Newsletter No. 201

June 2010

The Black Country Geological Society

Contents:

Copy date for the next Newsletter is

Monday 2nd August 2010

The Society provides limited personal accident cover for members attending meetings or field trips. Details can be obtained from the Secretary. Non-members attending society field trips are advised to take out your own personal accident insurance to the level you feel appropriate. Schools and other bodies should arrange their own insurance as a matter of course.

Leaders provide their services on a purely voluntary basis and may not be professionally qualified in this capacity.

The Society does not provide hard hats for use of members or visitors at field meetings. It is your responsibility to provide your own hard hat and other safety equipment (such as safety boots and goggles/glasses) and to use it when you feel it is necessary or when a site owner makes it a condition of entry.

Hammering is seldom necessary. It is the responsibility of the hammerer to ensure that other people are at a safe distance before doing so.

Future Programme

Lecture meetings are held at Dudley Museum & Art Gallery, St James's Road, Dudley, DY1 1HU. Tel. 01384 815575. 7.30 for 8 o'clock start unless stated otherwise.

Those wishing to attend field meetings please contact our Field Secretary, Andy Harrison, mobile: 07973 330706 or email: andrew_harrison@urscorp.com

Saturday 19th June *(Field meeting)* Buxton Area Volcanics. Led by Chris Arkwright. Meet at 10:15am in Miller's Dale Station pay & display car park (SK137 733) for 10:30am start. Walk 4 miles in total mainly on good level footpaths with some steps, to see Lower Carboniferous volcanics. 1. Miller's Dale Station Quarry, lava/limestone contact. 2. Park nr. Litton Mill to see different lava/limestone contact, eat lunch. 3. Tideswell Dale Quarry (pay & display), dolerite intrusion. 4. Drive to Calton Hill, park at farm lane entrance (SK112 710) to visit quarry to see 3 main types of igneous rock. Bring a packed lunch. Finish approx 4.30 pm.

Saturday 24th July *(Joint field meeting with the Woolhope Club)* Martley area. Led by Dr. Paul Olver. Meet at Martley Village Hall (SO 753 599) at 10.30am. Martley is on the B4197 about 4 km north of the A44 (Worcester to Leominster road). If approaching Martley from the south on the B4197, the Village Hall is on the right about 50m after sign at the start of the village. Pub lunch. We will see: the Precambrian/Cambrian basement in Martley Pit, complex folding and faulting of the Silurian successions, and quarries in Martley village where Triassic Sandstones were extracted for building.

Andy Harrison

Other Societies

BCGS members are normally welcome to attend meetings of other societies, but should always check first with the relevant representative. Summarised information for the next two months is given in our Newsletter. Further information can be found on individual Society web sites.

Woolhope Naturalists' Field Club - Geology Section

Saturday 19th June: Triassic of Aust Cliff and Manor Farm. Led by Simon Carpenter.

Saturday 24th July: Martley area. Led by Dr Paul Olver. Joint trip with BCGS (see above).

Saturday 7th August: Kington area. Led by Moira Jenkins. Joint trip with Mid Wales GC.

Guests are welcome, but must take day membership of the Club: £1.00. For further information: contact Sue Hay on 01432 357138, email svh.gabbros@btinternet.com or visit their web site: www.woolhopeclub.org.uk/Geology_Section/default.htm

Stamford and District Geological Society

Saturday 17th July: Bradley Fen. Perhaps a last chance to look for Jurassic fossils in this pit which usually produces some interesting finds. Meet at 10.00am at the end of the lane that passes McCain's chip factory. Turn north off the A605. Map ref: Sheet 142: 240 980.

Friday 6th August: Kirkby on Bain sand & gravel pit. Led by John Aram. Pleistocene structures, ice age and derived fossils. There may be time to visit another site in the area. Meet at 10.00am at the Woodhall Sand & Gravel site office. Sheet 122 TF 240 619.

Contact Bill Learoyd: billlearoyd@aol.com Further information at: www.stamfordgeolsoc.org.uk/

Shropshire Geological Society

Monday 21st June: Rockhop meeting, commencing 18.30pm. Lee Brockhurst and Marchamley. Led by Chris Rayner. Walking (one mile). Booking to reserve a place and obtain joining instructions from Frank Hay, preferably by email: frankhay@waitrose.com; tel: 01694 724 723.

Wednesday 23rd June (evening meeting): The Quaternary of Wenlock Edge. Led by Andrew Jenkinson. To look at Quaternary glacial (not Silurian!) features exposed in various quarries (Tel. 01743 850 773 or mobile 07986 558 683 to reserve a place).

Saturday 10th July (all day meeting): Brymbo Fossil Forest. Led by Dr. Jacqui Malpas (Geodiversity Officer, Clwydian Range AOB). Numbers limited to 20: booking to reserve a place and obtain joining instructions from Keith Hotchkiss by email: kah22@btinternet.com; tel: 01694 723 130).

Monday 19th July: Rockhop meeting, commencing 18.30pm: All Stretton (Batch Volcanics). Led by Keith Hotchkiss. Walking (two miles); Booking to reserve a place and obtain joining instructions from Keith Hotchkiss by email: kah22@btinternet.com; telephone: 01694 723 130)

Anyone wishing to attend should telephone the meeting co-ordinator at least 48 hours in advance. A nominal charge is levied for non-members. The Rockhops are primarily intended for beginners. Arrive 15 mins before the start of field trips for admin. Further info at: www.shropshiregeology.org.uk/

Mid Wales Geology Club

Wednesday 16th June: Dealing with the environmental legacy of Metal Mining in Wales. Speaker: Dr. Bill Perkins from Aberystwyth University.

Sunday 27th June: Visit to the Cambrian rocks at Llwyngwril. Meet at 11.30am. We meet at the lay-by on the left side of the A493 just beyond the end of the 30mph limit north of the village.

Wednesday 28th July: Evening field trip to quarry in Wenlock turbidites.

Meetings are held at Plas Dolerw, Milford Road, Newtown, Montgomeryshire, SY16 2EH. Meet at 7.15 for 7.30pm. Further details: Ed. newsletter & Hon Sec: Tony Thorp: Tel. 01686 624820 and 622517 jathorp@uku.co.uk Web site: www.mwgeology.uku.co.uk/

Warwickshire Geological Conservation Group

Saturday 12th & Sunday 13th June: Hamps & Manifold Valleys, Staffs. Led by Dr Patrick Cossey, Staffordshire University.
See: http://srigs.staffs-ecology.org.uk/Sites/SSSI/HampsManifold/index.html

Wednesday 21st July - 6.30pm: Building stones of Atherstone. Led by Hugh Jones & Alan Cook. Including a visit to Baxterley Quarry (Carboniferous sandstone). Meet at "The Plough" pub car park adjacent to Mancetter Church (SP 3206 9676)

Wednesday 18th August - 6.30pm: Rock Mill & Coton End Quarries. Led by John Crossling & Ian Fenwick. Meet SP 3016 6613 (Rock Mill Lane) - Please park in adjacent streets as approaches to Rock Mill are private areas.

If you wish to attend contact Ian Fenwick swift@ianfenwick.f2s.com or 01926-512531.The WGCG mobile phone (0752 7204184) available on the day from 11.00. There is a charge of £2.00 for non-members. For further information visit: http://www.wgcg.co.uk/

Editorial

Geoconservation Opportunities for BCGS Members

When an enthusiastic group of geologists founded the BCGS in 1975 it was with a very clear vision that the Society should play an active role in geoconservation. To quote from a report of the inaugural meeting in Newsletter No. 1: *"Dr. Oliver... stressed the importance of conservation and the important role that the Society could play. Mr. Cutler then followed Dr. Oliver by reiterating the importance of conservation and also the desirability of recording data of new and/or temporary exposures."* Our own web site states that *"the Society set out to raise the profile of geological awareness in the West Midlands and to document and conserve the geological sites."*

Geoconservation in the Black Country has made huge strides since these early days, with numerous sites designated as RIGS (Regionally Important Geological Sites), the production of several local geology leaflets, the on-going work at the Wren's Nest, and the creation of the Black Country Geodiversity Partnership: http://www.geowestmidlands.org.uk/wiki/index.php5?title=Main_Page.

Much of this progress has been made with passing reference to the Black Country Geological Society, but sadly, in recent years, with little involvement from its core membership. There is nothing quite like getting your hands dirty on site to sharpen personal interest and understanding, and to provide the satisfaction of knowing that you've made some small contribution to the cause of geoconservation.

Nature will take its course, and the sites that have been recorded and cleared over the years will inevitably become overgrown and inaccessible if they are not constantly maintained. This is an aspect of the Society's original purpose which I would very much like to see re-established. This can only happen with the willingness and enthusiasm of sufficient numbers from our membership.

Below are details provided by Alan Cutler and Andy Harrison of two opportunities to become involved. The request for volunteers for the Wren's Nest work has appeared in the last 2 Newsletters, but Andy has so far had no response. A good response from members for these projects may just be the start of greater things to come. It's an opportunity for us to meet in a local context, get involved - and you never know, it might even be fun! Although exact dates are not yet known for these projects, it would be helpful to know how many people are willing, in principle, to become involved. A 'yes' at this stage will not be an irrevocable commitment! So please give it some thought and get in touch with Andy (details below) as soon as possible. More information will be sent as soon as it is available. ■

Julie Schroder

Volunteers Please!

Moorcroft Wood Local Nature Reserve

There is an opportunity for voluntary work at Moorcroft Wood Nature Reserve, Moxley, near Walsall. The site is shown on the map in the Walsall 'Scorching Deserts ' leaflet. Details of work have yet to be confirmed but are likely to be biodiversity orientated with a geodiversity angle. The site is part of the Black Country Living Landscapes Project. There is geological interest in the form of the magnificent slag. The site is on the edge of Moxley Channel (glacial).

Wren's Nest

The Wren's Nest wardens are seeking volunteers to help with maintenance work from late October onwards. The work would involve scrub clearance from rock faces and possibly hedge laying in January 2011. It will involve 3 weekdays in October, November and January.

If you think you can spare time for either of these projects please contact Andy Harrison and state likely availability (weekdays and/or weekends), mob: 07973 330706 or email: andrew_harrison@urscorp.com

The Dudley Bug

Welcome

Hi, welcome to June's issue of "The Dudley Bug". In this issue we are hoping to shed some new light on the Silurian at the Wrens Nest following recent research at Dudley Museum. As many of you know, we have been working at Dudley museum and others in the borough on the geological collections. We have also undertaken fieldwork and lab work looking at the macro and microfossils of the Wenlock Limestone. This work has revealed some interesting results that we hope to share with you in this edition.

Alison and Chris

Wrens Nest – New Discoveries Unravelled

Macrofossils

During April, we visited the Wrens Nest to see what were the most common fossils found in various locations. The two locations which were chosen were the Much Wenlock Limestone Formation, Nodular Member and the older Coalbrookdale Formation. After a short period of collecting we returned to the museum where we laid the fossils out in rows of the same species. What we found was rather interesting.

Firstly, *Atrypa reticularis* was the most common brachiopod at both locations, suggesting that this was the most successful species throughout the Wenlock Epoch. There were significant differences between the *Atrypa* brachiopods from the older Coalbrookdale Formation and the younger, shallow marine Much Wenlock Limestone Formation. The Coalbrookdale Formation is associated with deep marine conditions as the sediment is a lime mud, deposited in low energy conditions. In this environment the brachiopods were larger and had wings on their shells, possibly to spread their weight on the surface of the soft sediments, whilst in the Much Wenlock Limestone Formation, the *Atrypa* brachiopods were much smaller in size due to living in the shallow reef mound conditions. The photo opposite displays the size and shape variations between the *Atrypa* species due to environmental pressures (Coalbrookdale Formation on the left). The ages between these brachiopods could be around 3 million years, so could this be evidence of evolution within this species?

This pattern is also apparent when the *Eospirifer sp.* brachiopods are studied. The Coalbrookdale specimens are considerably larger than the Nodular Member specimens. This can be seen in the opposite photo with the Coalbrookdale Formation specimen on the right. Further differences noted the lack of tabulate (colonial) corals in the deeper Coalbrookdale Formation, which are so abundant in the shallower reef mound environment. ►

Microfossils

Last summer a number of different research opportunites arose at Dudley Museum. They began last spring when Graham Worton spent a few days down the Step Shaft Mine collecting samples of the stratigraphy every 25cm. This included limestones, clays and bentonites (rotted down volcanic ash). But that was only the beginning. The summer saw the development of the museum's new Geoteam who spent hour after hour processing samples. This process involved sieving the bentonite samples into separate fractions, leaving them to dry and then methodically picking through each one with a paintbrush under the microscope. To begin with this was difficult but once we got our eyes in we were about to discover some very interesting things.

In July, I (Chris) was picking through a sample when I came across something I had never seen before. I got quite excited and called Graham up to have a look, who too got very excited! But what had we found? Neither of us had seen anyhing like it before. After a little more research we have discovered a new species of microfossil. This was a jaw-like object measuring around a tenth of a millimetre (106µm). This has since been taken to the University of Birmingham, to Professor Paul Smith. Paul Smith was unable to identify the specimen, indicating that this is completely new to science with very little literature available on it. The fossil has subsequently been found to be a new species of Scolecodont. This specimen belongs to a segmented worm (similar to present day ragworms) that lived in the sediment, and was equiped with claws and jaws to process its prey. In bentonite layers other new specimens have been found by Graham Worton which are claw-like pincers with around 3 million years between them (evidence for evolution?).

As well as microfossils, zircon crystals which measure up to 2mm in length have been found within the bentonites. These are used for dating and have been sent off to a lab for testing. This will give the first precise international stratigraphic date for the Wenlock - Ludlow Series, which will be based at the Wrens Nest. Due to their large size, we know that the volcano producing the ash that formed the bentonites wasn't far from the Wrens Nest. Research indicates that the volcano was at Cheltenham (information found by Graham Worton).

Other treasures unique to Dudley which were also found down the Step Shaft, are dog-tooth spar calcite stalactites and hair-like calcite tube stalagmites <1mm thick. Both are not known anywhere else in the world at present. So as you can see this is a very exciting time for the Geology at the Wrens Nest! We would like to thank Graham Worton for his guidance and work on the samples. ■

Photo frenzy!

This summer we are launching 'The Dudley Bug' photographic competition. The aim is to involve as many members as possible and to see geological environments as an art form as well as a piece of interesting Earth history. This is open to anyone with a camera, whether it is a compact or something more professional, plus it's open to all abilities. The subject of the photo can be anything geology related.

The rules are:

- The photo must have been taken after the 1st June 2010.
- The photo must have been taken in the UK.
- Entries are limited to two images per person.
- No computer editing is permitted, other than cropping the images or for black and white.
- Judging will be by the front of house staff at Dudley Museum and Art Gallery.

The images will be on display at the first indoor meeting in September, and prizes will be awarded for the top three photos.

Please send your entries to thedudleybug@hotmail.co.uk by Monday 13th September 2010 stating your name, photo title, where and when it was taken. Alternatively hand in at the museum desk if in hard copy. **GOOD LUCK!**

Field Meeting Reports

Sunday 21st March: Field Visit to **Wolverhampton.** Permo/triassic features and Glacial Erratics. Leader: Graham Worton, Dudley Museum & Art Gallery, BCGS.

Twenty five BCGS members met in Wolverhampton's West Park for this field trip centred around two key elements of local geology and their influence on local residents. Starting at the centre of the park, Graham and Mike Williams provided a potted history. West Park, once described as a 'treeless swamp', became a racecourse in the 1860's when coal production was at its height and living conditions were relatively poor. By 1879 it had fallen into disuse. The Park layout seen today was the winner of a competition called for by Public Health movements of the time and it officially opened on 16th June 1881 with an exhibition, similar to the 1851 Great Exhibition of London. A second exhibition followed in 1884 and both aimed to show off late 19th Century scientific and technological innovations. Both were large enough to spread into neighbouring East Park and also included a fully catalogued geological gallery.

West Park at the start of the field trip

Several large granite, gneiss, conglomerate and felsite boulders, (recorded as part of the BCGS 'Boulderdash' study), survive today as a legacy to the 1881 exhibition. Letters dated from approximately 1879 show that the boulders were enthusiastically donated by local people from across the Black Country. Graham pointed out that not only do these boulders hint at Victorian interest in geology, but also the good natured attitude of local people for whom they were important: they told a story, which on some boulders was recorded on a bronze plaque. Other Park features illustrating the connection between local people and geology include: a sculptured seat covered in pottery tiles made by local school children whose imagination was caught by ammonites and dinosaurs; a ring of Staffordshire Blue Bricks, and some Carboniferous limestone pavement complete with grykes. There is also a bridge made of Keuper sandstone imported from Codsall. The sculptured seat acts as a reminder of the Jurassic strata that once overlay this area and have since been eroded away.

Glacial erratic with 1881 plaque

For geologists these features tell a different story in terms of their formation, origins and history. During the last Ice Age approximately 17,000 years ago, glaciers are believed to have carried the glacial boulders to the Black Country from as far away as Ennerdale and Eskdale in the Lake District, and from Scotland. Wolverhampton is believed to have been at the southern limit of glacial advance at this time. Glacial till was deposited here by the retreating glaciers around 13,000 years ago, which accounts for the early 'treeless swamp' description of the Park. Turritellid gastropod shells have been found in the glacial till indicating that the ice sheets' progress south indirectly passed through the Irish Sea and dredged up seabed material along the way.

West Park and the surrounding landscape form a relatively flat and low lying plain. To the east the land gently rises towards Wolverhampton City Centre which is on a hill, and hence the Saxon name meaning 'Lady Wulfrun's High'. About half a mile to the west, at Tettenhall and Compton, a steep ridge rises approximately 100m and beyond is another flat plain. Along the base of the ridge is the valley of Smestow Brook, a tributary of which originates in West Park. ►

Wildmoor Sandstone in Tettenhall

Our next stop was 'The Rock' at Tettenhall, where an ivy covered exposure of the Triassic Wildmoor Sandstone Formation occurs (formerly Upper Mottled Sandstone). This forms the north-east to south-west trending ridge, and also underlies West Park. It is red and laminated with pale leached bands. It was deposited under tropical conditions by meandering streams flowing northwards into the Staffordshire Basin, and the leached bands and spots result from iron reduction during diagenesis. The Tettenhall pumping station borehole records the thickness of this Formation as approximately 500 feet (130m). Unconformably overlying this formation is the Bromsgrove Sandstone Formation (formerly Lower Keuper Sandstone), which forms the top of the ridge and the flat plain to the west beyond. Fewer glacial boulders can be found on this plain since they have been cleared to make way for nice level leisure/sports facilities, and for use in walls and as boundary markers. The BGS map covering the area shows that this sandstone ridge and the plain continue westwards until they meet the Severn Valley at Bridgnorth. The Triassic formations are also shown to dip westwards forming a large basin, which is cut by several faults.

Approximately one mile east of Wolverhampton the Triassic sandstones give way to Carboniferous Coal Measures. Separating the two is the Western Boundary Fault, which has downthrown the Triassic strata by some 600m. Compressional tectonic forces at the end of the Carboniferous resulted in gentle uplift of the landscape coupled with sagging of the crust. In Permo-Triassic times these forces became extensional causing the crust to be pulled apart. This led to faulting and dropping of the landscape.

Much of the ridge towards Wightwick has been quarried and small quarries were observed elsewhere along its length from Tettenhall. The nature of the Wildmoor Sandstone Formation meant that it was ideal to use as moulding sand in iron smelting and it was also quarried for building purposes. Unlike the underlying Bridgnorth Sandstone Formation (formerly the Lower Mottled Sandstone) found in other parts of the Black Country, the Wildmoor Sandstone was too impure to be used in glass manufacturing.

Before leaving the The Rock, Mike Williams spoke about how artists in the past have been inspired to paint pictures that include The Rock and views of the Black Country from it. Many such paintings can be seen in the Wolverhampton Art Gallery.

Kerb with ripple marks

Next we stopped at the Spar car park in Compton for a walk up Holloway Hill and a further look at how geology affects local character. Ascending Holloway Hill we saw houses built within former quarries, boundary walls constructed of Wildmoor Sandstone and blast furnace slag, a felsite erratic built into the pavement, and a kerb stone of Wildmoor Sandstone with ripple marks acting as a reminder of its fluvial origins. At the top of the Hill we stood next to a wall made from a multi-coloured assortment of sandstones from various sources including red calcareous conglomerate of the Enville Formation, yellow Tickshall Sandstone from Stafford (also used in the clock tower on Tettenhall Green), and the Wildmoor Sandstone. Beyond the top of Holloway Hill the houses were newer, built of brick and the underlying strata changed to Bromsgrove Sandstone Formation. With a final look down Holloway Hill out over the Smestow Valley to the Rowley Hills beyond, Graham gave a summary of what we had seen, the geological sequence of events and the influence of the local geology on the local population. ►

Boulders at Wightwick Manor

Our final stop was a walk up Wightwick Bank where we hoped to see the boundary between the Wildmoor Sandstone Formation and the Bromsgrove Sandstone. Unfortunately it was obscured by a wall and thick vegetation. In the grounds of Wightwick Manor, which is on the Bromsgrove Sandstone, we saw several glacial boulders of various lithologies from the Lake District and Scotland laid out in a line and each with its own plaque.

I would like to thank Graham and Mike for a very interesting day out. ■

Andy Harrison

Saturday 27th March: Field visit to **Lilleshall Village**, Shropshire. Leader: David C. Smith, Shropshire Geological Society.

We met at 11:00am at Lilleshall village church. The village is approximately 2km north east of Telford, and is dominated by Monument Hill, 132m sticking up island-like above the surrounding landscape. The geology underlying the village and surrounding area is complex, comprising Pre-Cambrian, Cambrian, Lower Carboniferous and Permian age strata associated with structures across Shropshire. From the village church, we drove to the village Hall from where we undertook a circular walk up over Monument Hill and to the northern parts of the village before returning to the village Hall. David's experience in geological mapping and exploration has been instrumental in deciphering the village geology, which has had much influence on the local villagers.

Pre-Cambrian Rocks

Monument Hill, Lilleshall

We encountered Pre-Cambrian rocks behind the village hall and on Monument Hill. They comprised purple, pink and orange rhyolite tuffs and breccias associated with the Uriconian Volcanics (Eastern Uriconian Group), for which Lilleshall is apparently the type area. The Group forms a series of hog backed hills, or inliers, along the line of the Church Stretton Fault, and include Ragleth Hill, the Lawley, Caer Caradoc, the Wrekin and Ercall Hill at the northern end of the Coalbrookdale Coalfield. At the base of Monument Hill these rocks comprise grey shales with flattened lapilli, and become purple, pink and orange massively bedded fine grained rocks containing numerous clasts further up the Hill. They are indicative of an ash fall deposit in either open air or a marine setting.

The Wrekin from Monument Hill

The summit of Monument Hill afforded a good view of the surrounding area with the Wrekin to the south, Breidden and Berwyn Hills to the west, and the Preece inlier, of Jurassic age, to the north-west. The surrounding landscape to the west is generally underlain by Permian age rocks and to the north, east and south by rocks of Cambrian and Carboniferous age. Much of these strata are also overlain by various glacial, alluvial and head superficial deposits. Several small infilled quarries pockmark the base of Monument Hill, hinting at a legacy of quarrying that once went on here.

Cambrian Strata

At the Village church David showed us several examples of dull grey and green roughly cleaved, steeply dipping sandstone underlying the church. The BGS Regional Guide describes these rocks as unfossiliferous, glauconitic and quartzitic sandstone. According to David these rocks are now accepted as Comley Sandstone of Lower Cambrian age, and they sit unconformably on the Pre-Cambrian strata. Monument Hill is surrounded by Comley Sandstone to the east, south and west and a small faulted area of Upper Cambrian Dolgelly Beds is situated south-west of the Hill. ►

The Lower Cambrian rocks are associated with deposition in shallow coastal waters, following a marine transgression in the region over a land surface of compacted, folded and denuded Pre-Cambrian rocks. By Middle and Upper Cambrian times slow subsidence of the area led to low energy shale and mudstone accumulation, and occasional sandy layers hint at wave action or tidal scour.

Carboniferous & Permian Strata

Lower Carboniferous Limestone occurs as a narrow faulted strip to the north-east of Lilleshall and along the western side of the Coalbrookdale Coalfield. This stratum is around 85m thick at Lilleshall and rests unconformably on the Lower Cambrian Comley Sandstone strata. The sequence ranges in age from Lower to Upper Dinantian, is very condensed, and overlain unconformably by Lower Coal Measures strata.

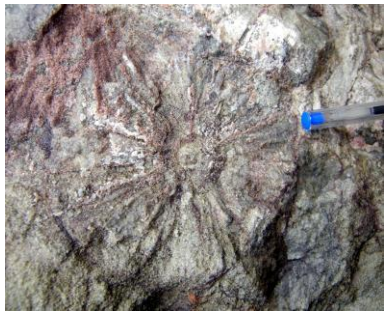
The lower parts of this sequence comprise interbedded grey sandstones and limestones, overlain by grey and red shales and thin fossiliferous limestones containing brachiopods and corals. The overlying upper part of the sequence comprises fossiliferous nodular limestones, red calcareous sandstone and red and black limestones and shales. The sequence is associated with deposition under shallow tropical marine conditions, possibly lagoonal, on a shallow shelf bordering a landmass known as St. George's Land. This landmass dominated the Central England area at that time. David believes that the shale and sandstone present are indicative of periodic catastrophic deposition of sediment, broken coral and volcanic debris onto the shallow shelf. The cause of this was possibly from tsunamis triggered by debris slumps on the slopes of the Staffordshire Basin to the east.

In the northern part of the village road names like 'Limekiln Lane', and house names like 'Quarry Lodge' and 'Rock House,' hint at the former quarrying industry in Lilleshall. The Lower Carboniferous Limestone was extensively quarried on the village outskirts up until about 1900 for use as flux in iron smelting. Most quarries have long been backfilled and developed into recreational or housing areas. Canal and rail links served the Village, exporting limestone and importing various goods. We entered one overgrown quarry and saw the remains of lime kilns and quarry workings where the limestone had been extracted in long drawn out trenches, close to surface, similar to those at Dudley's Wren's Nest. Fresh surfaces of broken-open nodules revealed very pure and crystalline limestone containing thecal pellets, platelets and Productid brachiopods. Leaving the quarry we were invited for a cup of tea by the owners of Quarry Lodge. They asked us to identify some rock and fossil specimens, and told us about the old mines and quarries that had played an important role in the lives of local villagers.

Our final stop was a house within an old small quarry built by the owners of Quarry Lodge. The current owner has a collection of many stones, including glacial erratics from the surrounding area. One end of the garden had been cleared by David to reveal an outcrop of Lower Coal Measures, which lie unconformably on the Lower Carboniferous Limestones. This exposure comprised grey, yellow-brown, white and red thinly laminated shales and interbedded sandstones showing synformal and antiformal structures possibly resulting from fluvial activity.

Walking back towards Monument Hill we crossed low lying ground underlain by the Permian Bridgnorth Sandstone. Other Permian rocks around Lilleshall include the Kidderminster Conglomerate Formation to the north-west of Monument Hill. It is less than 10m thick and rests on Keele Beds.

Oddities



Radial Baryte Mineralisation

The village church and churchyard contain a variety of multi-coloured sandstones within their walls including the Kidderminster Formation and a pale grey sandstone of unknown origin held together by barytes cement. The same, or a similar, sandstone was later encountered in the rockery of a house in the northern part of the village. Here the barytes, originally thought to be coral colonies, form rounded nodules of radial crystals, cementing the sandstone together. David believes their age to be either Upper Cambrian or the base of the Carboniferous. Boulders of this sandstone were also seen in other parts of the village. David has discovered that the monument on the summit of Monument Hill originates from a quarry to the south of the village. ►

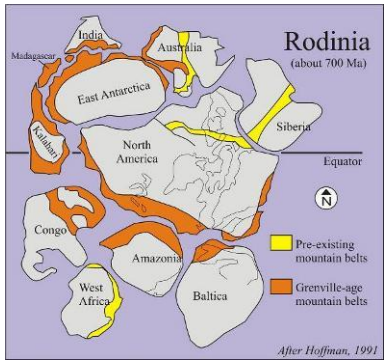
I would like to thank David for a very interesting field visit and hope that we can do more with the Shropshire Geological Society in the future. More information on the geology of Lilleshall can be found in the BGS guide for Central England, and in 'Geology of Shropshire' by Peter Toghill. ■

Andy Harrison

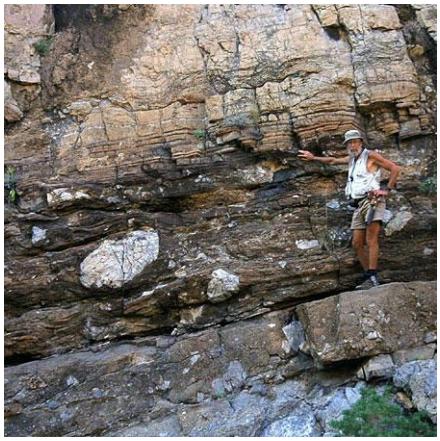
Snowball Earth 1 - the case for

Worldwide Precambrian tillites have been recognised for some time. The closest to us is the Port Askaig Tillite in the Dalradian. Many contain striated boulders; the Smalfjord diamictite in northern Norway rests upon a striated pavement. The term diamictite is now generally used for tillites and rocks with a similar lithology. As geological knowledge and geophysical and geochemical applications have developed and been applied to these deposits, it has given rise to the idea that our planet was once completely covered by ice; hence the term 'snowball Earth'.

As palaeomagnetic data was applied to these regions, and as a picture of the distribution of the continental masses was built up, it was becoming evident that these deposits were mostly formed in tropical regions close to the equator. They are of similar age, in the Neoproterozoic, which is the last period before the start of the Cambrian. A picture emerges of a large continent, Rodinia, straddling the equator and as it broke up by rifting, these glacial deposits are found. There is no dispute that there was a severe Neoproterozoic glaciation, but worldwide? Surely that is impossible?



There are explanations as to how this may come about, and they are to do with CO_2 levels and albedo - the reflection of the heat of the sun back into space by the surface of the Earth. It is suggested that if a severe glaciation covered half of the Earth's surface with snow and ice, the albedo of this surface, (ice and snow reflect 90% of the sun's heat), would lead to a runaway positive feedback loop, i.e. more snow ⇒ more albedo ⇒ lower temperatures over a wider area ⇒ more snow. There is also the role of carbon dioxide that as a greenhouse gas raises temperatures. It is removed from the atmosphere during the chemical weathering of silicate minerals. During the Quaternary glaciations the bulk of the continental masses were in the cold and temperate latitudes, and once covered in ice, chemical weathering ceased so leaving more CO_2 in the atmosphere to help counter the lowering of temperatures. If, however, the bulk of the continental masses are in tropical latitudes, in a glaciation, this extraction of CO_2 by weathering would continue much longer. The Earth could be completely covered by snow and ice and temperatures could drop to -50°C, which is the proposed scenario for snowball Earth.



**Boulders dropped by icebergs*

Other evidence brought forward to support the idea is the existence of Banded Iron Formations at this time. These BIFs are formed when the sea water is lacking in oxygen and Ferrous Iron (Fe^{2+}) is deposited in thick red beds. They were common in the earlier Precambrian before oxygen producing life was developing, but then ceased as the sea became more oxygenated and Ferric Iron (Fe^{3+}) dominated. But these BIFs return at the time of snowball Earth. Was the sea becoming deoxygenated again because ice prevented it from reacting with the atmosphere? The BIFs also contain dropstones, large boulders carried by ice and dropped when it melted. There are also pieces of geochemical evidence quoted, notably about the variations in carbon isotopes and the whole package seems to give strong evidence for the idea of a frozen planet. There are questions, such as how did life survive and how did we come out of it? If the theory is correct life did survive even though photosynthesis must have been much impaired. Coming out ►

of the big freeze is easier to explain; even snowball Earth would not stop plate tectonics and volcanic activity, and a big volcanic phase would pump carbon dioxide into the atmosphere with no chemical weathering to use it. A huge greenhouse effect and melting could cause rising sea levels, and the evidence for this is that on top of nearly all these Proterozoic diamictites are 'Cap Carbonates'. As CO_2 levels rise alongside temperatures precipitation is produced which would deposit limestones and dolostones into the sea, on top of the now flooded diamictites.

It is all very neat, but as with all paradigm-shifting ideas, it will be attacked by the resident scientific community, whether it be Plate Tectonics or Newtonian Physics. In a future Newsletter I hope to put the case against. ■

Bill Groves

* The illustration shows boulders dropped by icebergs into laminated marine sediment in late Precambrian time, Narachaampspos, Kaokoveld, Namibia. The chief proponent of the Snowball Earth hypothesis, Paul Hoffman, points to the transition to carbonate rocks which indicate the sudden termination of this frigid event. Photograph by courtesy of Prof. Mike Hambrey, Aberystwyth University.

The Wednesfield Dolerite: The Last Outcrop

Look at any solid geology map of the South Staffordshire Coalfield and one cannot miss the fact that the westward extension of the Bentley Faults complex ends with a large exposure of dolerite at Wednesfield.

At the members' evening we had an exposition of the phenomenon of "White Trap" invading the coal measures and local mine records show that this problem was particularly prevalent in pits sunk in close proximity to the Wednesfield dolerite.

Does this dolerite still outcrop today? Reference to the drift geological map shows two small surface exposures, one adjacent to New Cross Hospital in an old cemetery (promising, in view of its obvious use for internment), and the second is apparently at the highest point in the area on the edge of Wednesfield Park. Visits to these two localities proved to be very disappointing. However, rummaging around in the oldest part of the cemetery yielded specimens of dolerite, as did the old back lane which runs alongside the park, but no actual rock outcrop in situ. So, a little lateral thinking? Could it be that the local canal "the Curly Wyrley", a contour canal built without the use of locks, might provide the elusive exposure along its banks? The canal builders were a canny lot: they could quite possibly have skirted the hard dolerite when building the canal, which takes a sinuous route through the heart of Wednesfield. Therefore a search of the canal bank particularly in late winter when vegetation was at its lowest yielded the following photograph of an exposure on the far side of the canal in close proximity to the Dog & Partridge pub. It seems to show spheroidal weathering which is common to dolerite exposures so could this be the "last outcrop standing" of the Wednesfield Dolerite? ■

Mike Williams

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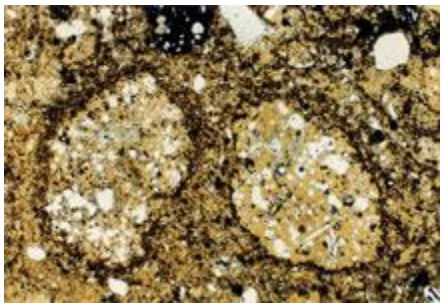
Geobabble

The geological word of the last two months is undoubtedly *ASH, v*olcanic ash from the Iceland volcano Eyjafjallajökull which shut all British airports and many in Europe on 15th April. I am writing this on 21st April as air traffic resumes and an argument is developing as to who is to blame for the full closure decision. I am more interested in the Geobabble of the last week or so, as the media attempted to explain geologically what 'ash' is and how it behaves.

The first report I saw was on the first BBC evening news after airport closure, when the ash was described as being sand falling from the air. Later, ITV news mentioned particles 'like glass', which if it got into aircraft engines would melt and so stop the turbines. The following morning I wondered how the papers would deal with the science and I expected some embarrassing descriptions, but I was agreeably surprised how well it was covered. They generally consulted a volcanologist to give an explanation. The Mirror chose Prof. Bill McGuire to show how this particular eruption might develop and the other papers tended to call upon similar academics. A common reference was to the Laki fissure eruption of 1783 which lasted eight months, and also the 1821 event which took a couple of years to subside, and it was pointed out that the neighbouring volcano Katla is linked to the fissure activity of Laki. If this went up there could be big problems.

On 16th April, Steve Connor in the Independent gave a detailed description of the eruption, and the nature of ash: '*Volcanic ash, formed when bubbles of molten magma collapse as they erupt from the ground, is like highly abrasive talcum powder. It is made of sharp fragments of rock that are capable of eroding plastic, metal and glass. The fine particles can block fuel nozzles and stick to the turbine blades of aircraft engines, causing them to stall.'* David Adam in the Guardian gave a similar explanation: '*The bubbles cause the magma to froth violently and burst out as a volcanic eruption. When the boiling fragments of liquid magma hit the cold air they freeze into individual dust particles, driven upwards towards the high atmosphere by the power and heat of the eruption.'*

As I followed the story through, I thought that there were some important features that had not been properly addressed. The word 'ash' was being used to cover all sorts of tephra from this volcano, ranging in size from the smallest dust to 2mm jagged pieces; some would be more dangerous to aircraft engines than others. Also the 'ash' would separate out into different altitudes depending upon density and air currents. But I need not have worried; not much publicity had been given to the active testing going on, but the Natural Environment Research Council's Dornier 228 research aircraft flew several missions: '*Flying at just below 10,000 feet, the research instruments identified three distinct layers of volcanic residue. Heavy, gritty particles seem to be sitting at around 8,000 feet, whilst lower down in the atmosphere there are sulphurous chemicals and finer dust particles.'* There were also some very clear explanations of how the most violent eruptions occurred when the magma was forcing its way through the ice to give phreatomagmatic activity. The BGS website was very informative throughout, and also showed how erupting through the ice provided the energy to give an explosive phreatic phase to the activity. This is shown in the illustration (left) which is a photomicrograph of fragments of glassy volcanic ash (armoured lapilli) from older eruptive deposits at the Eyjafjallajökull volcanic system. These were formed by steam explosivity (phreatomagmatic activity, when water and magma interact) and are about 2 mm long. The dark coating is volcanic dust which adhered to the lapilli as they settled from the volcanic ash plume.



In addition to the sources mentioned in the text, the on-line sites of the Daily Mail, Mirror, Sun and Daily Express were also used. ■

Bill Groves

For some excellent photos and a detailed day by day account of the Eyjafjallajökull eruption readers may be interested to visit the following web sites. Ed.

http://www.boston.com/bigpicture/2010/04/more_from_eyjafjallajokull.html
http://www2.norvol.hi.is/page/ies_Eyjafjallajokull_eruption

Members' Forum

Letters/emails

Carpoids from the Wren's Nest

Graham Hickman's piece in the April Members' Forum on ***Placocystites forbesianus,*** a Carpoid, and his question, "I wonder how many there are in the Dudley museum collection?" sent me searching through the archives. There are eight fossils labelled *Placocystites forbesianus* in the Dudley collection, one of which is illustrated in the photograph.

Placocystites forbesianus

The main question I suppose is whether they are *Calcichordates,* that is belonging to the stem group of the vertebrates, or whether they are an extinct group of echinoderms. *British Palaeozoic Fossils* puts it in the Calcichordata, and there was a classic paper by *Jefferies and Lewis* in 1978 which argued strongly for this. If you look at the illustrations in Graham's April article you can imagine that if this beast could move in the other direction you are getting something akin to a primitive armoured fish, with a distinct bilateral symmetry. I am no zoologist but when I looked at Richard Dawkins' website it appears that the 'experts' are still not in complete agreement as to where Carpoids sit in the overall tree of life.

However, of greater interest to me is where these fossils were found in the context of Dudley. *Jefferies and Lewis* looked at about 150 *Placocystites forbesianus* specimens and they mostly came from the Holcroft collection in the Lapworth Museum, but others came from the Beale Collection and also the Sedgwick Museum in Cambridge and the Nottingham Museum of Natural History. They do not seem to have looked in the Dudley Museum. Most of these specimens come from Dudley and came from the 'Dudley Limestone' which is now called the Much Wenlock Limestone, but none seem to have an exact location beyond 'Dudley'. It is assumed that they came from the Wren's Nest. Very few were found recently, most of them being collected between 1850 and 1900 and were in the collection of a John Gray of Hagley before being acquired by the museums.

Also very interesting is that the specimens *Jefferies and Lewis* looked at were in a "grey or greenish, rather silty marl and presumably come from the inter-reef deposits"; they were mobile, mud grubbing organisms. One specimen was found in 'Dudley canal tunnel' which throws up the possibility that some of the specimens may come from old Wenlock Shale, or Coalbrookdale Formation beneath the Much Wenlock Limestone. Carpoids are providing a great many problems to be investigated, which is of course one of the great attractions of Geology. ■

References:

Jefferies, R.P.S. & Lewis, D.N. 1978 The English Silurian Fossil Placocystites forbesianus and the Ancestry of the Vertebrates. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences, Vol. 282, No. 990 pp. 205-323.*

Graham Hickman: BCGS Newsletter No. 200. April 2010. p. 15.

British Palaeozoic Fossils 1975 Natural History Museum. p. 35, Plate 23.

Richard Dawkins.net http://forum.richarddawkins.net/viewtopic.php?f=4&t=68468&start=0

Bill Groves

A Blast from the Past!

Via BCGS founder members Peter Oliver and Alan Cutler, Eileen Bakewell (the Society's first Hon. treasurer) has sent us this photo. Eileen knew it was 'Clent 1975', and with a little research in Graham Hickman's Newsletter archive, I can reliably report that it was taken at the very first locality on the very first field trip, on Sunday 27th July 1975. This was led by Peter Oliver and Alan Cutler. BCGS Newsletter No. 1 records the event: "The first stop was Walton Hill, near Clent, where at the summit Mr. Cutler gave a preamble to the geology of the area, indicating at the same time major landmarks and topographical features".

Peter, Eileen and Alan have identified some of these pioneer BCGS field-trippers, and I've attempted to match names and faces. I've counted the back row (all those standing) left to right, 1 - 24, and kneeling, left to right, 1 - 4. I'm relying on our readers to complete the roll-call for our next edition (and send corrections for any misspelling and misidentification!). ■

Julie Schroder

The First BCGS Field Trip. Walton Hill, 27th July 1975

1. Doug ? 3. Peter Parkes. 9. Bill Evans. 10. Eileen Bakewell. 17. Margaret Oliver. 18. Alan Cutler. 19. Freda Tabberner. 20. Peter Oliver. 21. Dave Wraight. 22. Sheila Pitts.
Kneeling: 1. John Golledge. 2. Jenny Wraight

The Silurian Way

Spotted on a website:

"The Silurian Way takes its name from the geological period (about a million years ago)".

http://www.discovercumbria.co.uk/grizedale.html

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