



The Black Country Geological Society

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Newsletter No. 209

October 2011

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Copy date for the next Newsletter is

Monday 1st December 2011

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, telephone: 01385 370 188, mobile: 07973 330706 or email: andrewcfharrison@yahoo.com

Monday 17th October: (Indoor Meeting) N.B. Change of Speaker. 'The life and Times of John Johnson Shaw and his Earthquake Detector'. **Speaker: John Lester**, Local Historian from Walsall. This talk will examine how a humble local man, born in Gornal and who lived most of his life in West Bromwich, went on to become one of the most famous seismologists ever and appeared in the media whenever a great earthquake occurred. It will look at how he met up with Milne - sometimes called the founding father of earthquake recording - and at the seismograph that they developed.

Monday 21st November: (Indoor Meeting) N.B. Change of Speaker. (Jon Clatworthy's talk previously advertised is re-scheduled for 23rd April 2012.) 'Seeing inside the Stones'. **Speaker: Dr. Imran Rahman**, Post Doctoral Research Associate, University of Birmingham. This talk will explain how experiments using hospital CT scans of fossils (mostly very ancient starfish, sea urchin and sea lily type creatures) have allowed us to look inside the stones to reveal their secrets. Images will be shown in red-green 3-D format and 3-D glasses will be used to make the pictures literally pop out of the screen! Imran will show us how this technique has made many new amazing insights into how this group of sea creatures (echinodermata) evolved their biology through time.

Monday 5th December: (Indoor Meeting, 7.00 for 7.30 start) BCGS Members' Evening and Christmas Social. We are now taking offers of short talks and displays for this meeting. Refreshments will as usual be provided in the convivial atmosphere of the festive season. This is the annual opportunity for members to make their contributions: either share your experiences in a short presentation (perhaps of a geological holiday?) or bring along specimens, photos etc. for display and discussion. Please send your suggestions to our Meetings' Secretary Graham Worton: graham.worton@dudley.gov.uk (or contact him via the Dudley Museum and Art Gallery, details above). Contributions from New Members, however short will be especially welcome. **As we go to press no volunteers have come forward!** So please don't be shy - share your geo-experiences with all of us!

Monday 23rd January 2012: (Indoor Meeting) 'The geology and geoarchaeology of Jordan'. **Speaker: Dr. John Powell**, British Geological Survey. John has spent many years working overseas for the British Geological Survey. In particular this talk will focus on the geological influences on the spectacular archaeology in the region called 'Petra to Pella' - which became famous as one of the most amazing locations used for making the film 'Raiders of the Lost Ark'.

Saturday 28th January: (Field Meeting) Visit to Coln Quarry and other Cotwolds quarries for a day of fossil hunting in the Oxford Clay and Pleistocene deposits. **Led by Neville Hollingsworth.** (Full details in the December Newsletter.)

Monday 20th February: (Indoor Meeting) 'The Geological Photo Archive of the Geologists' Association'. **Speaker: Dr. Jonathan Larwood**, Natural England, Peterborough. The Geologists' Association has a long history stretching back to 1858. Throughout much of that history it has recorded its activities through written documents and captured its field excursions in many photographic formats including glass plates. This talk will reveal some of the forgotten images of geology through the last century with particular reference to the Black Country and its surroundings.

Monday 19th March: (Indoor Meeting) 'The Permafrost'. **Speaker: Dr. Richard Waller**, Keele University. Following on from last year's introduction to ice ages, glaciers and glacial landscapes, this talk will focus on the permafrost as a facet of the world's past and present frozen environments (the cryosphere). It will look at the evidence in and around the Midlands for permafrost environments and landscapes of the past.

Monday 23rd April: (Indoor Meeting) 'Next Steps for the Development of the Lapworth Museum of Geology'. Speaker: Jon Clatworthy of the Lapworth Museum of Geology, University of Birmingham. During 2010 and 2011 the Lapworth Committee have been drawing up plans for a major re-fit and re-display of the Lapworth Museum. Jon will share this vision with us and focus on some of the wonderful new initiatives of the redevelopment.

Other Events and Information

Geologists' Association Festival of Geology: 5th & 6th November

Saturday 5th November, 10.30am - 4.30pm. University College London, Gower Street, London WC1E 6BT. **Entrance Free!**

Exhibitors from the World of Geology: Fossil and mineral displays, jewellery, books, maps etc.

Discovery Room: Activities for children with fossils, racing trilobites, Jurassic dioramas and more!

Geological Talks: Prof. Richard Selley: The impact of geology & climate on 2 millennia of British vineyards; Dr Joe Cain: Crystal Palace dinosaurs; Prof. Hazel Rymer: Volcano hazards; Dr Andrew Ross: Amber.

Sunday 6th November: Walks and Field Trips.

Amateur Photographic Competition: Any geological topic: **£100** 1st Prize, **£50** 2nd Prize, **£25** 3rd Prize. **Further details:** www.geologistsassociation.org.uk or www.rockwatch.org.uk
tel: 020 7434 9298 email: geol.assoc@btinternet.com

Earth Heritage

Earth Heritage is a twice yearly publication produced by the Joint Nature Conservation Committee, Natural England, Scottish Natural Heritage and the Countryside Council for Wales. It is available for free download from www.earthheritage.org.uk/

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

Friday 18th November: 'Underground, overground: Britain's longest cave and the changing landscape of the lower Usk valley and its tributaries.' Talk given by Dr. Mike Simms.

Saturday 19th November: Gilwern Hill, Bloreng. Led by Dr Mike Simms. A follow-up to the previous night's talk. Meet at the car park by Keepers Pond (Pen-ffordd-goch Pond), south-west Bloreng (SO 254 109) at 10.30 am. Bring a packed lunch and drink, also suitable clothing and footwear for this area of high ground.

Guests are welcome, but must take day membership of the Club: £2.00. Further information: Sue Hay on 01432 357138, email svh.gabbros@btinternet.com or visit their web site: www.woolhopeclub.org.uk/Geology_Section/default.htm

Lapworth Lectures

Monday 17th October: Details of this and future lectures to be confirmed.

All lectures commence at 5.00pm in the Dome Laboratory, Earth Sciences, University of Birmingham. All are welcome! Further info at: <http://www.lapworth.bham.ac.uk/events/lectures.shtml>

North Staffordshire Group of the Geologists' Association

Thursday 13th October: 'Topics in Igneous Petrology'. April Fitz-Gerald and Adam Jeffrey (Keele University).

Thursday 10th November: Wolverson Cope Memorial Lecture: 'Mercury - New views of the Sun's innermost planet'. Dr David Rothery (Open University).

Lecture meetings are held monthly during the autumn and winter, at 7.30 in the William Smith Building at Keele University. Further information at: www.esci.keele.ac.uk/nsgga/

Manchester Geological Association

Saturday 12th November: The Broadhurst Lectures: The Coal Measures

Rates of Sedimentation in the Namurian and Westphalian: A Review. Dr. Derek Brumhead MBE, MGA.

Trace Fossils of the Carboniferous Coal-Bearing Rocks: 160-Year Manchester Heritage. Dr. John Pollard, University of Manchester.

The Rise and Fall of the Coal Forests. Dr. Howard Falcon-Lang, Royal Holloway, University of London.

Coal Mining in Lancashire, the Photographic Record. Alan Davies, formerly Curator, Lancashire Mining Museum.

Booking essential for this event.

Visitors are always welcome. Further information about meetings at <http://www.mangeolassoc.org.uk/> or email lectures@mangeolassoc.org.uk

Warwickshire Geological Conservation Group

Wednesday 19th October: AGM followed by Jim Passmore: 'Early Geologists & Geological Maps'.

Wednesday 16th November: 'The Bytham River Story'. Prof. Jim Rose (Royal Holloway, University of London).

For details of venues/times contact Ian Fenwick swift@ianfenwick.f2s.com or 01926-512531. The WGCG mobile phone (07527 204184) 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/>

Shropshire Geological Society

Wednesday 12th October: 'Conserving the Stone Built Heritage of Shropshire' (guest speaker: Colin Richards MBE, Shropshire Council).

Wednesday 9th November: 'Current perspectives on meteorites' (guest speaker: John Armitage).

Wednesday 14th December: 7.00pm start: AGM and lecture on Yellowstone National Park (speaker: Mary Steer).

Generally held at Shire Hall, Shrewsbury, commencing at 7.15pm for 7.30pm. A nominal charge is levied for non-members. Further info at: www.shropshiregeology.org.uk/

West Midlands OUGS Day of Lectures

Saturday 21st January 2012: 10.30 - 16.00 (approx.) Dome Lecture Theatre, University of Birmingham. Break for lunch around 13.00. There will be a charge of £5.00 for non-OUGS members. Speakers include: Dr. Chris Carlon, formerly an exploration geologist with Anglo American; Dr. Matt Watson, Bristol University; Dr. Will Gosling, The Open University; Dr. Isabelle Ryder, Liverpool University; Dr. Emily McMillan, Birmingham University.

To book a place, please contact Linda Tonkin, west.midlands@ougs.org

Editorial

Much has been happening in the local geological world during the summer months. In August, volunteers from BCGS flew the flag for the Society at the Black Country Living Landscapes 'Wildlife Road Show', and in September the Wren's Nest took centre stage during the Geological Association's 2 day meeting 'Geoconservation for Science and Society: An agenda for the 21st Century'. With the 'Ripples Through Time' project nearing completion of its next phase, (see Newsletter 205, p.5 and pp.5&6 below), it was selected as one of two sites for the Meeting's Field Workshop visits where good practice in Geoconservation is demonstrably alive and thriving. The other site visited was the Barnt Green Road Quarry 'Champions' site in the Lickey Hills (see p.13 for more on the Champions project).

For the BCGS, the highlight of the summer was undoubtedly our presence at the Dudley Rock & Fossil Festival, on 24th & 25th September. A few intrepid members of the committee worked hard to gather together material for geological 'doggy bags' plus 'information packs' and 'welcome packs' for new members. The stand was professionally festooned with illustrations and our logo was blazoned prominently. Geologically themed badge making proved to be a great hit with the children. Our treasurer, Mike Williams did particularly sterling work in recruiting new members - totalling 49 in all! We look forward to giving them all a warm welcome at our next meeting, and to an action packed and well-supported season ahead. (See also Mike Williams' report on p.16.) ■

Julie Schroder

'Ripples Through Time' - a face-lift for the Wren's Nest



On 27th September 2011, after nearly ten years of developing ideas, searching for funding, securing funding and then agreeing on what access improvements and pieces of artwork/interpretation would be installed, the 55th birthday of Wren's Nest NNR saw the official unveiling of four new themed walks, around ten pieces of sculpture, five new interpretation boards and hundreds of metres of improved paths, steps and fencing - all installed with the aim of enhancing the visitor experience and creating

greater opportunities for learning about this amazing site.

For the past five months, the project team has been working with artists to develop: A new welcome pillar at the new dedicated Wren's Nest NNR which provides an overview of the site - including some casts of fossils that you will be able to find if you are lucky enough; Interpretation Boards at the key features, including the Coral Reef, Ripple Beds and Murchison's Viewpoint, and a fantastic set of Story Stones at the Seven Sisters mines, bringing together the geological and archaeological importance of the site. ►



Dotted around the NNR, plaques with casts of local children's hands and ears have been placed to make visitors stop and listen for a bird call, place their hands across millions of years of Geology or look for a mini Dudley Bug. A Time Periscope has also been installed near the Quarry, so go and have a look and see whether you can work out the layers.

The waymarkers for the themed walks were unfortunately delayed for the opening, therefore these will be installed over the next few weeks - so keep an eye out for them.

We hope that you enjoy exploring the site and looking for these new additions. The project team has been excited about the new pieces of art and the panel and we hope that you enjoy them as much as we who have been involved in designing them. ■



Penny Russell (Tourism Development Officer, Dudley Council)

Have a look at our website at: www.bcgs.info

The Science and Mysteries of the Wren's Nest National Nature Reserve

They don't give away the designation of National Nature Reserve lightly. It is a badge of the greatest natural heritage accolade which few geological sites can ever achieve. In the case of the Wren's Nest it was the very first true ancient geological National Nature Reserve ever to be selected, assessed and subsequently declared. On the 27th September 2011 we celebrated its 55th year - its emerald anniversary together with partners from many organisations and communities to mark the start of the next stage in its evolution as a national treasure and wonderful inspirational local community resource.

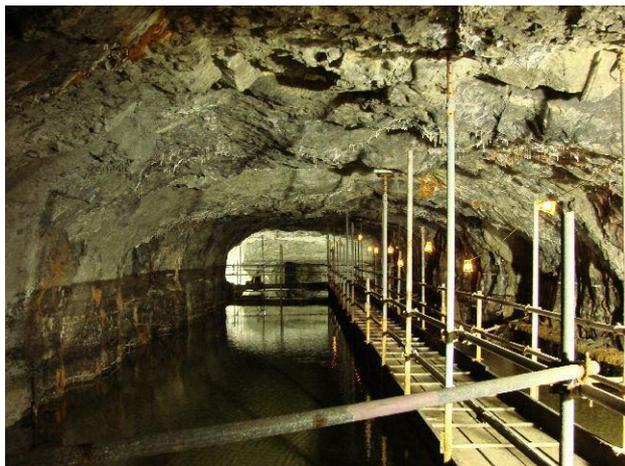
This was done in pomp and circumstance with the unveiling of some new interpretation and artworks, with the cutting of ribbons and speeches as is the customary way, but we also celebrated in a quiet way the new knowledge that the recent years have brought us which add a new understanding and richness to the heritage of this incredible place. It was a delightful and very fitting day that I was proud to have played some small part in.

In terms of the science here we have made a few steps forward but there are still many puzzles to be solved about the rocks of the Wren's Nest and the ancient world in which they were formed. A few things that we have learned in the last couple of years though, which readers might be interested in I've outlined below.



The Mayor cuts the ribbon at the 'Ripples through Time' launch

In the last two years the Step Shaft Cavern (or Wren's Nest East Mine Complex) has been opened up for a short time in order to assess its condition and safeguard it against decay and collapse. In doing that we were able, for a short time underground, to study in detail the geology which has not been subject to the rigours of weather and development. This allowed us to see and sample layers of softer muddy rocks that simply cannot be seen at the surface. ►



Canal basin scaffold near Cathedral Cavern, 2009

These samples have been sieved and picked through in great detail in the laboratory at the museum and have yielded tiny fossil treasures that we had no previous knowledge of. In particular a vast array of tiny (less than a tenth of a millimetre long) jawbones of fossil worms have been discovered. Most appear never to have been discovered or described by science before. Scientists call these things scolecodonts and I am now working with fellow scientists in Prague, USA, Sweden and Denmark to understand more about these beasties and how they changed through time.



Scolecodont jaw found in the Step Shaft Rocks

The bentonite clays within this pile of ancient sea beds (those sticky yellow and white clays that you sometimes come across), are the remnants of rotted volcanic ash layers that spewed from ancient volcanoes and smothered the crystal clear seas that once existed here. One of these which sits on top of the upper limestone bed (the Upper Quarried Limestone) is actually at the boundary between two great rock Series - the Ludlow Series above and the Wenlock Series below. Due to a grant from Natural England we were able to send a sample to the National Isotope Geochemical Laboratory of the British Geological Survey in Nottingham, where its tiny cargo of zircon crystals was liberated and then dated using radio isotopes. This has told us that the rocks at this point in the pile are no younger than 427.77 million years ± 0.25 million years – which is much older than anyone suspected and is a globally significant time-marker being at this important series boundary. Work by the Swedish scientists on a bentonite layer at the base of the Lower Quarried Limestone has recorded a value of 428.47 million years, so that for the first time tells us that the full suite of rock layers that you can see at the surface of the Wren's Nest was formed within a time frame of about 700,000 years to 1 million years.

I am delighted that these new discoveries have already been adopted into the new artworks and interpretation that we have just put into the landscape of the Wren's Nest and I am very aware and excited by the fact that these small nuggets of new knowledge form the stepping stones to yet more discoveries in the future. ■

Graham Worton

Information for members

From time to time, the Society is emailed copies of other geological societies' newsletters. If you would like to be emailed a copy when they are available please email the Newsletter Editor at the address below. You may, of course, ask to be removed from the list of recipients at any time.

More Erratics - Probably

In Newsletter 208 I described some of the Devensian erratics that I had found within walking distance of the centre of Wombourne, mostly in the villages to the west. The technique I used as part of the BCGS 'Boulderdash' effort was to record the position of each erratic with a GPS which would give me a 10 figure map reference and the altitude. I was then given a crash course in IT skills from my son enabling me to convert the map reference to Latitude/Longitude. You can read this directly from the GPS (but it is prone to copying error), and then put each position on the local map using Google Earth. This produced a very nice distribution map, but did it really mean much? I started to question this when I was describing the erratics in Seisdon. ►



Photo 1, Post Office Road



Photo 2, Post Office Road

There are many erratics in this village, too many to record each one. One particular road, Post Office Road was particularly interesting, although I should point out that it is a very quiet, pleasant residential road, so I did not spend too long standing outside houses making notes and taking photographs. At SO834952 there is a large boulder over 1m in diameter, crystalline with mica, hornblende and white feldspar (photo 1), rather like a diorite. As I continued down the road there were lots of smaller boulders on the field edges, and at SO837953 where the road crosses Smestow Brook there are several boulders around the stream, including one of Shap Granite (photo 2). I identified this several years ago, but access was difficult this time. Among the many other

boulders in this locality are two at SO838952 either side of a drive. One is a pink igneous rock but interestingly the other is of a hard, coarse sandstone between 1 and 2m across. It is white, mostly quartz, poorly sorted and not well rounded with a grain size of around 2mm (photo 3). This is an unusual erratic and I am not sure where it has come from. Further down the road there is a wall constructed out of boulders (photo 4). Some are exotic – there are two dark crystalline lumps, but others are distinctly local; the liver coloured pebbles are from the local Triassic bedrock.



Photo 3, Post Office Road

There are many things to bear in mind when searching for these boulders. To record every one, as I described at the start of this article, is a bit ambitious, and indeed, probably a waste of time. We are only seeing those boulders exposed at the surface; if we are on glacial till there will be many more beneath our feet. The bedrock in this area is the Triassic Sherwood Sandstone Group, with its many pebble beds. Some well rounded clasts as in my Seisdon Wall are likely to be from that source. We have to be sure that they were transported by



Photo 4, Post Office Road

ice and are roughly in the area that the ice left them. Many boulders have apparently been moved by developers to enhance a site. In Kingswinford at SO875892 a small children's play area has recently been built, and as a finishing touch three large boulders have been placed, excellent for sitting on and hiding behind, but brought in from another place in the borough.

At one point in Wombourne I was looking at a boulder of igneous rock, when a passing walker asked me what I was doing. I explained that it was brought by the ice and he got down on his knees and ran his hand over the surface and said, "Is it granite?" It did look like an acid or intermediate rock, and

bearing in mind that in the Black Country all igneous rocks tend to be called 'granite' I replied, "You're not far wrong". Having felt the top surface he told me that he thought it could have been an anvil. The nail makers would look for boulders of 'granite' with a flat surface to use as an anvil in the nail making process. I have never heard this before and would be interested to know if this is possible. There is another complication: there was more than one glaciation. Can we separate the erratics from their different parent glaciations? (There will be more from Bill on the fascinating subject 'Devensian or Anglian' in the next Newsletter. Ed.) ■

Bill Groves

Please send material for the next Newsletter to:

julieschroder@blueyonder.co.uk

42 Billesley Lane, Moseley, Birmingham, B13 9QS.

The Dudley Bug

Welcome

We hope you have all enjoyed the summer period, but the autumn is certainly upon us with the crunching of leaves now heard as you stroll through the parks. It has been a very busy few months for both of us since the last Dudley Bug. We have recently had the Dudley Rock and Fossil Festival which was a huge success and enjoyed by all who attended. To those of you who have just joined the Society we welcome you to the Society and hope that you find our section of the Newsletter both informative as well as humorous from time to time. We are bringing metals and ores to you as the topic this issue so sit back, relax and enjoy.

Alison and Chris

Metals and Ores

Today we use metal for practically everything such as transport, electricity and buildings. Over the last 50 years, uses and demand for metals has increased, which is due to their properties. The most common metals we use in today's modern society include copper, aluminium, iron and steel. Less common metals include gold and silver.



The huge Bingham Canyon Copper Mine, Utah (Timjarrett, Wikimedia Commons)

Metals are found naturally occurring in rocks but are only economic when the geological processes which formed the rock have caused the metals to concentrate. These concentrations are known as ore deposits. They can be found within the earth formed through magmatic processes, or on the surface formed through weathering and deposition.

In order to work out the processes which have formed the ore deposit we use SADE: **S**ource **A**gent **D**eposition **E**nergy. The **source** of metal is where it is found on a long term basis such as the crust or the oceans. The **agents** of transport indicate how they are removed such as in magma or water. This can depend on the solubility of the metal which can be altered by temperature, pH and other substances around. In order for a metal to be **deposited** a suitable site and the correct conditions are required. Finally the **energy** to move the substance is required, such as convection or radioactive ►

decay. The three main ways in which ores are deposited are through igneous, surface and hydrothermal processes.

Magmatic processes form three types of deposits: magmatic segregation deposits, pegmatite deposits and porphyry copper deposits. **Magmatic segregation deposits** can form through fractional crystallisation within a magma chamber. This occurs when different minerals cool and crystallise at different times. They form layers which are concentrated in different minerals. Another method is liquid immiscibility which occurs when the majority of the magma has cooled and separated leaving very few minerals. This means that the magma is saturated with these minerals, such as sulphur. As it cools this separates, and may sink to the bottom of the magma chamber and form layers at the base.

Pegmatite deposits are formed as pegmatite rock which is a very coarse igneous rock associated with granite plutons. They form with the final part of the magma chamber that is still un-crystallised. Because this part of the magma usually has a high water content, the crystals which form as it cools are very large, as in the Bikita Pegmatite deposit in Zimbabwe.

Porphyry copper deposits are associated with porphyritic felsic intrusions which form large but very low grade deposits. These deposits are formed as rising magma degasses and the fluid is left carrying soluble metals known as chlorite complexes. As the magma continues to rise it boils causing the surrounding rocks to fracture. The fluid quickly fills the gaps created by the fracturing and begins to alter the rocks. As it cools the metals within the fluid cool and form deposits which can be large enough to form ore deposits. Because of the location of these deposits within rock, it isn't economically viable to extract the ore deposit on a small scale. The main metals which are sourced from these deposits include Cu (copper), Sn (tin), Au (silver) and Ag (gold). One of the largest and best known examples of a Porphyry Copper Deposit is the Bingham Deposit in Utah, USA. This deposit measures 2.5km x 1.7km and is 1.0km deep.

Surface process deposits form from processes which include chemical leaching where a substance is removed from a rock by fluids which run through the rock. Others include secondary enrichment deposits and chemical transport. The latter method forms banded iron ore deposits.

The stability of a metal ore depends on how reactive the metal is. Very reactive metals such as aluminium react to form stable oxides. Less reactive metals such as iron react to form less stable oxides. So the reactivity of the metal will dictate its extraction method. Different methods are used to extract metals. Below is a table giving some common examples:

Metal	Method/Reaction
Aluminium	Electrolysis
Calcium	Electrolysis
Copper	Chemical reactions including hydrogen
Gold	Chemical reactions including hydrogen
Iron	React with carbon or carbon monoxide
Lead	React with carbon or carbon monoxide
Magnesium	Electrolysis
Platinum	Chemical reactions including hydrogen
Potassium	Electrolysis
Silver	Chemical reactions including hydrogen
Tin	React with carbon or carbon monoxide
Zinc	React with carbon or carbon monoxide

Definitions

Ore – A metal resource that can be extracted because it is both viable and economic to do so at the present time.

Resource – A concentration of a naturally occurring substance that can be economically extracted now or in the future.

Field Meeting Report

Sunday 12th June: Apedale Colliery and Heritage Centre.

The Apedale Colliery and Heritage Centre is located approximately 3.0km NW of Newcastle-under-Lyme town centre, Staffordshire. We met at the Centre at 11:00am on a wet and cold Sunday morning, and were given a guided tour of the mine and museum by former mine workers and volunteers.

History

It is unknown whether the name Apedale has Roman, Saxon or Nordic origins; however it is known that mining in the area dates back to Roman times around 100AD. The Romans established a fortress on the highest ground, now Chesterton Hill, overlooking Apedale and by the 2nd century AD the small town of Holditch had grown up adjacent to it. In return for food and other goods the Romans provided the townsfolk with protection, but their main reason for being there was to mine ironstone for weapon manufacturing.

Since then the area has had a history of iron making, mining and armament manufacture all serviced by horse, water and steam power and, like the Black Country, was one of the first centres of industry to appear during the 18th Century.

Mining at Apedale Colliery dates back to 1931. Seam after seam was worked and after the last economic reserves were exhausted, in November 1969 the Coal Board closed the mine. It then passed into private hands and continued operating until 1999, when it was finally closed and its roadways and galleries detonated to try and seal it. The Apedale Heritage Centre took over the site in 2001 and ever since has worked hard to reopen the former drifts, roadways and galleries, employing many of the original staff that worked in the mine.

Local Geography and Geology

The Apedale Colliery sits within a NW/SE trending valley, within the Apedale Community Country Park. The area is part of the North Staffordshire Coalfield and the underlying geology is the Upper Carboniferous Coal Measures, which includes several heavily worked coal seams: Hoo Cannel Seam, Bassey Mine Seam, Upper Peacock Seam, Peacock Seam and Spencroft Seam. Each seam is interbedded with mudstone, ironstone and fireclay, which were historically extracted for iron manufacture, brick making and fuel.

These strata were deposited over 300 million years ago when Staffordshire was situated at equatorial latitudes and comprised a low lying, water-logged plain with shallow lakes and peat mires, which later became coal. The collision of Armorica (France) and Laurasia at the end of the Carboniferous resulted in heavy folding and faulting of the region. The Upper Coal Measures strata beneath Apedale now form the eastern edge of a NE/SW trending fold, the Western Anticline.

Colliery and Heritage Centre Tour

Before entering the mine everyone was kitted out with a hard hat and head lamp ready for a traditional mining experience. Silver tags were handed out, which had to be swapped for bronze ones once we entered the mine. Tagging acts as a method of checking people into and out of the mine at the start and end of every shift. Bronze tags are used down the mine because they are less likely to cause a spark. ►



The mine comprises a number of Drift tunnels and coal galleries, which Heritage Centre staff have been working hard to reopen. Our tour took us down Drift No.4 to the Bassey Seam coal gallery and back up via Drift No.3. More recently Drift No.7 had to be opened to help with ventilation and to act as another escape route from the mine. With our guides Dave and Keith, both former mine workers, we descended into the dark depths along Drift No.4. During our descent we could see how the Drift was lined with wooden planks and corrugated iron sheeting and wooden props to keep it open. Steel rails used for carrying carts and engines also ran the length of the Drift.

Part way along, some of the tunnel lining had been removed revealing the Peacock seam. This seam comprises 2.0m of extensively worked coal, which in places has been eroded by glaciation and replaced with sand. Walking along the Drift the rocks became progressively younger and higher up the Upper Coal Measures sequence. The Upper Peacock, or Yard, Seam sits 8.0m above the Peacock Seam and has never been worked. Above that is the Bassey Seam, which has been extensively worked. The coal seams are inclined at an angle of 1 in 2 and in order to intercept them the Drifts were cut at an oblique angle of 1 in 4.



Eventually we reached a point where the No.4 Drift was blocked off. Hanging on the wall was a plan showing the extensive workings of the Bassey Seam. Our tour then continued through a perpendicular low, dark and cramped coal gallery where the worked face of the Bassey Seam was exposed. This seam had last been worked six months earlier and the coal gallery had taken four years to open up during which time 80 tons of rock was removed.

Mining has many associated hazards including tunnel stability, gas and groundwater to name a few. Stresses released during tunnel construction may result in roof collapse, especially from fossilised tree roots, and floor lift. David said that collapsing tree roots were not an issue at Apedale, but floor uplift was and could be as much as 2 to 3 feet. Wooden props and tunnel linings are therefore a necessity to keep tunnels open.

Gases occur such as carbon dioxide, or 'Black Damp' which induces unconsciousness, and methane or 'Fire Damp', which is explosive and historically the biggest killer underground. Air quality is continuously monitored to check for gas build up. Today this is done electronically, but in the past miners used canaries. Bituminous coals, such as the Bassey Seam, pose a lower risk since they do not produce methane. Airflow through the mine tunnels is constantly regulated through the use of ventilation shafts and doors to prevent gases building up. According to David all mines require at least two openings to provide ventilation and escape routes in case of tunnel collapse. With the opening of No.7 Drift the Apedale mine now has four.

We exited the Bassey Seam coal gallery into Drift No.3, which we followed back to the surface. This Drift has been set up to demonstrate the workings at the coal face. Once a Drift or roadway was cut to a coal seam the 100 to 200 yard long coal gallery was cut perpendicular to it. Rock cutters and explosives were used to break up the coal face into spoil of various sized lumps and dust, called slack. The dust was another major health issue and after a shift miners would leave a pit black from head to foot. The spoil would be loaded onto conveyors, carried to waiting trucks and hauled to the surface by steam locomotive, or historically by pit pony. All electrical equipment had to be intrinsically safe to avoid igniting any Fire Damp. As the coal face moved forwards the props behind were removed and the roof allowed to collapse. All mine tunnels were carefully surveyed and the strings used to do this could still be seen suspended from the tunnel ceilings.

After lunch we were given a brief guided tour of the Heritage Centre Museum, by Barrie Collinson. Heritage Centre staff, private local collectors, North Staffs Tile and Brick, the Moseley Trust and the North Staffordshire Group of the Geologist's Association have all contributed to the museum. Displays include the Roman and industrial history and geology of the area and a look into the life of the miners and local communities who worked and lived in and around Apedale. ►



Our day ended with a rather damp ride on the Apedale Valley Light Railway, a replica narrow gauge steam train opened by the Moseley Railway Trust in September 2010.

I would like to thank the Heritage Centre Volunteers, Les, David, Keith and Barrie for their time and giving us a wonderful day out. Thanks also go to Gerald Ford (NSGGA) who first told me about the site. ■

Andy Harrison

We are the Champions!

In 2008 the Herefordshire and Worcestershire Earth Heritage Trust (H&W EHT) received a grant from the Heritage Lottery Fund (HLF) to fund the Community Earth Heritage Champions project, an initiative to select key geological sites in Herefordshire and Worcestershire and involve local people in their ongoing maintenance and promotion. Additional funding was also obtained from Natural England through Defra's Aggregates Levy Sustainability Fund, the Malvern Hills AONB and the Tomlinson Brown Trust. Having selected 19 suitable sites, project manager Eve Miles organised public meetings to recruit the 'Champions', and along with her colleagues from the EHT has worked tirelessly throughout the three and a half years of funded support to bring this part of the project to a satisfactory conclusion at the end of August this year. But that conclusion is really just the beginning! Now it's over to the Champions to continue, more or less unaided, to keep the ball rolling...

Community Earth Heritage
CHAMPIONS
project



After the recruiting process those of us who 'signed up' were steered through a process of training which, it is hoped, has left us well prepared for the task ahead. From all walks of life, with vastly differing backgrounds and reasons for becoming Champions, we were given the opportunity to attend training days. We had a brief introduction to the basics of geology, with particular reference to Herefordshire and Worcestershire; we were given training in the use of tools, vegetation clearance, health and safety, and the ongoing recruitment of volunteers. We were invited to undergo a two day first aid course, an opportunity I felt was certainly too good to miss. We also had the opportunity to attend longer courses in the basics of geology, and there were events where we could meet and 'network' with Champions from other sites.



Help from the fire brigade at Barnt Green Road Quarry

I am one of the Champions for the Warren Lane and Barnt Green Road Quarries in the Lickey Hills. The Warren Lane quarry is used as a depot and is not permanently open, but the Barnt Green Road Quarry is our pride and joy, and one of the 'jewels in the crown' of the entire Champions project. Unlike some of the Champions groups, we played no part in the initial site clearance. This was a major undertaking involving the use of heavy machinery and the fire brigade to clean the rock face, and it has been largely due to the interest and close co-operation of the Lickey Hills Park Rangers that the project has proceeded so smoothly.

It is known that this quarry provoked some geological interest in the late 19th century for its dramatic structure, and now, its superb overfold in the Ordovician quartzite has been clearly revealed once again. Certain exposures at the southern end of the quarry have caused speculation within the professional community about a ►

possible connection with the Barnst Green volcanics exposed to the south of the Lickey Hills. Thin sections have been taken for analysis and many questions have been raised for further research.

We were initially a group of 5, ageing from student to retired, and from backgrounds about as diverse as you could imagine, but we pooled our ideas for one purpose - to make a success of our project. We had numerous meetings, some with Eve, who noted our ideas and incorporated them into the professionally produced information panels and a 33 page information booklet. Way markers bearing the Champions logo were installed, and the site was made safe for visitors. In preparation for our launch event in July, we collected rock samples of all the local rock types, later to be put on permanent display in the Lickey Hills Visitor Centre. Bearing in mind that our main geological feature was the overfold, we did a display based on folding, and created some activities for children, including a quiz to focus their minds along the trail to the quarry. Since the launch, one of our members has taken a school party to the site, and we are hoping to involve many more school groups. We are in the process of sounding out local interest groups and geological societies for us to give talks and/or organise trips to the site. We have established a monthly rota to keep an eye on the site and do basic maintenance.

We were very proud that the Lickey Hills Champions project was selected by The Geological Association as a flagship site for a field visit during its recent 2 day meeting to discuss 'Geoconservation for Science and Society: An agenda for the 21st Century'. The delegates seemed very impressed, particularly with the well-managed public involvement, which will enable the Champions to proceed with confidence once the H&W EHT life-support system is withdrawn.



Lickey Champions at the launch event

A very satisfactory corollary for all those involved in the Champions project is the recent announcement that an HLF commissioned study has selected the Community Earth Heritage Champions project as one of 26 projects to be flagged as an example of 'best practice' to inform future HLF grant funded projects. It is deemed to have been particularly successful in achieving 'community impacts', particularly in attracting a broad demographic of volunteers, and in achieving a high level of community cohesion.

There are currently 86 active volunteer 'Champions' spread across the 19 sites, and it is hoped that recruitment will be an active, ongoing process for all the sites. Some are badly in need of more volunteers. I can highly recommend getting involved. Since becoming a 'Champion', I have learned new skills, made new friends, become immersed in the geology of my site, and lots of new doors have opened.

The following places have Champions sites near to them: Malvern, Kington, West Malvern, Ross-on-Wye, Abberley, Whitchurch/Ganarew, Bewdley, Yarpole, Ombersley, Goodrich, Martley, Fownhope, Wyre Forest, Ledbury, Lickey Hills, Storrige. A list of the sites can be found on the Champions web site (details below).

For further information visit the H&W EHT's web site: www.earthheritagetrust.org or the Champions web site: <http://champions-earthheritagetrust.org/?cat=3>

If you are interested in becoming a volunteer 'Champion' in your area or would like to arrange a visit to one of the Champions sites, or if you are interested in establishing a similar project, please contact the Earth Heritage Trust: Tel: 01905 855184 or email: eht@worc.ac.uk. Or, you can contact the project manager, Eve Miles directly by email: e.miles@worc.ac.uk

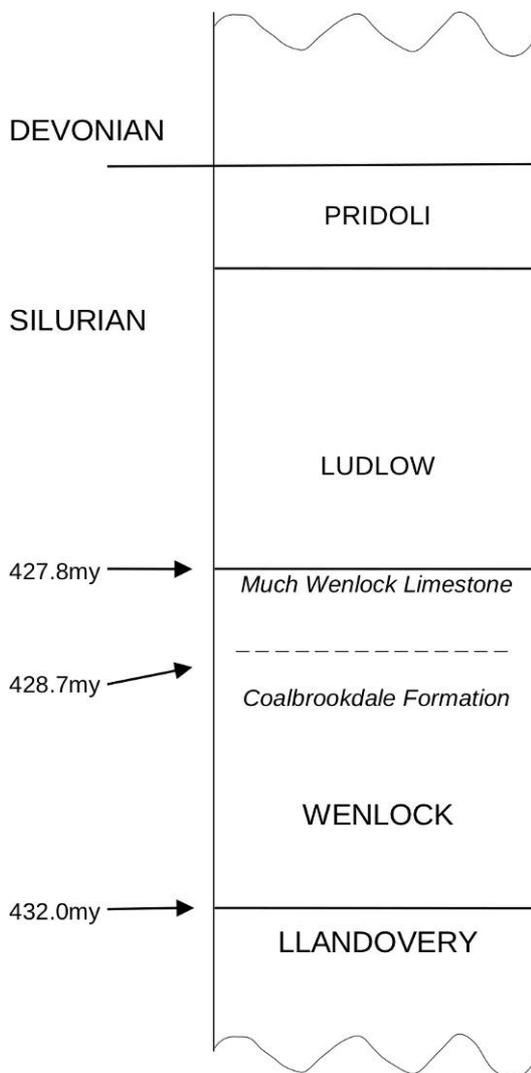


Julie Schroder

Geobabble

Stratigraphy has always been a very important area in the study of geology. Within any geographical area, if you are looking at the geology you need to understand the sequence of the rocks, and visualise it as a column, with the oldest beds at the bottom. Geologists soon get used to writing down these sequences starting at the bottom of the page and working upwards. Traditionally stratigraphy was taught to budding geologists by starting with the oldest rocks in Britain and working upwards to the youngest, so in the Silurian, you would start with the Llandoveryan and work through the Wenlockian, into the Ludlovian and so on. The traditional way of finding where you are in the sequence is to look at the fossils, as they will change with time as life evolved and so distinct horizons were identified with fossil zones. Staying with the Silurian, my 'British Palaeozoic Fossils', dated 1975 has 23 graptolite zones, mostly Monograptus.

But what about the Silurian of the Black Country? Graptolites did not survive in the high energy or shallow environments that produced the Much Wenlock Limestone Formation, and although experts could tell you where you might be in the sequence using other fossils, graptolite biostratigraphy is not a secure indicator of relative time. So we must turn to other methods that have been developed through looking at bentonites in the succession. These are clays produced by the weathering of volcanic ash and they are very common in our local Silurian. If each bentonite is analysed chemically it is found that no two are identical; each has its own distinctive 'fingerprint'. These volcanoes were mostly from a subduction zone and so varied in magma composition with time, and sequences and changes in the chemical composition can be recognised. Another feature of these bentonites is that they contain crystals of zircon, a mineral that is basically Zirconium Silicate ($ZrSiO_4$), but will give an accurate absolute radiometric age when put through the complex and expensive procedures required. (See 'The Science and Mysteries of the Wren's Nest NNR', pp.6-7 above. Ed.)



These techniques are all very well, but what can be seen without resorting to complex chemical procedures? Well, you can use your traditional biostratigraphical methods, but using microfossils. Some of these techniques are being used at Dudley Museum and Art Gallery by Graham Worton and his Geoteam, a group of young geology students who volunteer to do this research. You simply collect your sample of bentonite from a known horizon, dry and sieve it into its various size fractions and then look at it under a binocular microscope and identify the microfossils. It sounds easy but I assure you that it is time consuming and requires a great deal of skill, particularly when you appreciate that these microfossils are measured in microns. The table illustrates the local succession with the absolute age of the Much Wenlock Limestone Formation, only 1 m.y. long. The Geoteam are looking at 17 bentonites, mostly in the Much Wenlock Limestone and Coalbrookdale Formations, but stretching right up to the top of the Pridoli. This cutting edge research gives us another stratigraphic method to help in the understanding of our Black Country rocks. ■

Bill Groves

BCGS - on the Road Again!

2011 has been memorable for BCGS as this year marks the Committee's attempts to expand the appeal of the Society to a wider possible membership through participation in local events and science related shows.

Commencing in the Spring when BCGS participated in the GA sponsored event at the Three Counties Showground, Malvern through Wildlife Trust local displays at Bushbury, Moorcroft Wood, Sandwell Valley and Bumblehole, Netherton to our outstandingly successful performance at the Dudley Rock & Fossil Festival, BCGS has begun a journey where lessons have been learnt, relationships forged and an exciting future way forward unveiled.

It is hoped that, subject to budgetary constraints, the Society can invest in its own dedicated customised stand which can then be used at many future events throughout the West Midlands where the Society can be promoted to a much wider audience. Participation on behalf of the Society in these events can be extremely rewarding if you are passionate about geology and enjoy engaging with people for there are a surprising number out there who want to know more about earth science. So please, don't be afraid to put yourself forward and join in with the Society on our stand at these events next year.



Gordon, Alf & Anne take a well earned rest on BCGS Stand at Moorcroft Wood.

Finally, a special thanks to our Chairman, Gordon Hensman, Secretary, Bob Bucki, Newsletter Editor, Julie Schroder plus Alf and Anne Cole who have all always been available to man our stall and also to everyone who contributed in any way to our outstanding success at the R&F Festival where the Society doubled its membership.

Mike Williams, Treasurer

BCGS Welcome Packs

These were available for New Members who joined the Society at the Rock & Fossil Festival. For those who have joined recently but have not received a Welcome Pack they will be available at our indoor meetings.

Members' Forum

We have no items for the Members' Forum for this edition!

This space is reserved for your letters, comments, queries, short items, photos and anything that you think may be of interest to the membership, or in the case of geological questions, in the hope of getting a response from someone 'out there'. We especially want to hear from our many new members, and from people other than those who contribute regularly. So please don't be shy. Contact us by email, phone or post and help to increase the strength and inclusiveness of this great Society.

I shall use the space this time to re-iterate the need for you to **come forward with items and ideas for the Members' Evening on 5th December!** Contact our Meetings' Secretary Graham Worton: graham.worton@dudley.gov.uk (or via the Dudley Museum and Art Gallery, details on p.2).

Julie Schroder

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