



The Black Country Geological Society

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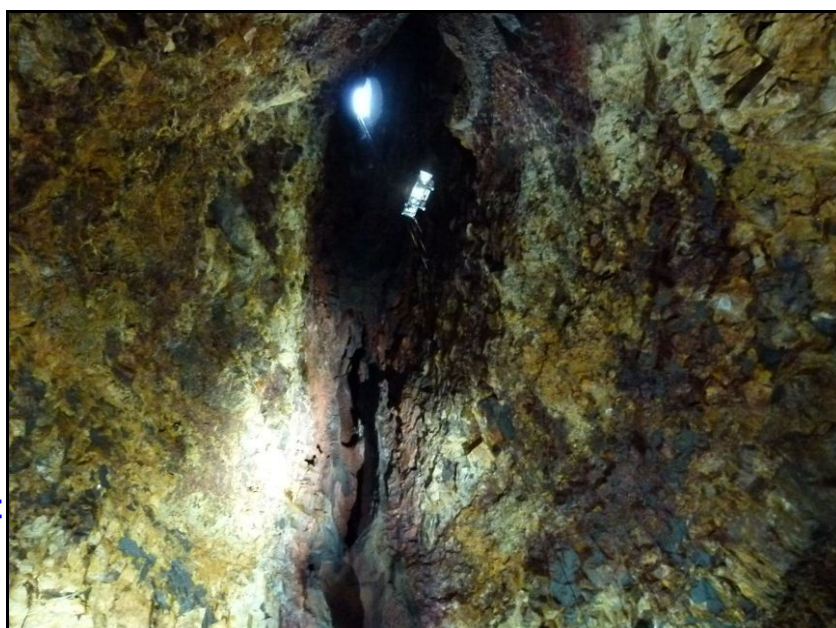
**Copy date for the next
Newsletter is
Wednesday 1 October**

Newsletter No. 226

August 2014

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<p>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.bcgs.info</p>		

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.**

**Please let Andy Harrison know in advance if you intend to go to any of the field 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.**

Saturday 16 August (Field Meeting): The Geology of Worcester, led by Andy Harrison. Meet at 10.30 outside the Guildhall on the High Street (NGR: 385006, 254780). Joint meeting with the Woolhope Naturalists' Field Club, Geology Section. The day will begin with a look at the geological setting and building stones of Worcester and a circular walk of the City Centre. After lunch we will visit Worcester Cathedral, last resting place of Prince Arthur, Henry VII's eldest son.

Saturday 6 September (Geo-conservation Day): Rowley Quarry, led by Paul Stephenson. Meet at St Brades Close at 10.30 for an 11.00 start. 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 22 September (Indoor Meeting): 'Provenance - the search for a source'. Speaker: Dr Haydon Bailey FGS, President of the Geologists' Association. The talk will show how geological investigation can help to solve provenance puzzles not only in the world of geology but in many other fields, including archaeology, art and forensic science, where it played an important role in the Soham murder case.

Sunday 5 October (Geo-conservation Day): Saltwells Nature Reserve (SSSI) and Doulton's Clay Pit, led by Alan Preece. Meet at the Nature Reserve car park (NGR: 393424, 286899) on Saltwells Lane for 10.00. We will be joined by the Saltwells Volunteer Group for scrub clearance within Doulton's Claypit. Wear old work clothes, waterproofs and stout footwear or wellies. Please bring gloves and garden tools; loppers, secateurs, forks and spades if you have them. Either bring packed lunch or hot food can be acquired from the Saltwells Inn adjacent to the car park. Finish at 14.30.

Monday 20 October (Indoor Meeting): 'The Island of Rum, Diary of a 60 Million Year Old Magma Chamber'. Speaker: Dr Brian O'Driscoll, Keele University.

Sunday 2 November (Geo-conservation Day): Another visit to Saltwells Nature Reserve (SSSI) and Doulton's Clay Pit, led by Alan Preece. Details as for 5 October.

**Monday 17 November (Indoor Meeting): 'The Galapagos - geology, fauna and flora'.
Speaker: Dr Les Riley, Consultant Stratigrapher.**

Saturday 6 December (Geo-conservation Day): Barr Beacon and Pinfold Quarry, led by Andy Harrison and Helen Sanger. 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 8 December (Indoor meeting, 7.00 for 7.30 start) BCGS Members' Evening and Christmas Social.

Your contributions are needed for this event!

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 (10 - 15 minutes) - on any topic with geological connections; or perhaps bring along some of your specimens and/or photos for admiration, discussion and identification. Please don't be shy about volunteering - this is an informal and relaxed occasion: the more contributions we have, the merrier the evening. **Please contact our Secretary, Linda Tonkin if you would like to make a contribution to this event: secretary@bcgs.info or phone: 01902 846074.**

Saturday 31 January 2015 (Geo-conservation Day): Another visit to Barr Beacon and Pinfold Quarry, led by Andy Harrison and Helen Sanger. Details as for 6 December.

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

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 the **next two months** is given in our Newsletter. Further information can be found on individual Society web sites.

Fossil Family Fun Day 2014

Saturday 30 August, 10.00 - 4.00 at Dudley Museum & Art Gallery. Admission is free.

Come and see the amazing collection of fossils from across the globe on display at Dudley Museum and have a go at making your very own fossil cast! BCGS will be represented with its own stand (see box below) and there will be magic shows, fossil-themed craft activities, storytelling, exhibitions and stalls with a selection of fossils, gems, jewellery, crystals and minerals for sale. Further information at: [Dudley Museum and Art Gallery website](http://www.dudleymuseum.org.uk) or phone 01384 815575.

Can You Help at the Fossil Family Fun Day on Saturday 30 August?**The BCGS stand needs volunteers!**

We need several members of the Society present throughout the day to man the stand, hand out leaflets, and talk to people and explain who we are and what we do. Helpers would also be appreciated on Friday 29 August at the museum for setting up. No previous experience is needed, so if you can spare some time on either day please get in touch with our Secretary:

Linda Tonkin: secretary@bcgs.info or phone: 01902 846074.

Warwickshire Geological Conservation Group

Saturday 16 & Sunday 17 August 11.00 to 3.30: Upton House, OX15 6HT. A WGCG event in partnership with the National Trust. There will be a WGCG display with children's activities as well as guided walks to explore the geology of the site and the house.

Friday 12 September: Astley Castle Open Day, Nuneaton, Warwickshire, CV10 7QS.

Wednesday 24 September: Warwickshire Museum Store CV34 5LT. Meet 11.00 at WCC site, Montague Rd, Warwick. Leader: Jon Radley. Recently, Warwick Museum store has been transferred to new accommodation. This will be an opportunity to see their extensive reserve collections.

For more details visit: <http://www.wgcg.co.uk/> or contact Ian Fenwick swift@ianfenwick.f2s.com or 01926-512531. There is a charge of £2.00 for non-members.

Woolhope Naturalists' Field Club - Geology Section

Saturday 16 August: Worcester Building Stones, led by Andy Harrison. Meet at 10.30 outside the Guildhall, High Street. (Joint meeting with BCGS. Full details on p.2.)

Saturday 13 September: Huntsham Hill Geology and Landscape. Led by Moira Jenkins. A 5km walk looking at flash floods in deserts, tropical seas and gorges including the view from Yat Rock. Meet at 10.00 at the car park at Symonds Yat Rock (parking cost £3.50) GR: SO 564155. Bring a packed lunch, stout footwear and suitable clothing. Steep slopes both up and down.

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

Mid Wales Geology Club

Saturday 23 August 2.00 - 4.00: Fossil Afternoon. Guest Speakers: Dr. Joe Botting and Dr. Lucy Muir - begins with a fossil lecture.

Sunday 31 August: Llyfnant Valley, near Machynlleth. Field trip, led by Julien Lovell.

Wednesday 17 September: 'A new look at metal extraction in the Bronze Age and Iron Age'. Speaker: Tony Thorp.

Sunday 28 September: Geological Features in Hafren Forest. Field trip.

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 7:15pm (tea/coffee & biscuits) with talks at 7:30pm at Plas Dolerw, Milford Road, Newtown.

Geological Society, West Midlands Regional Group

Tuesday 23 September, 18.30 for 19.00: 'Engineering Geology, Past, Present and Future'. Speaker: Professor Jim Griffiths (Plymouth University). Haworth 101 Lecture Theatre, University of Birmingham.

Tuesday 14 October, 18:00 for 18:30: 'Our Geoheritage'. Speaker: Graham Worton (Keeper of Geology, Dudley Museum and Art Gallery). Part of the Geological Society's 'Earth Science Week 2014'. Venue: University of Birmingham.

For further details and enquiries, please contact the Group Secretary, Daniel Welch at: geolsoc_wmrg@live.co.uk

Teme Valley Geological Society

Saturday 23 August: 'GeoFest' Talk and Demonstration 'The Geopark Way Apps' by Michael Brooks. Martley Memorial Hall, 14.00. Cost £3.00. Contact John Nicklin: 02033 717647.

Monday 22 September: 'The Secret Life of your Mobile Phone'. Speaker: Andrew Bloodworth, BGS. 19.30 at Martley Memorial Hall.

£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

Saturday 13 September: Scunthorpe. Leader: Paul Hildreth. Meet at 11.00 at Scunthorpe Museum (GR: SE 892108). Visiting Jurassic and Cretaceous sediments providing an overview of the geology of the area and an opportunity to collect fossils. Travelling by private cars, hard hats, high viz jackets and a packed lunch will be needed. Please contact Steve Alcock (Field Secretary) email: steves261@aol.com or phone: 01538 360431 or 07711 501028.

Non-members pay £2 to cover temporary membership giving them insurance cover. A field fee of £2 per head is normally charged for members and non-members to cover the leader's expenses. Further information at: www.esci.keele.ac.uk/nsgga/

Shropshire Geological Society

Sunday 24 August: Quatford. Looking at the red sandstones and ice age features between here and Bridgnorth. Led by Andrew Jenkinson. Meet at 10.00 at the layby outside the Danery Inn on the A442, GR: SO 738906. Booking: Andrew Jenkinson: email: andrew@scenesetters.co.uk telephone: 01938 820764.

Anyone wishing to attend should contact the co-ordinator for the meeting. A nominal charge is levied for attendance by non-members. Further info at: www.shropshiregeology.org.uk/

East Midlands Geological Society

Sunday 28 September: Day excursion around Nottingham. Leaders: Keith Ambrose and Oliver Wakefield. Meet at 11.15 in the car park at the end of Holgate, Clifton Village (GR:SK 539348).

Any non-members attending field excursions will have to pay a temporary membership fee of £2.00 and should register with the secretary, Mrs Janet Slatter. email: secretary@emgs.org.uk For more details visit: www.emgs.org.uk

GeoFest 2014

Below is a selected brief summary of the remaining 'GeoFest' events. For full details of these and lots more events view the calendar or download a GeoFest 2014 programme at: <http://geopark.org.uk/>

Booking required for all events. Unless otherwise stated: 01905 855184 or eht@worc.ac.uk

Saturday 16 August: 'Hands-On Illustrated Talk - Fossil Collecting', 2.00 - 4.00 at the Malvern Hills GeoCentre, Walwyn Road, Upper Colwall. Speaker: Dr. Mark O'Dell and colleagues.

Sunday 24 August: 'The Severn Valley'. Guided 'Geology and Landscape' walk, 10.00 - 1.00. Meet at the Danery Inn, near Bridgnorth. Booking: 01938 820764 / andrew@scenesetters.co.uk

The Old Red Sandstone: is it Old, is it Red, and is it all Sandstone?

Symposium: Thursday 2 - Saturday 4 October, Brecon

Venue: The Elim Church conference Centre, Canal Road, Brecon, Powys.

A three day symposium to stimulate interest in this facies and explore the latest research, comprising a day of lectures, a day of field excursions and a public open-day of interest to palaeontologists, stratigraphers, sedimentologists and structural geologists.

Thursday 2 October: Day of lectures 10.00 - 17.00, Conference Dinner

Friday 3 October: Field meetings to local sites

Saturday 4 October: 'Geofest' public open day

The day of lectures will cover many aspects of Old Red Sandstone geology. There are already a number of confirmed speakers including some from Australia and France. It is hoped that it will be possible to publish the proceedings of the symposium in due course.

Two field excursions by coach will be on offer to areas around Brecon to look at various aspects of Old Red Sandstone geology.

The public open day on the Saturday is aimed at being a festival of geology, bringing geology to the attention of all. Local geological groups and other organisations will be putting on displays, public talks, hands-on activities and building stone walks around the town.

To express an interest in attending the meeting and to put your name on the mailing list please contact Dr John Davies, Fforest Fawr Geopark, Brecon or email: sion_cwm_hir@hotmail.com

What Lies beneath our feet - Photographic contest 2014

The West Midlands Regional Group of the Geological Society and the Black Country Geological Society are hosting a geological Photo Contest under the theme 'What Lies Beneath Your Feet' which is open to individual interpretation.

All entries will be displayed at an exhibition at Dudley Museum & Art Gallery. The top 3 entries will be chosen by an independent judging panel.

First prize: £200 Second prize: £100 Third prize: £50

Deadline 31 August 2014

The contest is open to all with postcodes starting B, CV, DY, HR, ST, SY, TF, WR, WS and WV.

This is the final reminder - for full details see Newsletter 223, February 2014 pp 8 & 9.

Editorial

During the summer months we have a break from indoor meetings and take to the outdoors instead, so we have less regular contact with each other. But I'm pleased to report that our officers have been busy organising the programme for next year, and you'll see that we have a varied selection of indoor talks, and a full programme of geo-conservation meetings to look forward to. There is one more field visit - to explore the fascinating building heritage of Worcester on 16 August. Do come along to this if you can, and remember, if you need transport, get in touch with Andy. It may be possible to arrange a lift.

The 'Fossil Family Fun Day' on Saturday 30 August (details on p.3) also precedes our next indoor meeting, and will be an opportunity to re-connect with all things geological before the start of our Autumn programme. BCGS will be manning a stand, and volunteers are needed. This is a chance for you to get involved, help the Society and have some fun! (See box on p.4.)

Earlier in the year our secretary, Linda Tonkin, wrote a letter of support on behalf of BCGS for the Lapworth Museum's re-development project. It is good news that their round 2 Heritage Lottery bid has been successful. The museum will close in December and will re-open in October 2015. We wish them well during the months of upheaval and hard work, and will look forward to visiting the new-look museum in the future.

Last but not least, please note that this is the final reminder about the Photo Competition. The closing date is 31 August, and full details can be found in the February Newsletter, Issue 223 pp 8 & 9. ■

Julie Schroder

Field Meeting Report

Sunday 15 June: Lickey Hills Country Park. Led by Julie Schroder and Adrian Wyatt (Lickey Hills Geo-Champions)



Warren Lane Quarry

Lickey Hills Geo-Champions, Julie Schroder and Adrian Wyatt, led this field visit which aimed to gain a better understanding of the geological formations of the Lickey Hills and their context within the wider landscape. Members of the BCGS, Warwickshire Geological Conservation Group and Lickey Hills Geo-Champions met at the Lickey Hills Visitor Centre. The weather was overcast and warm with the occasional light shower through the day. The morning was spent following the Champions Trail (about 1.5 miles) and the afternoon was spent visiting other sites of geological interest in the Lickey Hills area.

Before starting on the Champions Trail we visited Warren Lane Quarry, closed to the public, for a look at the inclined bed of the Ordovician Lickey Quartzite Formation contained within. Next, following the Trail (which starts from the Visitor Centre), we headed northwards along the line of the Lickey Hills Ridge. The ridge is a north-south trending fault-bounded anticlinal graben structure that dominates the eastern edge of the Country Park. On the way we stopped to look at more exposures of Lickey Quartzite and boulders of brecciated quartzite. The northern extent of the trail stops at a viewing point with great views over the undulating landscape that forms the northern end of the Lickey Hills Country Park. This landscape, to the west of the main ridge, is a direct reflection of the underlying geology. Immediately west of the ridge the ground quickly drops into a valley excavated from softer, younger mudstones and sandstones belonging to the Carboniferous Salop Formation and, at the northern end of the ridge, the Halesowen Formation. Further west the ground gently rises towards Beacon Hill and Monument Lane, where harder and younger breccia of the Permian Clent Formation overlies the Salop Formation. West, beyond Beacon Hill and Monument Lane, still younger beds of gravelly conglomerate belonging to the Triassic Kidderminster Formation, overlie the Clent Formation. ►

Heading southwards back along the ridge, we passed a couple of viewpoints with vistas looking east towards Birmingham. Eastwards away from the ridge the ground surface again gently falls away where it is underlain by the relatively softer Kidderminster Formation. Back towards the Visitor Centre car park the trail continues down the eastern side of the ridge to the Barnt Green Road Quarry. Here the Lickey Hills Geo-Champions have been working hard to clean up the exposed faces of Lickey Quartzite and to unravel the mystery of the tortuous folding revealed.



View NW from Champions Trail view point

After lunch we had a more general walk around the Country Park visiting Rose Hill Quarry and Beacon Hill with its toposcope. We walked through an undulating open and wooded landscape along paths that revealed the changes in geological formation as we went. Our final stop of the day was the Rubery Cutting, outside the Country Park. Here we viewed the exposure of Rubery Sandstone unconformably overlying the Lickey Quartzite, which had become quite overgrown since our cleaning efforts in April 2013.

A summary of the various geological formations to be seen across the Lickey Hills area is given below. However, we did not encounter all of these during our field visit: ►

PERIOD	AGE (Ma)	FORMATION NAME	DESCRIPTION	LOCATION
Triassic	251	Kidderminster Formation	Red sandstone and conglomerates.	South-western edge of the Lickey Hills CP and to the east of the Lickey Hills Ridge.
Permian	299	Clent Formation	Breccia (including the Clent Breccia), red marls and sandstone; Calcareous conglomerate (Bowhills Group), red marls and sandstone.	High ground, including Beacon Hill and Monument Lane along the western parts of the Lickey Hills CP.
Carboniferous	306	Salop Formation (Alveley Member)	Red and red brown mudstone.	Low ground to the east of Beacon Hill and Monument Lane and west of Lickey Hills Ridge.
	308	Halesowen Formation (Westphalian D)	Olive, buff and green grey sandstones and mudstone, thin coal seams & spirorbis limestones.	Small outcrop, northern end of the Lickey Hills Ridge, north of Rednal Hill (not seen).
Silurian	425	Much Wenlock Limestone Formation	Interbedded limestone and mudstone.	Kendal End farm south of Cofton Hill, southern end of the Lickey Hills Ridge (not seen).
	430 - 439	Rubery Sandstone	Pinkish brown sandstone.	Rubery Cutting
Ordovician	488	Lickey Quartzite Formation	Quartzite, pale grey and purple (ranging from lithic arenite, subarkose to quartzite) and thin beds of fissile mudstone and possibly tuff.	Lickey Hills Ridge, Warren Lane and Barnt Green Road Quarries, Rubery Cutting.
		Barnt Green Volcanic Formation	Crystal and crystal lithic tuffs, tuffaceous siltstones, sandstones and mudstones.	Southern end of Lickey Hills Ridge, south of Cofton Hill (not seen).

The Lickey Quartzite and Barnt Green Volcanics represent the oldest formations seen in the Country Park, dating from around 488 Ma. This puts them in the early Ordovician Arenig Epoch (476 - 493 Ma). During this time a chain of tectonic events had commenced that would end with the construction of a new equatorial continental land mass in the early Devonian.

During the Arenig Epoch much of Southern England and Wales formed part of an elongate micro-continent called Avalonia, which had split from the supercontinent of Gondwanaland to the south. Between the two landmasses lay the newly opened and widening Rheic Ocean. Avalonia, at approximately 55° south of the equator, sat on the southern margins of the closing Iapetus Ocean, the shallow coastal waters of which covered the West Midlands and Northern England. To the north-west lay a north-east to south-west trending island arc of active volcanoes and an associated subduction zone. Further to the north-west was a mid-oceanic spreading ridge, trending north-east to south-west, and beyond this lay a second volcanic island arc to the south-west of the landmass of Laurentia. To the north-east lay the landmasses of Baltica and Siberia.



Barnt Green Road Quarry

It was into the shallow coastal waters of the southern Iapetus Ocean that layers of sand (eroded from Avalonia), and volcanic ash were deposited, that would later become the Lickey Quartzite and Barnt Green Volcanics.

Through the Ordovician and Silurian periods the Iapetus Ocean continued to close and the Rheic Ocean continued to open. Towards the end of the Ashgill Epoch, approximately 439 Ma, Avalonia and Baltica collided leading to an episode of folding across Southern Britain and the Midlands/Welsh Borders, known as the Shelvian Event. This event coincided with several marine

transgressions and regressions across Wales into the Midlands area and a major period of glaciation in Northern Africa. It may also account for some of the folding seen in the Lickey Quartzite.

Continued closure of the Iapetus led to a major marine transgression across the Welsh Borders and towards the Midlands during the early Silurian Llandovery Epoch, leading to the deposition of sediments such as the Rubery Sandstone. Through the Silurian Wenlock and Ludlow Epochs warm shallow seas, teeming with life, covered the Welsh Borders and much of the West Midlands, into which accumulations of shale and limestone were deposited. The end of the Silurian saw the final closure of the Iapetus Ocean and the onset of the Caledonian Orogeny, which ended during the early Devonian. The result was the folding and thrusting of earlier Cambrian, Ordovician and Silurian rocks into the Caledonian Mountain Range, which lay across northwest Britain and provided eroded sediment for a newly emerged equatorial Old Red Sandstone continent.

During the Carboniferous, a landmass known as the Wales-Brabant Massif dominated much of Wales, the Irish Sea, Central England and East Anglia. The island comprised St. George's Land (Wales/Irish Sea) in the west, and the Midland Barrier, or Mercian Highlands, (Central England and East Anglia) in the east. This landmass represented the eroded remains of the Caledonian Mountain Range and the Old Red Sandstone continent.

To the north lay a shallow tropical marine basin, the Pennine Basin, which stretched eastwards across Europe to Russia and opened to the south-west into the Rheic Ocean. To the north of the basin lay Laurentia. Shallow tropical deltas separated the southern shore of the Wales-Brabant Massif from the Hercynian Continent further south.

The Late Carboniferous saw the closure of the Rheic Ocean as a result of the growth of the proto-Pacific Ocean (Panthalassa) during the Devonian and Early Carboniferous. During this time the Midlands lay on the northern shores of the Wales-Brabant Massif with rivers draining the Mercian Highlands (to the south) into subsiding marginal basins to the north. It was into these basins that the sequences of later Coal Measures strata, Halesowen and Salop Formations were deposited. ►

Compressional tectonic forces resulting from the closure of the Rheic Ocean, led to uplifting of the previously subsiding marginal basins towards the end of the Carboniferous.

The final closure of the Rheic Ocean caused further uplift north of the Wales-Brabant Massif through the Permian and Triassic. This gave rise to an arid landscape with rivers draining northwards off the eroding Mercian Highlands to the south. Over this landscape a variety of geological processes, including cliff erosion, fluvial and lacustrine deposition, acted to produce such strata as the Clent Formation.

In the Triassic, approximately 251 Ma, the Mercian Highlands had all but eroded to give way to a series of major rivers draining northwards into a vast low lying desert plain with deltaic lakes covering Cheshire and the north Midlands. At this time the Midlands area was dominated by the Budleighensis River, which flowed northwards from Northern France bringing with it material that was deposited as delta fans. Today this is recognised as the Kidderminster Conglomerate, which represents the youngest rocks seen in this area.

With time, these deposits were covered over and buried with later Mesozoic and Tertiary strata. Later tectonic forces and erosion have acted to uncover and sculpt the landscape into that seen today as the hills and low lands of the Midlands Region.

We finished at the Rubery Cutting at around 16:00. I would like to thank Julie and Adrian for a very interesting day. We look forward to joining them on more clearance days at Barnt Green Road Quarry and the Rubery Cutting. ■

Andy Harrison

References:

1. *Lickey Hills - Barnt Green Road Quarry, Community Earth Heritage Champions Project*, Herefordshire and Worcestershire Earth Heritage Trust Booklet, 2011.
2. *Explore Lickey Hills, Landscape and Geology Trail*, Herefordshire and Worcestershire Earth Heritage Trust Guide, 2005.
3. *The Geology of Britain, An Introduction*, Dr Peter Toghill, 2003.
4. *BGS British Regional Geology: Central England*, Third Edition 1969.

Creetown Museum - a little Gem!

Those of you with really good memories may remember my reference to this little discovery of a place a few years ago (see Newsletter No. 208, August 2011, p.16). I recently paid this corner of the kingdom another visit and to my delight found that this establishment is not only still there, but is positively thriving despite its rather 'out-of-the-way' location. Galloway in general is a lovely part of Britain and with geology such as the Ballantrae ophiolite not far away, deserves to be visited more. It seemed to me the main visitors were people in search of good fishing in the many lochs which are much highlighted in the local tourist literature. The Rhinns



coastline is a real eye opener for anyone who enjoys majestic coastal scenery and the hunt for graptolites... much of the geology centres on Ordovician/Silurian turbidite sequences for which the whole of the Southern Uplands is renowned. And book-lovers will enjoy Wigtown, Scotland's answer to Hay-on-Wye.

Anyway, to return to the main theme, I would like to share the 'Creetown Rock and Gem Museum' experience with you by way of some fuller details than I was able to impart in my earlier piece. ►



The museum is housed in a substantial stone building, a former schoolhouse, well signposted from the main A75 (and just as well - you'd never suspect it's existence otherwise) some five miles short of Newton Stewart, on a little back road that heads uphill out of the centre of the village. It has been in the same family for three generations now, and represents some 80 years of collecting/gathering together one of the finest private collections in the country, particularly of minerals. The third generation representative of the family, Tim Stephenson, was on hand to offer insights into the displays. I found all the staff enthusiastic and helpful.

The museum is, however, foremost a family business, so that unlike municipal museums, the sales desk is a major part of the *raison d'être* of the place. The place is strongly geared to family visiting, with initiatives to keep youngsters interested/involved. There is also an appetising cafe (open to all without the need to pay the admission fee) which has been part of a significant refurbishment since my last visit (in 2008). Other additions since then are the 'Professor's Study' - a comfortable room in which to settle down for a ten minute or so video about the mineral world, or browse magazines on the same subject - and the 'Crystal Cave' which houses a miscellany of fine large specimens, including a small display of fluorescent/phosphorescent minerals.

Additionally one can view the lapidary workshop where jewellery is made and exhibits prepared. There is a small area for youngsters to have some hands-on fun with actual specimens (of pretty reasonable calibre/quality, I might add), and nearby is an enviable collection of 'rock and mineral eggs' displayed in large glass cabinets.



For me, however, it was the main mineral gallery that held my attention the most (and which you enter first, after the entrance counter). This spacious area has purpose made cabinets with a great many 'themes': jade/rose quartz, diamonds (well fashioned rock-crystal replicas of many of the most famous and iconic stones such as the Cullinan, Hope, Star of India, Koh-i-Noor, Jubilee etc.), ore minerals, quartz, amethyst, calcite, gypsum, fluorite, malachite/lapis, agates, meteorites, soapstone/marble/onyx, organic mineraloids, as well as cabinets given over to geographically based collections - British, Scottish, African and Australian. I think that about covers the lot - though they also make space for single items like a replica gold nugget and a rather

incongruous skeleton of a cave bear (they've got it, so I guess it has to go somewhere!). I also seem to recall a rather large ammonite lying around the place somewhere. Further individual pieces adorn the cafe and corridors, such as a rather fine septarian concretion sliced to display both inside and outside.

For the fossil enthusiast the selection is limited (though quality marks the few specimens they have got) but for the mineral enthusiast, this is a place worth going the extra mile to see. ■

Mike Allen

Diamonds and Tectonic Activity

Recent research has shed light on when the process of plate tectonics began. This has been achieved by analysis of tiny mineral inclusions trapped within diamonds sourced from five ancient continents. Two radiometric dating techniques were used in the analysis: samarium-neodymium and rhenium-osmium. The ancient diamonds originate from deep within the mantle, up to 175 km below the surface, and brought to the surface by volcanic eruptions.

The data revealed information about the processes occurring deep within the mantle at the time when the diamonds formed and enveloped the inclusions. It seems that the mineral composition of the mantle underwent dramatic change about 3 billion years ago. Inclusions older than about 3 billion years were found to comprise only peridotitic minerals (chromium rich garnet and nickel/iron sulphides), which were believed to have originated from an earlier melting of the mantle. Melting of the mantle has occurred several times during Earth's history. However, inclusions younger than 3 billion years contain mostly eclogitic minerals. Partial melting at high pressure of mantle peridotite produces the metamorphic rock 'eclogite', which is essentially the high pressure equivalent of basalt (ocean floor).

Two explanations come to light from these observations. Basalt rocks at the base of continental crust were converted to eclogite and thrust deep down into the earth (what mechanism?). A more feasible argument is that basaltic oceanic crust from under the very ancient continents was subducted deep into the Earth by the process of plate tectonics, with eclogite forming during the process. If the latter is correct it suggests that 'modern' plate tectonics began about 3 billion years ago. But, what was occurring before plate tectonics started? True, there is some evidence for subduction in Greenland and Australia, but it appears that this differs from what we observe today.

So, the suggestion is that because there were no eclogitic inclusions in diamonds before 3 billion years ago there was no deep plate subduction to transport minerals to sufficient depth for metamorphism to occur. About 3 billion years ago, mantle cooling allowed much larger plates to form and kick start the tectonic plate motions we know today. Other lithospheric evidence also suggests that Earth experienced a change in tectonic activity about 3 billion years ago. ■

Pete Stamper

Thrihnukagigur - Inside the Volcano

The Reykjanes peninsula in the south-west corner of Iceland lies astride the Mid-Atlantic Ridge and is characterised by fissure swarms trending in a NE-SW direction. These belong to 4 separate volcanic systems, and all the rocks of the peninsula are less than 700,000 years old. There are sub-glacial hyaloclastite (Icelandic 'móberg') ridges in the south, but most of the peninsula is covered by post-glacial basaltic lava fields, crater rows and shield volcanoes.

Thrihnukagigur (Þríhnúkagígur in Icelandic) or 'Three Peaks Crater' lies along one of these crater rows about 13 miles to the south east of Iceland's capital city, Reykjavik. At first sight it appears to be a rather unremarkable small cinder cone, about 35m high with a crater opening about 4m x 4m. But unlike the majority of similar Icelandic cones which tend to be plugged or infilled with volcanic



Walking the plank to the cage

deposits, beneath the rim of Thrihnukagigur a narrow chimney plunges down to a vast, empty oval-shaped chamber. The chamber floor is 120m below the surface and measures about 50m x 70m across, with further passages continuing down to a total depth of 200m (see diagram below). The experience of being inside this cathedral like vault must surely make Thrihnukagigur one of the most remarkable volcanoes in the world.

The volcano last erupted around 4,000 years ago, and is classed as 'dormant'. The first (known) descent to the bottom was made by Árni B. Stefánsson in 1974. It was his vision to make it accessible to the public, whilst ensuring its future preservation and protection. And ►

how to make it accessible? Place a crane jib horizontally over the opening, attach a window cleaner's cage, organise a bridge from the volcano rim to the cage, and that's how numerous visitors have enjoyed the experience since the operation began in 2012. It was intended to be a pilot scheme for that one season, but 'Inside the Volcano' trips (run by the tour operator 3H Travel) have been in operation each summer season since then.

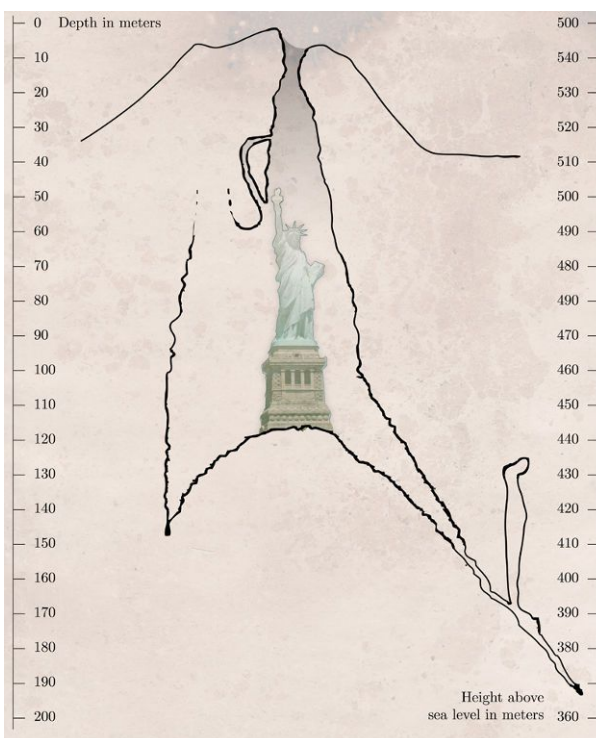
The trip involves a 40 minute walk across a lava field from the Bláfjöll ski centre (about half an hour's drive to the south-east of Reykjavik) and we chose to take the whole 'package' from Reykjavik which included the return coach trip, and we were accompanied by the same guide throughout the trip.

Rain and poor visibility were the order of the day, but this didn't dampen our spirits as we anticipated the excitement ahead. At the base camp we were fitted out with harnesses and hard hats, then made the short ascent to the rim for our turn in the cage. Hooked to a cable alongside the hand rail, we walked the plank out over the gaping abyss, and were then re-hooked to the cage - no chance of falling out! (See photo



Magma 'drips' solidified on the chimney wall

Safely on the crater floor our eyes gradually became accustomed to the flood-lighting, and with the help of our guide we could begin to piece together the story of this volcano. The most likely explanation for its empty state is that the lava found a new exit at the base of the cone at a critical moment when the magmatic activity was subsiding, and pressure reduced. We learned that there is evidence for this in a lava flow on the flanks of the cone outside, and we saw evidence ourselves that the chamber must have drained rapidly. On the sides of the chimney, 'drips' of magma had solidified as they tried to drain back down into the crater - frozen in time for 4,000 years (see photo above). There is evidence of the rifting which accompanied the eruption in diametrically opposite vertical features in the crater walls. Especially at the base on one side, a horizontal layer seems to break and plunge downwards (see photo, right). Two passageways disappear into the bowels of the earth below these features. ►



Cross section of Thrihnukagigur's magma chamber (Statue of Liberty for scale) from: www.insidethevolcano.com, with permission

above.) Then down and down, for 6 minutes - with one controlled bump into the side, (where mother nature had inconveniently failed to ensure that the chimney was completely vertical with unrestricted space for a window cleaner's cage!). Then the cage seemed very small as the chamber opened around us, and we were overwhelmed with the sheer beauty of the colourful mineral deposits, and the awe-inspiring vastness of the space (see front page photo).



The crater floor is domed with vast quantities of loose, mostly basaltic lava boulders, clearly fallen from the walls and ceiling, but leaving fresh surfaces for a better view into the heart of the volcano. High in the walls there are vents of various shapes, sizes and colours, adding to the beauty and complexity of the overall picture. We were allowed to wander around fairly freely within marked boundaries, but all too soon it was all over. Back at the base camp we enjoyed some traditional Icelandic lamb soup, before being escorted back to Bláfjöll by our guide. Throughout the trip the guides and all the staff were friendly, helpful and well-informed.

There are plans to drill into the volcano and make it more easily accessible with a designated viewing area. Having experienced the 'cage' and enjoyed the awe-inspiring feeling of being cocooned inside the volcano - with no other way out - this would seem to us like desecration. But in the interests of tourism it's almost bound to happen. True, it will reduce the cost and open up the prospect to a far wider range of people, but I hope it won't turn Thrihnukagigur into just another routine 'must do' tourist attraction like the 'Golden Circle' and the Blue Lagoon have become.

Being inside Thrihnukagigur was one of the most amazing experiences of our lives. Go if you can! Whether by cage or through a tunnel, there is nowhere else in the world where you can experience the awe-inspiring mystery of being deep inside a volcano. ■

Julie and John Schroder

See more Thrihnukagigur photos at: <http://photos.johnschroder.co.uk/ph/iceland-2014/Thrihnukagigur/>

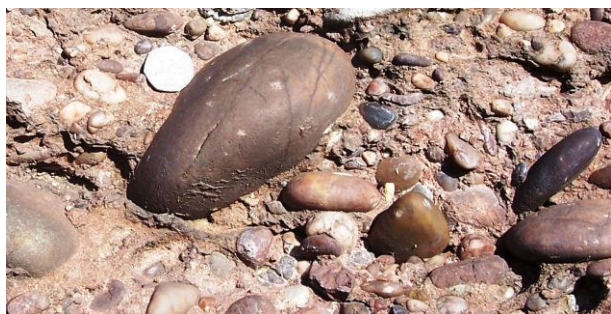
Geobabble

Some time ago we were discussing the naming of the Much Wenlock Limestone Formation, and it was pointed out that Dudley Limestone might be a more appropriate term, as there is a more complete succession there. The name Much Wenlock Limestone is an example of naming a rock formation after a locality, although traditionally it was simply called 'Wenlock Limestone'. When the occurrence of a formation is localised, the use of terms based on place names causes no confusion, but when it is found over a wide geographical area it is more logical to use other names, for example Chalk, Millstone Grit or Coal Measures.

Triassic rocks outcrop to the west of the Black Country in a broad, north/south trending area up to the Permian Bridgnorth Sandstone. At its base is the Sherwood Sandstone Group and the lowest formation is the Kidderminster Conglomerate, which is a very local term. In the old classification this formation was called the Bunter Pebble Beds, now considered an out of date term, not to be used, much to the disappointment of many older geologists.



It is important to remember the paleogeography of that time; it was a continental, desert landscape with a large river system flowing northwards from the Variscan or Armorican (which name should we use here?) mountains of northern France, through a series of largely faulted basins in England. In the southern basin the pebble beds are locally called the Budleigh Salterton Pebble Beds; in Cheshire they appear to be called the Chester Pebble Bed, and in the Midlands we have Kidderminster Conglomerate. If only we had retained Bunter Pebble Beds.



In the May/June edition of that excellent magazine 'Geology Today', there is a most interesting feature entitled 'Bunter quartzites: remarkable journeys in time and space'. At last, the term Bunter is back in use; it seems a far better name than all the different local names, but that is a personal choice. However, whatever it is called, it is a beautiful rock so here are a couple of photographs. ■

Bill Groves

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