MERCIAN Geologist

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Front cover: Vein cavities on vertical fractures above small caves exposed in the open pit fluorspar mine in Carboniferous Limestone adjacent to Dirtlow Rake, above Castleton. See report on page 290. Photo: Tony Waltham.

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MERCIAN NEWS

Southwell Minster

Some mysteries posed on the Society's visit to Southwell Minster (*Mercian Geologist*, 2006, 220-222) have been resolved through further enquiries by Ian Thomas, with assistance from Malcolm Rose, Mary Skinner, Rory Young and Tony Morris.

The apparently 'red sandstone with occasional green veining' on the west facade of the pulpitum was scorched in a fierce fire caused by a lightning strike 1711, which also brought down the bells, engulfed the timber of the tower and destroyed much of the roof. The redness is ascribed to oxidation, in the fire, of the iron content in the originally paler sandy limestone. The poor state of the stone in parts of the Chapter House is largely due to weathering in the 17th Century, when that part of the Minster had no windows after their lead seatings had decayed.

Of the two main types of stone used in the Minster, resolution of the sources (Mansfield or Mansfield Woodhouse) awaits sampling and chemical testing, to determine whether the blue-grey stone was worked from a deeper, less weathered horizon, or from a site away from the source of the rust-stained stone.

The stone used in the plaque commemorating the Polish army officers murdered in the Katyn Forest was cut by Beaufort Linely, to a design by Ronald Sims (then cathedral architect) using Westmorland slate, and the wall memorial to Bishop Barry is of Cumberland green slate, carved by Simon Verity. The source of the alabaster memorial to Bishop Ridding remains unverified. High in the North Transept, the pilgrim sculpture was carved by Rory Young in Ancaster 'blue heart' stone, from the un-oxidised cores of blocks of the shelly Jurassic limestone from Lincolnshire, most of which is a honey colour due to weathering inward from joint surfaces.

Grand Canyon Skywalk

The many members of the Society who have visited the Grand Canyon in Arizona may rest happier to know that the newly-opened and much-publicised Skywalk does not intrude into the well known vistas of the Canyon. It is actually 240 km downstream of the National Park sites that lie astride the Bright Angel trails, far beyond even Havasupai and Toroweep. It has been built on Eagle Point, in the Hualapai native reservation. Significantly this is less than 150 km from Las Vegas, so it targets the day-trippers for whom the Park's South Rim is a bit too far away. It stands on the Permian Kaibab Limestone (same rim rock as at the Park), which is marked by a good vertical cliff. Publicity has amusingly distorted the facts, by rounding its height above the river to the nearest 1000 feet, making it 4000 feet up. In fact it is about 3580 feet (1100 m) above the river; still respectable, even if the river is just over 2 km away, and it has a steeper profile to the river than anywhere else except the less-visited Toroweep Overlook.

Hamps and Manifold Geotrail

A new geotrail has been established by the Staffordshire RIGS Group, to explore the geology and scenery of a fascinating part of the Peak District. The 13 km trail mainly follows the resurfaced track-bed of the old Leek and Manifold Valley Light Railway between Hulme End and Waterhouses, with access at Ecton Bridge, Wetton Mill and Weag's Bridge.

A new guide describing the trail has a full-colour map, which includes a depiction of the geology, bordered by images and text of numbered features along the route, together with a geological column and cross section through the Ecton Anticline. Short notes explain the background geology of Lower Carbonifereous reefs and muddy limestone turbidites, with later Earth movements and mineralization. Geomorphological features include spectacular gorges and numerous caves. Modern dry river beds, swallets and resurgences are explained, together with periglacial dry valleys, screes and fans. Caves in the area have yielded human and animal remains from the last 10,000 years. The view from inside Thor's Cave provides the distinctive cover illustration. Mining of the copper ore, chalcopyrite, from Ecton Hill goes back to Bronze Age times and there is plenty of evidence remaining of late-18th Century endeavours. Limestone has long been quarried at Apes Tor and Brown End, while aggregates and cement are currently produced at Cauldon and Waterhouses.

The guide is aimed to provide walkers with information that will increase their awareness, understanding and enjoyment of the area. It was written by Patrick Cossey, John Reynolds and Richard Waller, with design by Rosie Duncan. It can be downloaded from the Staffordshire RIGS website, www.esci.keele.ac.uk/srigs . The project was funded by Staffordshire Aggregates Levy Grant Scheme 2006.

Editorial

The editor is happy to be able to thank John Mather, Peter Gutteridge, Mike Murphy, Tim Colman, Richard Hamblin, Keith Ambrose, Eric Robinson, the late Ron Firman, and the members of the Editorial Board for their assistance in refereeing papers that have been submitted to the *Mercian Geologist*, and also Alan Filmer for compiling the index for this volume.

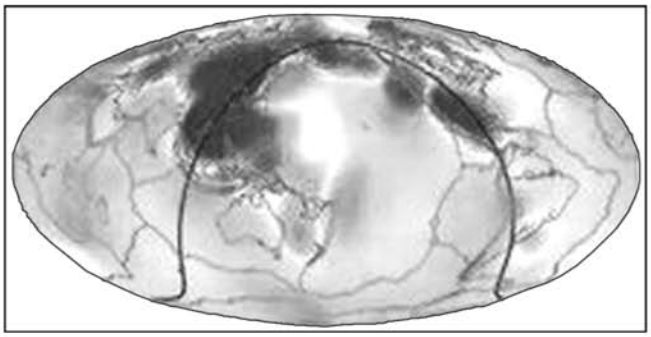
Skywalk out over the rim of the Grand Canyon.

Is science fiction now a reality?

Two recent articles provide more evidence that science fiction stories sometimes predict future discoveries.

Take kryptonite, the glowing green mineral that sapped Superman's powers whenever he was exposed to it. We all thought it only occurred on the planet Krypton, but recently researchers from the mining group Rio Tinto have found a new mineral – sodium lithium boron silicate hydroxide – which has virtually the same scientific name as that written on the box labelled 'kryptonite' that was stolen from a museum in the *Superman Returns* film. But there is a down-side to this, which BBC Television's *Have I Got News For You* programme exposed with their customary ribaldry. The new mineral does not contain fluorine (which Superman's kryptonite did), it is white, does not glow green in the dark, and is quite harmless even to super-beings. Also, it can't be called kryptonite because it does not contain the element krypton. To cap it all it has been called, disappointingly, 'Jadarite', after the place in Serbia where it was discovered (from *Science Daily* website).

The second story takes us on a *Journey to the Centre of the Earth.* Verne wrote this classic novel partly to air his theories about the internal workings of the Earth. The story culminates when the explorers stumble across a vast underground world, lit by electrically charged gas and filled with a very deep subterranean ocean surrounded by a rocky coastline covered in petrified trees and giant mushrooms. Of course there are various prehistoric creatures including an ichthyosaur, which fights and kills a plesiosaur. Most of Verne's ideas could not be proven and were ridiculed at the time, but geophysicists are constantly probing deep Earth and have recently come up with the idea that a body of water, with a volume at least as large as the Arctic Ocean, may be present within the mantle. The technique they used is based on analysis of areas within the mantle where seismic shock waves become incredibly highly attenuated ('dampened') as a result of passing through a medium that does not readily transmit them. Such areas have been found beneath Asia, along the toe of the western Pacific subduction system (dark on the world map below), and the attenuation is attributed to vast amounts of water.



This water was taken down by the subduction zone, whereas Verne used an underground river to fill his subterranean sea. Unfortunately, terms such as 'deep ocean' for this water mass cannot be accurate since voids could not be present at mantle depths. Instead, the water is taken down within the subducting slab and when finally released, it is injected into the fabric of the mantle rocks, perhaps acting as a lubricant for mantle flow and also facilitating deep-seated igneous processes such as partial melting (Source: *University of Washington in St Louis).*

Plate tectonics theory back in time

Since the theories of Plate tectonics first evolved in the late nineteen sixties a constant research theme has been to find out how far back in time the process operated. To answer this question it is necessary to find *bona fide* fragments of ophiolite, which consists of a layered sequence of highly distinctive lithologies representing a former slice of oceanic crust. Such a sequence has recently been discovered in the Isua basement complex of Greenland, and is believed to be the Word's oldest ophiolite (*Science: 23 March, 2007).* The sequence was mapped between outcrops covering 4-5km (2.5-3 miles) and it has all the ingredients of a typical ophiolite, except that the lowest mantle portion is missing. Crucially, these rocks show well preserved sheeted dykes and pillow lavas, clear evidence to many that these are the ancient remains of sea floor created by the types of ocean spreading processes seen today. The fact that these rocks have been radiometrically dated to 3.8 billion years ago is regarded by the researchers as a 'significant milestone' for many reasons. The discovery pushes back the oldest known evidence of plate tectonics by at least 1.3 billion years. Not only does it give clues to the processes that formed the surface of the Earth today, but it is also relevant to theories of when the Earth's crust and mantle formed. It now seems that all the essential elements for Plate tectonics must have been in place immediately after the last major meteorite bombardment, between 4 and 3.8 billion years ago (*Geobrowser, 2004).*

…so are microbes

The Isua belt of Greenland could be noteworthy for another 'first'. It contains rocks with thin layers of black sediment that is carbon-rich and may therefore represent the World's oldest microbial accumulations. No microfossils have yet been found to confirm this, but in Pilbara, Australia, there are unusual laminated rocks, 3.4 billion years old, that are believed to be fossil stromatolites (*Geological Survey of Western Australia, 2002*). This, too, has not yet been convincingly demonstrated, but all the signs now point to some sort of microbial life commencing very soon after the first oceans were formed.