



The Black Country Geological Society



Newsletter No. 233

October 2015

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**Copy date for the
next Newsletter is
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For enquiries about field and geoconservation meetings please contact the Field Secretary.

To submit items for the Newsletter please contact the Newsletter Editor.

For all other business and enquiries please contact the Honorary Secretary.

For further information see our website: www.bcgss.info

Future Programme

**Until further notice indoor meetings will be held in the
Abbey Room at the Dudley Archives, Tipton Road, Dudley, DY1 4SQ
7.30 for 8.00 o'clock start unless stated otherwise**

Please let Andy Harrison know in advance if you intend to go to any of the field or geoconservation meetings. If transport is a problem for you or if you intend to drive and are willing to offer lifts, please contact Andy with at least 48 hours notice.

Monday 19 October (Indoor meeting): 'In search of ancient subduction sites in the UK'. Speaker: Chris Darmon, Geo Supplies and 'Down to Earth' magazine.

Saturday 7 November: (Geoconservation day): Barr Beacon, Pinfold Quarry. Meet at 10.30 at the entrance on B4154 Beacon Road, opposite Bridle Lane (the southern entrance to Barr Beacon) Grid ref: SP 060967. Wear old work clothes, waterproofs and stout footwear. Please bring gloves and garden tools; loppers, secateurs, forks and spades if you have them. Also bring lunch. Finish at 14.30.

Monday 16 November (Indoor meeting): 'Insights into the glacial history of the British Isles: the newest methods and theories'. Speaker: John Groves.

Saturday 5 December (Geoconservation day): Portway Hill, Rowley. Meet at St Brades Close at 10.30. Directions: from Birmingham New Road (A4123) turn left on to Tower Road if coming from Birmingham, right if coming from Wolverhampton. Just after Bury Hill park, turn left onto St Brades Close. Wear old work clothes, waterproofs and stout footwear. Please bring gloves and garden tools; loppers, secateurs, forks and spades if you have them. Also bring lunch. Finish at 14.30.

Monday 7 December (Indoor meeting, 7.00 for 7.30 start): BCGS Members' Evening and Christmas Social. This is our annual chance for members to share their geological experiences in a sociable atmosphere with a Christmas buffet provided by the Society. We need a few of you to volunteer to do a short presentation - on any topic with geological connections; or perhaps bring along some of your specimens for admiration, discussion and identification. Please contact our Secretary, Linda Tonkin if you can make a contribution to this event: secretary@bcgs.info.

Saturday 30 January 2016, Saturday 20 February and Saturday 12 March (Geoconservation days): Details tbc.

Saturday 23 April (Field meeting): Cannock, led by Ian Stimpson, NSGGA. (Details tbc.)

Saturday 14 May (Field meeting): Oxford University Museum of Natural History, led by Paul Smith, Curator. (Details tbc.)

Procedures for Field Meetings

Insurance

The Society provides public liability insurance for field meetings but personal accident cover is the responsibility of the participant. Details can be obtained from the Secretary, and further helpful information can be found in the [Code for Geological Field Work](#) published by the GA and available on our website. Schools and other bodies should arrange their own insurance as a matter of course.

Health and Safety

If you are unsure about the risks involved or your ability to participate safely, you should contact the Field Secretary. Please take note of any risk assessments or safety briefing, and make sure that you have any safety equipment specified. The Society does not provide hard hats for use of members or visitors. It is your responsibility to provide your own safety equipment (eg. hard hats, hi-viz jackets, safety boots and goggles/glasses) and to use these when you feel it is necessary or when a site owner makes it a condition of entry. Hammering is not permitted unless specific permission has been sought and granted.

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

Other Societies and Events

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

Lapworth Lectures

Monday 19 October: 'Mid-Ocean ridge processes' (title tbc). Speaker: Professor Christopher MacLeod, University of Cardiff.

Monday 9 November: 'Dynamic topography: How the convecting interior talks to the Earth's surface'. Speaker: Professor Nicky White, University of Cambridge.

Monday 16 November: 'Experimental taphonomy' (title tbc). Speaker: Robert Sansom, University of Manchester.

Monday 30 November: 'Battered Mars: New evidence from Scotland'. Speaker: Dr Michael J Simms, Curator of Palaeontology, Dept of Nat Sciences, Nat Museums, Northern Ireland.

Lectures at 5.00 in lecture theatre WG5, Aston Webb Block A, University of Birmingham. All are welcome to attend and there is no admission charge. For further information phone: 0121 414 7294 email: lapworth@contacts.bham.ac.uk or visit: <http://www.lapworth.bham.ac.uk/events/lectures.shtml>

Woolhope Naturalists' Field Club - Geology Section

Friday 20 November: 'Morocco: from the High Atlas Mountains to the Sahara Desert'. Speaker: Dr Sue Hay.

Friday 11 December: 'From the Depths: how speleothems (calcareous cave deposits) reveal past environments and climates'. Speaker: Professor Ian Fairchild, Birmingham University.

All indoor events are held in the Woolhope Room, Hereford Library starting at 5.30 unless otherwise specified. 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

Manchester Geological Association

Wednesday 14 October at 19.00: 'Scientific Exploration of the Moon'. Speaker: Dr Katie Joy, University of Manchester.

Saturday 14 November at 13.00: 'Current Earth Sciences Research at Manchester'. Four talks from PhD students about their geological research.

Saturday 5 December at 13.00: 'Climate Change in the Geological Record'. Three talks from palaeoclimate experts on how the climate has varied throughout time.

Most MGA Meetings are held in the Williamson Building, Oxford Road, opposite The Manchester Museum. For further information about meetings go to: <http://www.mangeolassoc.org.uk/> or email lectures@mangeolassoc.org.uk Visitors are always welcome.

Mid Wales Geology Club

Wednesday 21 October: Two short talks: 'The Formation of Iron Pyrite'. Speaker: Michele Becker. 'OT Jones: Wales' greatest geologist'. Speaker: Colin Humphrey.

Wednesday 18 November: 'Wine, Whisky and Beer: the role of geology'. Speaker: Prof. Alex Maltman.

Further information: Tony Thorp (Ed. newsletter & Hon. Sec): Tel. 01686 624820 and 622517 jathorp@uku.co.uk Web site: <http://midwalesgeology.org.uk> Unless otherwise stated, meetings start at 7.15 (tea/coffee & biscuits) with talks at 7.30 at Plas Dolerw, Milford Road, Newtown.

East Midlands Geological Society

Saturday 17 October: 'Cambrian Explosion'. Speaker: David Harper, Professor of Palaeontology at Durham University.

Saturday 14 November: 'Engineering and environmental geology in Cyprus'. Speaker: Paul Nathanail, Professor at Nottingham University.

Non Members are welcome. Meetings will be held in the Geography Department of Nottingham University, which is in the Sir Clive Granger Building. Further info at: www.emgs.org.uk or email: secretary@emgs.org.uk

Shropshire Geological Society

Wednesday 14 October: 'Rock along the Cut'. Guest speaker: Andrew Jenkinson.

Wednesday 11 November: 'Fracked or Fiction'. Guest speaker: Martin Carruthers.

Held in the Conference Room of the Shropshire Wildlife Trust HQ in Abbey Foregate, opposite the Abbey and adjacent to the large public car park with free evening parking, commencing at 7.00 for 7.30. A nominal charge is levied for attendance by non-members. Further info at: www.shropshiregeology.org.uk

Understanding the Malvern Hills

Sunday 1 November, 9.30 - 4.45: Conference organised by 'Voice of the Malvern Hills', at the Cube, Albert Road North, Malvern, WR14 2YF. Tel. 01684 575363. Talks to include: 'Ice cold in Malvern'; 'Springs of the Malvern Hills'; '1000 years of building in the Malvern Area'; and much more. Members £15, Non-members £17, Students and under 18's £10. Price includes buffet lunch. More information from: redwards@waitrose.com or visit: voiceofthemalvernills.org.uk

Teme Valley Geological Society

Monday 12 October: 'Fracking Bio'. Speaker: Dr Tom Sinclair.

Monday 16 November: 'Mining the Heritage' Speaker: Graham Worton.

7.30 at the Martley Memorial Hall B4197 by Sports Ground. £3 non-members. For more details visit: <http://www.geo-village.eu/> or contact Janet Maxwell-Stewart, 01886 821061

North Staffordshire Group of the Geologists' Association

Sunday 15 November: Exhibition at Apedale Mining Heritage Museum. Field trip to Apedale Country Park and opportunity of a 'deep' mine tour for NSGGA members.

Thursday 19 November: The Wolverton Cope Lecture - on William Smith. Speaker: Prof. Hugh Torrens.

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

Layered landscapes: geology and travel in Romantic-era Britain

Reardon Smith Lecture Theatre, National Museum Cardiff
Friday 27 November, 10.30 - 4.30

A day of lectures and discussions exploring how new concepts in geological thinking changed perceptions of landscape in the Romantic period, particularly in Wales and Scotland. This is the second in a series of collaborations between National Museums Wales and the AHRC-funded project 'Curious Travellers: Thomas Pennant and the Welsh and Scottish Tour 1760-1820'.

Keynote Speaker: Professor Martin Rudwick (University of Cambridge) 'Landscape art and hard-nosed geology in the Romantic era'.

Other speakers include: Dr. Richard Bevins, Dr. Mary-Ann Constantine, Dr Elizabeth Edwards, Dr. Paul Evans, Dr. Shelley Trower, Tom Sharpe, Dr. Tom Furniss, Tom Cotterell.

Cost £10 (£5 concessions) with tea & coffee. For more information: contact a.elias@cymru.ac.uk visit: www.wales.ac.uk/Resources/Documents/Centre/2015/ThomasPennant/Layered-Landscapes-Sept.pdf or phone 01970 636543

H&W EHT - Lickey Hills Geo-Champions

Sunday 11 October, 10.30 - 2.00: Lickey Hills Geo-Champions: Open Geoconservation day at Kendal End Quarry. Grid ref: SP 002747 (a short walk south from the Lickey Hills Country Park Visitor Centre, Warren Lane, Birmingham B45 8ER). Drop in and see the group in action. All are welcome.

Sunday 18 October, 10.30 - 3.30: Lickey Rocks! Activity Day. Venue: Lickey Hills Country Park Visitor Centre, Warren Lane, Birmingham, B45 8ER. Displays and geologically-themed family activities, organised by the Lickey Hills Geo-Champions in conjunction with the Lickey Hills Rangers.

Tuesday 20 October: 'The Forgotten Man - the story of William Smith (1769-1839)'. Talk by Bryan Maybee at the Trinity Centre, 411 Old Birmingham Road, Lickey B45 8ES. This event is organised in conjunction with the Lickey Hills Society, and the Lickey Hills Local History Society. Doors open 7.30 for refreshments and socialising. Talk starts at 8.00. Cost for non-members: £3.00.

For further information: visit web site: ehtchampions.org.uk or email: lickeychampions@gmail.com

Warwickshire Geological Conservation Group

Wednesday 18 November: 'The Genesis and Evolution of Sulphate Evaporites'. Speaker: Dr Noel Worley (formerly chief geologist, British Gypsum).

Venue: St Francis Church Hall, Warwick Road, Kenilworth CV8 1HL. For more details visit: <http://www.wgcf.co.uk/> or contact Ian Fenwick swift@ianfenwick.f2s.com or 01926 512531. There is a charge of £2.00 for non-members.

Two weeks in the far north of Scotland

North-West Scotland

It is a long while since Mary and I did a tour of the far north, so we thought that this year might be a good one to pay a return visit. We opted for late May / early June because the weather in the NW Highlands is usually bright, dry and pleasant at that time (and there are no midges!). Our first week was spent in a rented cottage at Rhiconich.



The Moine Thrust at Knockan Crag in pouring rain!

caves excavated by the legendary Survey geologists Ben Peach and John Horne in 1889. They found the remains of animals which once roamed the Highlands including lynx, polar bear, arctic fox and lemmings. This valley also contains some really striking karst scenery and the bubbling source of the Fuaran Allt nan Uamh, emerging from the base of a limestone cliff, has to be seen to be believed - the volume of water seemingly gushing out of solid rock is quite amazing. If you continue up the valley beyond the spring, the bone caves are soon visible on the right, and a little further up, in a branch valley, strontianite occurs in muddy cavities in the limestone.

Journeying further north, we did the hike out to Sandwood Loch and Bay - a justly popular and scenic spot, but reached via a rather dreary track across featureless moorland, and attracting too many visitors for it to feel truly 'special'. Our next stop was the dramatic Smoo Cave at Durness, a spacious cavern (200 feet long, 130 feet wide, and 50 feet high at the entrance) opening onto the beach, and in which a substantial stream plunges through the roof, making a dramatic waterfall (see front page). The cave is 'inhabited' for seven months of the year (June to October) by Colin Coventry, a local caving enthusiast who guides visitors around the cave and offers a short (very short!) subterranean boat trip in a rigid inflatable boat across the pool to a short passage beyond the waterfall (see www.smooacetours.weebly.com for details of Colin's digging activities).

The north coast from Durness to Bettyhill contains a series of attractive bays, and many of these feature fantastic outcrop geology. We visited Midfield Bay ►

The geology of the NW is fantastic and presents itself everywhere you look. We enjoyed seeing the 'roadside' geology in various cuttings and outcrops, and appreciated the grander scale features too, like the Moine Thrust at Knockan Crag, the great unconformity with the striking mountains of Torridonian Sandstone planted on a landscape of Lewisian Gneiss, and the contrasting limestone country around Assynt.

We explored two valleys to the east of Assynt. The first, Gleann Dubh behind the Assynt Hotel contains some impressive limestone caves with disappearing rivers, and enjoys views up to Conival and the popular Corbett of Breabag. The second valley, a little further south is the Allt nan Uamh, and this contains the famous bone



The spectacular Fuaran Allt nan Uamh spring, near Inchnadamph

just west of Tongue to see the magnificent exposure of garnet-mica schists. Garnets are to be seen everywhere along the western side of the bay, but strangely the tidal action has concentrated garnet sand on the other side of the beach. This is a great spot for a picnic, and we found quite a number of plants of the rare Scottish Primrose (*Primula scotica*). It is endemic to the north coast of Scotland, including Caithness and Orkney.

Heading eastwards we called in at the Strathnaver Museum, specifically to see a small display of minerals from the collection of the late Alasdair Mackay. A substantial portion of his collection was bequeathed to the Hunterian Museum, University of Glasgow.

Orkney

Our second week was spent on Orkney. After visiting the excellent Thurso Museum (now known as Caithness Horizons) where we learned much about the Dounreay nuclear establishment, we boarded the ferry for a delightful cruise across the Pentland Firth in glorious evening sunshine. We were treated to fabulous views of the Old Man of Hoy, which is just as well, because the weather was appalling on the following day when we crossed to Hoy to hike over to see the Old Man from the cliff top!

I had hoped to do some reconnaissance of a couple of Heddle* localities on Hoy, but the timing of the ferry is such, that even when getting the first boat out and last ferry back, there is barely enough time to do the hike to the Old Man. We did pay a brief visit to the Burn of the Sale in search of goethite, but had to abandon my plan to walk along the cliffs to Lead Geo to assess the potential for a descent in search of manganese mineralisation 200 feet below the cliff top. Another time perhaps!

Orkney is composed predominantly of Devonian (Old Red Sandstone) flagstones and sandstones which were deposited in a huge freshwater lake. These rocks are superbly exposed along the many cliffs and shore platforms, and give rise to some dramatic coastal scenery. Better known for superb fossil fish than for its minerals, Orkney offers relatively few potential collecting sites for minerals. There are, however a couple of places that I have long wanted to visit, and we did manage to accomplish this. An old lead mine west of Stromness looked like a candidate for interesting supergene alteration products (maybe phosgenite) on the foreshore. A small amount of spoil around a collapsed shaft in the field on the cliff top yielded representative veinstone showing galena, sphalerite and barite, but the outcrops on the beach showed little of interest. The vein here is reported as containing a mixture of strontianite and barite, but I did not see anything resembling strontianite.



The Old Man of Hoy sea stack viewed from the Orkney ferry



The vein outcrop on the foreshore at Stromness lead mine

Wha Taing, on the SW tip of Burray was worked for copper, although apparently not to any great effect. Here too, the vein outcrops on the shore and is a substantial, slightly rusty quartz vein. Sparse grains of chalcopyrite are visible in the vein stone, and oxidised fragments on the beach show green and blue staining, and the occasional microcrystal of azurite. The specimen potential here, however, is poor, and I was very disappointed not to see more interesting material.

Our third mineral sortie on Orkney was to the Point of Ayre, in search of analcime and natrolite. We located the outcrops of vesicular basalt without difficulty, but zeolites were in very short supply. Yes, there is evidence of both analcime (as small crystals to about 2mm), and highly weathered aggregates of what is probably natrolite, but specimens - well, no! ►

Orkney is awash with fabulous antiquities and we visited most of the major stone circles and tombs, some of which are fantastically impressive and thought provoking. Birdlife abounds, and amongst other species we think we saw a Hen Harrier, one of Britain's rarest birds.

Finally we caught the ferry from St Margaret's Hope across to the mainland and headed south to Golspie. Here we visited the Orcadian Stone Company and their geological museum - a really excellent introduction to Scottish geology, fossils and minerals. (See also Newsletter 205, February 2011, p.14 for an item on the Golspie museum. Ed.) Then we spent an enjoyable day at Dunrobin Castle, seat of the Duke of Sutherland. I last visited Dunrobin back in July 2003 specifically to visit the museum in the castle grounds in search of specimens of amazonite collected by Matthew Forster Heddle. The large slab which we had hoped to see was no longer there, and I do not recall having seen anything of note. However, the museum cases are not lit, and this time, with the aid of Mary's handbag torch we located two specimens of interest: a block of amazonite-bearing pegmatite about 25 x 15 x 15 cm from Ben Loyal, and a smaller, bright green crystal of 'microcline var. amazonestone' about 11 x 8 x 4 cm, from Heddle's boulder on Beinn Bhreac, and presumably forming part of the find which he reported in the Transactions of the Royal Society of Edinburgh, Vol. XXVII (1876–1877). The large slab however, was nowhere to be found, and discussions with the General Manager failed to shed any light on its whereabouts. Further enquiries are clearly going to be required.

So, the weather felt more like March than May or June, but we had a good time, saw lots of great geology and went to some places we'd not been before, which is always good. ■

Roy Starkey

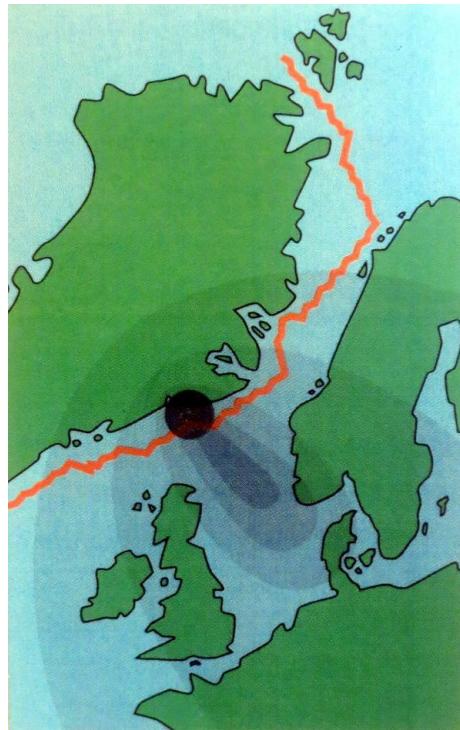
*Matthew Forster Heddle. See Newsletter 232 p.16 for details of a biography by Hamish H. Johnson.

The Mo-clay and the Moler Museum

There have been several occasions in BCGS activities (talks, field trips, displays) over the last year or two when the term 'bentonite' has been mentioned, particularly in respect of the British Silurian. Bentonites are the residues of volcanic ash in which the clay mineral montmorillonite is prominent, and there is nothing special about the Silurian as far as their occurrence is concerned: volcanoes have been blowing their tops throughout much of the geological record.

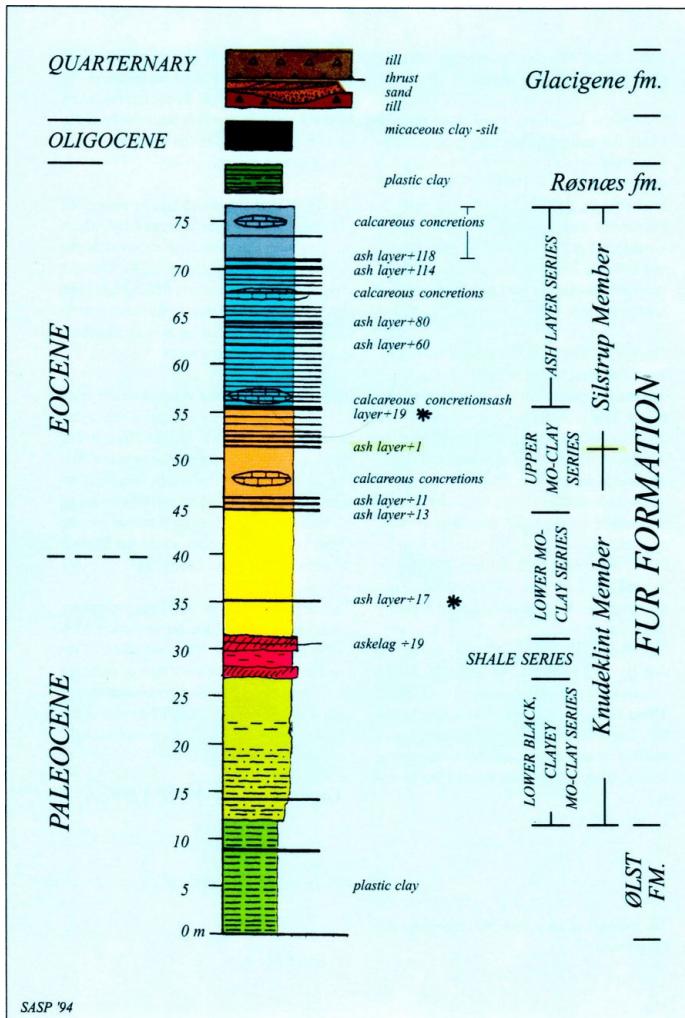
This rather oblique introduction leads us to another part of British stratigraphy in which ash bands play a role, the lower part of the London Clay (which is now re-assigned separately as the Harwich Formation) of early Eocene (Ypresian) age, approximately 56-54 million years old. I'm sure some readers will be only too familiar with the glutinous blue-black clays celebrated for their rich and exotic fossil content, as seen in the cliffs of Sheppey and the southern Essex coast.

The ash bands that occur in this deposit are but a pale shadow of their counterpart across the North Sea to be found in all their glory in northern Jutland, the mainland part of Denmark. Both have a common provenance, produced in ash clouds released from volcanoes far away to the north when the northern part of the Atlantic Ocean was beginning its birth pains. One ash band (-17: see right) has been definitively related to the Gardiner intrusion and Gronau tuff of east Greenland.



Map of the ash cloud originating in Greenland for ash band -17

In Denmark this period of time is represented by the Fur Formation, named after one of the smaller islands in the Limfjord, but informally this has been long referred to as the Moler, or Mo-clay. The formation actually straddles the Palaeocene-Eocene boundary and is divided into two members, but, not as you might expect, separated at the Palaeocene-Eocene junction! This was also the time of the so-called Palaeocene-Eocene Thermal Maximum (PETM), a time of rapid rise in global temperature much referred to these days in connection with our current obsession with climate change. Indeed, the volcanic activity mentioned above might not be entirely unconnected with the PETM. ►



onwards, there is a consistent oceanic basalt character probably associated with the development of a stable ocean crust. This is a clear progression reflecting the opening of a new ocean, the North Atlantic, much like the present condition of the Red Sea.

In places along the cliffs, but often even better in quarries, the extravagant glacio-tectonic deformation to which these beds have been subjected make quite an impression, dare I say even more so than the impressive chalk rafts and thrusts we have on our own north Norfolk coastline.

The Mo-clay however is more than just these ash bands. The major part of the sediment consists of approximately 2 parts diatomite and other siliceous microfossils to 1 part clay mineral, in which smectite predominates. Diatoms are microscopic algae that produce frustules of opaline silica with which to construct their 'shells'. Radiolaria and silicoflagellates also contribute to the siliceous content, but it is strange that there appear to be no calcareous microfossils present. The favoured view is that these have been dissolved during post-depositional processes, and perhaps contribute largely to the formation of large calcareous concretions that occur in parts of the formation. The smectite clay mineral is similar to the montmorillonite found in bentonites in that it has a layered atomic structure which gives it great absorptive properties.

Both the concretions and the smectite contribute to the distinctive character of this formation. The diatomite/clay mix is often quite a pale colour that contrasts greatly with the ash bands. Thus we end up with a sedimentary rock that is strongly colour banded. This produces a striking appearance on the large scale, especially when deformed as described above by glacio-tectonic action. ►

The Mo-clay is typically only about 60m thick and is seen to advantage not just on Fur, but also on the adjacent island of Mors, as well as along the southern coast of Thy across the Limfjord. Within this thickness there are over 200 ash bands of which 179 have been formally numbered. These vary in colour from shades of grey to black, bluish, off-white, yellow or brown, but all consist of gritty grains of volcanic origin. Most are basaltic in composition, but a few stand out as having a more acidic character (rhyolitic or trachytic). The bluish ones are not unlike kimberlites (the rock with which most naturally occurring diamonds are associated). For reasons that only geologists could come up with, the numbering system is such that they range from negative (in the lower member) to positive (in the upper member). I conclude (perhaps wrongly) that at some time this boundary was taken to be at the Palaeocene-Eocene transition but that it has now been reappraised at around the -15 ash band level.

Looked at more closely, the ash bands demonstrate a chemical evolution in the volcanicity. Four stages are recognised: alkaline and rhyolitic magmas indicative of a continental setting, alkaline to peralkaline magmas indicative of rift zones (these two stages are the negative series of ash bands), passing up into basaltic magmas showing some chemical differentiation and terminated by the thickest single ash band (+19) which was deposited in shallow water. Finally, from ash band +20 onwards,



Mo-clay deformed by glacio-tectonics seen in a clay pit near the museum

The siliceous and absorptive properties of the Mo-clay formed the basis for large-scale working of the deposit. Early in the 20th century a specialist brick industry arose that radically improved the economic conditions of the area. The main product was lightweight, porous bricks with excellent insulating properties. In the 1970's this was transformed into producing 'absorbing granules' on a grand scale as further uses such as cat litter increased demand. The modern plant also supplies such specialist markets as fillers and binders for the chemical industry, as well as dispersion, absorption and anti-caking agents in the form of Mo-clay 'Micro-Granules'.

Returning to purely geological interests, the relatively fine-grained nature of the sediment and the quiet conditions in which deposition occurred (albeit with subsequent reworking by burrowing organisms) lends itself to excellent fossil preservation potential. The fruits of this can be seen in the purpose built museum established close to the main centre of modern production at Skarrehåge. The first item that catches your attention as you drive into the car park are the number of large boulders laid around the perimeter. These prove to be mainly a selection of erratics derived from some of the more distinctive rock types from southern Scandinavia, such as the rhomb-porphries from the Oslo Fjord area, the well known larvikite also from across the waters of the Kattegat, Skolithos pipe-rock from Scania, but also less familiar items such as Sårna tinguaite and the odd 'cauliflower-textured' Kinnekule basalt, both, again, from locations in Sweden.

Entering the museum you find a typical layout of sales desk and small workshop with enthusiastic curator on hand to take your modest entrance fee, but one is unprepared for the treasures displayed in three parallel 'main galleries' plus another room beyond. The museum developed out of a private collection in 1988, when the state took it over to safeguard its future and establish it as a visitor centre. Nearly all the exhibits are local, and indeed collected by local enthusiasts. The main focus is on the Mo-clay and Chalk (which hereabouts includes the Palaeogene 'Danian' Bryozoan-Chalk).

One gallery describes the geology of Denmark and concentrates on the Mo-clay ash bands, crystals and concretions before passing on to a good selection of fine Chalk fossils, including echinoderms and sponges (a favourite of mine). The middle gallery concentrates on the insects, fish and other fry that are beautifully preserved in the Mo-clay. The third gallery is largely devoted to plant fossils and wood, again from the Mo-clay. A 'back-room' display of old photographs of the area also includes a special display of large crystal aggregates of calcite variously described as pseudomorphous after ikaite (hydrated calcium carbonate) or gaylussite (a double carbonate of sodium and calcium). One such crystal claims to be the largest such in the world, and at almost 2 feet in length this seems quite plausible. This room also presents a wheelbarrow full of sea-urchins preserved in flint which are commonplace in parts of the Danish coast. There is one story doing the rounds of a local lady who has a collection of over 70,000, while my informant, the curator of the museum, has to make do with a measly 12,000. I'm clearly a mere beginner, with just around 30 harvested in a few days! ■

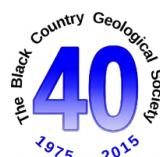


*The 'giant calcite crystal'
(pseudomorph after ikaite)*

Mike Allen

Field Meeting Report

Saturday 18 July: BCGS 40th Anniversary field trips: 'An Introduction to the Geology of the Black Country - Part 1'. Led by Andy Harrison (BCGS).



The day was warm, sunny and clear for this, the first of two field visits celebrating the BCGS 40th anniversary. These field visits aimed to repeat those undertaken in 1975, following the footsteps of members back then, looking at what they saw and at what had changed over the last 40 years. The original field visits introduced BCGS members to Black Country geology. From the first location, Walton Hill, Clent, a general overview of geology and landscape could be seen. After this the locations progressed up through the stratigraphic column of Black Country geology. The first field visit of July 1975 also included the Rubery Cutting on the A38 in Birmingham, Castle Mill Basin in Dudley, and the Saltwells Local Nature Reserve (LNR) Netherton, to view the Palaeozoic stratigraphy of the region. Today the Castle Mill Basin can only be accessed via canal boat and so for our visit this location was changed to the Nature Conservancy Council ►

(NCC) Cutting and the Snake Pit at Wren's Nest. Along the way we were able to view photographs, kindly donated by Peter Parkes, taken on the day in 1975. (*Peter's photos may be seen on the [website archive](#).*)

Locality 1: Walton Hill, Cleint

We met in the Walton Hill car park for a brief introduction to the day, before heading up on to Walton Hill. The trees had grown since 1975, but the view of hills and low ground forming the Black Country were not obstructed. The geological map for Dudley shows how the underlying strata form this landscape. Hard strata (limestone, dolerite and sandstone) form the high ground (Wren's Nest Hill, Castle Hill, Rowley Hills and Barr Beacon) and soft strata (mudstones and clays) form the lower lying ground. Together, Wren's Nest Hill, Castle Hill and the Rowley Hills form part of a ridge that represents the watershed of Central England. Rainfall to the north runs to the River Trent and out to the North Sea and rainfall to the south flows to the River Severn ending up in the Bristol Channel. This ridge posed a tough geographical barrier to early canal builders, who built the Dudley and Netherton canal tunnels to improve communications between Birmingham and the Black Country.



Walton Hill

Locality 2: Rubery Cutting



Rubery Cutting

Our next location, the Rubery Cutting, lies alongside the A38 at the Leach Green Lane junction. Here the oldest rocks of the region are exposed: the Ordovician grey-white and pink Lickey Quartzite underlying Lower Silurian pinkish-brown Rubery Sandstone. A neptunian dyke of rounded pebbles in a finer matrix between these two strata represents the Shelveian Event, which folded the rocks of the Welsh borders and central England during the late Ordovician. Since the 1975 field visit, the age of the Lickey Quartzite has been re-classified from Cambrian to Lower Ordovician. A housing estate now dominates the former quarry. In 2013 the site was included in the Birmingham and Black Country Wildlife Trust's 'nature improvement area' (NIA) grant scheme. It has been established as a unique aid for interpreting and understanding early Silurian palaeontology and palaeo-environments.

In keeping with the field visit forty years ago, after the Rubery Cutting we had lunch at the Holly Bush pub on the Stourbridge Road.

Locality 3: Wren's Nest (NCC Cutting and the Snake Pit)

After lunch we headed to the NCC Cutting and the Snake Pit at the Wren's Nest, to view the same sequence of Silurian Wenlock strata as seen in the Castle Mill Basin. The exposures comprise inter-bedded layers of fossiliferous limestone, mudstone and bentonite that represent the next sequence of rocks above those of the Rubery Cutting. The NCC cutting was excavated after 1975 to aid with the research of these strata. Over the past forty years this research has revealed much new information regarding the Silurian Period, the animals living at the time, and has possibly identified a volcanic source beneath Cheltenham. ►



The NCC Cutting

Locality 4: Saltwells LNR

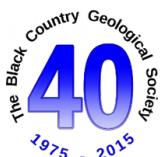
Following the Wren's Nest, our final location for the day was the Saltwells LNR. Starting at the tramway, we continued to the Brewin's Bridge Cutting and finished at Doulton's Clay Pit. Within the tramway, Upper Silurian rocks belonging to the Lower Ludlow Shale (or Lower Elton Member) strata are exposed. The same strata are also exposed within the Snake Pit at the Wren's Nest. Overlying these strata within the Brewin's Bridge Cutting, are beds of Carboniferous Lower and Middle Pennine Coal Measures. Between these two strata is a major unconformity representing 100 million years of missing geological time, corresponding to the mountain building event of the Caledonian orogeny. The sandstone, shale, ironstone and coal strata of the Coal Measures are well exposed within Doulton's Clay Pit.

As with the NCC Cutting, over the past forty years the Saltwells site has become very overgrown and it is a constant battle to keep the vegetation in check. Since 1975 many strata names have also changed, including the 'Lower and Upper Quarried Limestone Member' replacing the 'Lower' and 'Upper Quarried Limestone'; the 'Nodular Limestone Member' replacing the 'Nodular Member'; the 'Lower Elton Formation' replacing the 'Lower Ludlow Shales'; and the 'Pennine Lower and Middle Coal Measures Formation' replacing the 'Lower' and 'Middle Coal Measures'.

Before leaving Brewin's Cutting we looked for an outcrop of dolerite, but this turned out to be too overgrown to see and in need of much clearing. The dolerite was intruded at the end of the Carboniferous period, during the Variscan orogeny.

The strata seen at the Saltwells LNR represented the end of Part 1 of the anniversary field trips. Part 2 would carry on with the Upper Carboniferous and Permo-Triassic strata that represent the youngest units seen in the Birmingham and Black Country region.

Saturday 15 August: BCGS 40th Anniversary field trips: 'An Introduction to the Geology of the Black Country - Part 2'. Led by Andy Harrison.



It was a warm and sunny day for Part 2 of the 40th anniversary field trips. We met in the Dudley Archives Centre car park, rather than the Dudley Museum and Art Gallery where the group met forty years ago. Once again the aim of the field visit was to follow in the footsteps of those on the second field visit in August 1975. The sites visited included the old (Dupont) marl pit at Tividale, Allsops Quarry on the Rowley Hills, the roundabout outside the Halesowen Grammar School and finally Barr Beacon, which was a last minute substitute for Queslett Quarry. Once again, photos taken by Peter Parkes in 1975 were used, and the main focus of the visit was to illustrate just how much had been lost in that time.

Locality 5: Former Dupont Marl Pit, Tividale

After a brief introduction at the Archive Centre car park, we piled into one car and headed into the maze of roads that cross the Black Country, for the former Dupont Marl Pit, Tividale. We stopped on Palmerston Drive and via Bourne Close were able to access the site through a gap in the palisade fencing. The 1975 photos show an empty expanse with low cliffs where exposures of the Etruria Marl could be observed. Today the area has largely been infilled with colliery sand and waste, is covered in grass and trees, and partly developed with houses and industrial units. The Etruria Marl, excavated for brick manufacture, is associated with the Upper Carboniferous Unproductive Coal Measures strata (Red Beds). It is the result of the continued tectonic processes following the Variscan orogeny, which caused ongoing uplift of the land around 300Ma, and a change in drainage pattern from swamps to more estuarine type mudflats. Today all evidence of this stratum is no longer visible.



Dupont Marl Pit

Locality 6 – Former Allsops Quarry, Rowley Hills

From Tividale we headed for the Rowley Hills and along the Portway to the site of the former Allsops Quarry. Once again, the photos of 1975 show what has been lost in the last 40 years. Once a major hole in the ▶

ground, this site was worked for dolerite used for aggregate and road dressing around the Midlands and further afield. However, like many holes in the ground, this site fell victim to landfill and today no evidence remains of the excavation. The site has become a golf course and a small residential development. Fortunately, some large dark boulders of dolerite survive in the golf course car park. The dolerite is associated with episodes of magmatic intrusions and volcanism during the Variscan orogeny at the end of the Carboniferous period. Intrusions of similar dolerite from the same time can be found at Saltwells LNR and Barrow Hill as well as the Rowley Hills, i.e. Portway Hill.

The exposures at Allsops Quarry provided good examples of the contact between the dolerite and the earlier Etruria Marl. Although these exposures are no longer visible, examples of this contact can be seen at Barrow Hill, which, along with Portway Hill, also exhibits examples of columnar jointing and spheroidal weathering.

Locality 7 – Halesowen Grammar School

From Allsops Quarry we headed to Halesowen and the roundabout at the bottom of Mucklow Hill, opposite Halesowen Grammar School. The photo of this site from 1975 shows a relatively fresh cutting and subway beneath the roundabout. Unfortunately, due to misuse, the cutting/subway was backfilled and all that remains today is a small step, the crest of the former cutting, across the centre of the roundabout. Exposed within this cutting were beds of the Halesowen Formation sandstones which lie at the top of the Upper Carboniferous Coal Measures. The local St. John the Baptist church is constructed from this stratum, which is red-brown in colour and shows evidence of cross-bedding, Liesegang rings and weathering. In places the stone has been replaced with harder wearing sandstone, which is common to many such old structures. The stratum represents continued uplift of the local ground surface and changes in drainage conditions to more fluvial activity following the Variscan orogeny.

Locality 8 – Queslett Quarry and Barr Beacon, Pinfold Quarry

The final location should have been Queslett Quarry, off Booths Lane, near Great Barr. Unfortunately the excavations shown in the photos of 1975 are long gone, having largely been landfilled or landscaped to make way for the Queslett Nature Reserve, an Asda supermarket and a new housing development. The quarry was originally worked for sand and gravel associated with The Kidderminster Formation, which is Triassic in age. This represents some of the youngest strata seen in the Black Country, but today the exposure is totally obscured. Consequently, it was decided to relocate to the former Pinfold Lane Quarry, near Barr Beacon. We stopped for lunch on Barr Beacon summit, the good weather providing clear views over the Black Country and towards the Clent and Clee Hills, and the Wrekin. This once again illustrated the role geology has to play in shaping the regional landscape.

Within the Pinfold Lane Quarry, exposures of the Kidderminster Formation can be seen overlying Permo-Carboniferous Hopwas Breccia, which is of similar age to the Clent Breccia and Bridgnorth Sandstone. The breccias are associated with terrestrial erosion and depositional processes going on when the local environment was very arid and similar to our modern deserts. Similarly, the cross-bedding associated with the Bridgnorth Sandstone results from the activity of barchan sand dunes. Together these strata form the base of the former Bunter Series (or Lower Mottled Sandstone).

The Kidderminster Formation represents the top of the Bunter Series (Bunter Pebble Beds) and is associated with the deposition of fluvial fans within a river known as the Budleighensis. This watercourse flowed northwards from Northern France up through what is now the Severn Valley, through Gloucestershire and Worcestershire to discharge into the Cheshire Basin.

Like Queslett, Pinfold Lane Quarry was originally exploited for its sand and gravel. Fortunately, it has survived being turned into a landfill site and today is an important nature and geological reserve. Like the Saltwells LNR it has been earmarked as a site for the proposed Black Country Geopark. It requires a lot of ongoing maintenance to prevent it from becoming overgrown.

Summary

Although the main aim of these two field excursions was to celebrate the 40th anniversary of the BCGS, they highlight some important points. The Birmingham and Black Country region has a very diverse range of geology, spanning approximately 300Ma. Not only has this been important in shaping the physical and social landscape of the region, but it also provides an important mineral and educational resource. The region ►

has many sites that provide exposures of the underlying geology, which within a relatively short space of time can be lost to development and neglect. For those sites that have been lost since 1975 alternative ones exist showing similar features and these need protecting and managing.

I would like to thank Peter Parkes for providing the photographs from 1975 and Alan Cutler and Peter Oliver for their help with making these field visits possible. Thanks also go to Peter Smith for acting as chauffeur for the day during the Part 2 field visit. ■

Andy Harrison

Geobabble

Until a few months ago, there were fourteen named veins of Blue John in Castleton in the Peak District. Now there are fifteen. The discovery of this new vein made the national news, and some asked why all this fuss over a mineral? After all, Blue John is only a variety of a very common hydrothermal mineral, fluorite: calcium fluoride (CaF_2). It is most common as a gangue mineral alongside quartz, calcite, and the more valuable galena, sphalerite and barite. It is not particularly hard or soft, reading 4 on Mohs scale and it forms cubic crystals. However it takes on a variety of colours which make it particularly attractive. It can be blue, purple, green, yellow or colourless.

Blue John is a very distinctive variety with a complex colouration which defies description; you have to see a picture. There are specimens in most geology museums and the illustration is of a piece of Blue John from Dudley Museum and Art Gallery. You can also find ornaments made out of the mineral as it can be turned and shaped without breaking up.

Castleton is a place that most people keen on geology have visited. There are several mines including the Speedwell lead mine which is partially flooded and so involves a boat trip underground. Blue John is restricted to two of the mines, the Blue John cavern and Treak Cliff and this new vein has been named the Ridley Vein after Mr Ridley who manages the Treak Cliff cavern.



This discovery was reported on the BBC website on 19 August with a series of photographs, one of which was of a new rock saw that was being tested, and in this case it illustrates the good use of such an instrument. However, it raises yet another issue that valuable fossil discoveries can be illegally removed if you have rock cutting equipment. If you find an interesting fossil or feature in a rock face, leave it there for other people to see. ■

Bill Groves

Archive photo mystery solved - and much more!

Mike Rosenbaum's enquiry in the last Newsletter (No. 232, p.16) elicited a response and photo to Mike from Jon Clatworthy (Director, Lapworth Museum of Geology) which fully resolves the issue:

"Just responding to the article regarding the field trip location, and field party members, that you posted in the BCGS August Newsletter. The attached is a photograph with date, location and names - which almost matches your image. Our photo is from the Lapworth Archive at the Lapworth Museum, if you look carefully the people and locality are the same but a few have moved their heads and in the case of Lapworth, he has removed his fine hat! - when compared with your image. It clearly is the case that the photos were taken just a few moments apart." ►



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Here again, for reference, is the BCGS archive photo:



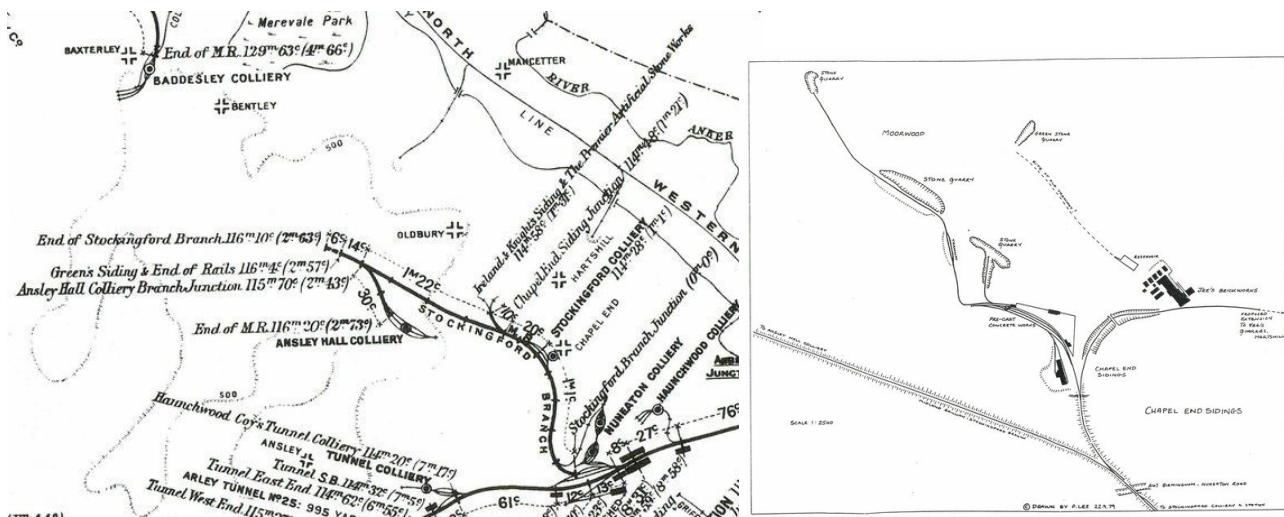
A field trip of the Dudley Geological Society with Professor Lapworth c.1885.

I felt that in this anniversary year of reminiscence, the following detailed response from Mike Rosenbaum deserved full coverage. I thank him for his trouble and for allowing us to reproduce his email, and Peter Lee from the Nuneaton History Society (nuneatonhistory.com) for permission to reproduce his diagram. Ed.

Dear Jon,

What a wonderful discovery, and thank goodness someone (Jerome Harrison, perhaps?) had the foresight to annotate your photograph. Not only are Lapworth and Watts presence confirmed but we have the names of everyone else, the date and the location. I expect there are some tales that could be told about the other participants too, but they are not people I know anything about myself. 1898 was a year when Lapworth and Watts led quite a number of field trips to demonstrate the geology of the area, the Precambrian rocks of Charnwood in particular and no doubt Nuneaton as well, since this was when Lapworth published his substantial PGA article: 'The Sketch of the Geology of the Birmingham District' with Watts and Harrison as co-authors, and the associated GA field excursion, so there must have been a lot of interest in his ideas. ►

The photo states that this was the first excursion but I am not sure who the group is. The railway line in the foreground is interesting. There are two tracks but these are very close together and clearly out of alignment, and ballast has not yet been applied. This might possibly be a quarry line but it could also be a contractors line or even a permanent line that has only recently been laid and not yet ballasted and tamped. To see the context here are two maps of the railways in the vicinity, from <http://www.nuneatonhistory.com/on-midland-railway-lines.html>, and indicate that Chapel End led to a number of quarrying concerns (Ireland & Knight, The Premier Artificial Stone Works, etc.). Peter Lee's sketch (right) shows greater detail:



I therefore wonder if this was a dry run for the GA trip that was to take place in mid-summer that year. The subsequent account in the PGA (v.15, p.420) reads:

"Joining the carriages, the party drove to Chapel End, and after lunch they pressed on to the new railway cutting now being made by Messrs. Trye, north of the village. This cutting exposes a fine section of black Stockingford Shales (Oldbury Shales), bent back and folded by the soil-creep down the hill slope. In addition to this it shows the unconformable junction of the Coal Measures. The lowest Carboniferous rock is a conglomerate in which pebbles of vein quartz are very common, but fragments of quartzite and diorite are also of frequent occurrence. Yellow sandstones succeed, and the cutting plainly shows that the diorite dykes, like the shales, were cut off by denudation before the Carboniferous rocks were deposited."

So, if this is the same locality, the railway cutting is probably the one shown in the sketch map above marked 'Chapel End Sidings' which seems to have been new in 1898, and appears from the photo that the track had been laid but not yet been properly installed. Given the good lighting on the figures and the rock face I would hazard a guess that this was the south-east facing part of the new cutting in the vicinity of the bridge marked on the sketch map. ■

Mike Rosenbaum

All this now begs the questions: Was this field trip run for the Dudley Geological Society as a 'dry run' for a later GA field trip? Where is the original copy of the BCGS archive photo? Ed.

Photographic Competition 2015 - 'Geologica Britannica'

This is a reminder about the 2015 photo competition organised jointly by the West Midlands, North West, and Southern Wales Regional Groups of the Geological Society, and the Black Country Geological Society. Please refer to Newsletter No. 231, June 2015, p.8 for full details.