *Peloneustes*, *Metriorhyncus*, and *Muraenosaurus*.

More recently a specimen of *Leedsichthys problematicus*, found in 2001, has been prepared in the museum laboratory. In October 2006, another fish was found, but has yet to be positively identified, though it is of particular interest because it includes skin impressions. Other fish include *Lepidotes*, *Leptolepis* and *Caturus*. Sharks are represented by an array of teeth and fin spines, but, because they are cartilaginous, no shark bones have been found. There is also a varied population of invertebrates, including ammonites and belemnites.

In addition to the Jurassic fauna, fossil remains of an extensive Pleistocene animal population are found in the overlying glacial deposits. Woolly mammoth and woolly rhinoceros are frequently found in the Devensian gravels, together with reindeer, horse, bison, aurochs and bear. Earlier remains, from the Ipswichian warm period, include the head and forequarters of *Palaeoloxodon antiquus*, the straight-tusked elephant, and also a hippopotamus.

Crytptochidus eurymeus *under assembly.*