Newsletter No. 217

February 2013

The Black Country Geological Society

Contents:

Copy date for the next Newsletter is

Monday 1st April 2013

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

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

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

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

Future Programme

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

Those wishing to attend field meetings please contact our Field Secretary, Andy Harrison, telephone: 01384 370 188, mobile: 0797 333 0706 or email: fieldsecretary@bcgs.info

Saturday 2nd February *(Conservation day)*: Rowley Hills. Meet at St Brades Close at 10:30 for an 11:00 start. Directions: from Birmingham - along the Birmingham New Road (A4123) turn left on to Tower Road (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 18th February *(Indoor meeting)*: 'The Origins of the Universe'. Speaker: Dr Gillian Pearce, Physicist. Gillian will trace the origins of the universe from the big bang all the way through the formation of our solar system and planet Earth to the possible futures that the universe faces. She will also look at what the chances are, on a cosmic scale of life happening just here, and the chances of you being you.

Saturday 2nd March *(Conservation day)*: Return to Barr Beacon. Meet at 10:30 for 11:00 at the entrance on B4154 Beacon Road, opposite Bridle Lane (the southern entrance to Barr Beacon) Grid ref: SP 060 967. 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 18th March *(Indoor meeting, 7.00 for 7.30 start)* AGM followed by **'Permafrost part 2': 'Surges, Jokulhlaups & Buried Ice: the extraordinary ice-marginal environment of Skeidararjokull, south Iceland'. Speaker: Dr Richard Waller,** University of Keele. Skeidararjokull is a large outlet glacier in S. Iceland that experiences a range of dramatic processes and as a consequence, displays an extremely varied ice-marginal environment. Key amongst these processes are surges (rapid advances not related to climate change) and jokulhlaups (huge flood events caused by the rapid release of glacially-dammed lakes). This talk will provide an overview of the work I've undertaken at the site over the last 16 years and will explore the distinctive landscape features associated with a range of dramatic glacial processes.

Saturday 6th April *(Field meeting):* Around Warwick and Warwick Museum, led by Hugh Jones and Martyn Bradley. Meet at 10.30 at the Warwickshire Golf Course, Leek Wootton, car park at SP 2889 6834. To visit North Woodloes Quarry (LGS 81). Then move to Warwick. Visit the castle entrance (Bromsgrove Sandstone). Lunch. Walk round Warwick roughly following the WGCG's Warwick Building Stones Trail. Visit the geology gallery of Warwickshire Museum: Plesiosaurs, Rhyncosaurs & other reptile footprints, and our amphibious friend, Dasyceps.

Monday 29th April *(Indoor meeting):* 'The Oxford University Museum of Natural History'. Speaker: Prof. Paul Smith, museum director. Further details of his talk tbc.

May *(Field meeting):* Oxford University Museum of Natural History. Dates and details tbc.

June *(Field meeting):* Trip by canal boat through the Black Country. Details tbc.

Newsletter by email

If you are a member who receives a printed newsletter then you may prefer to see it in colour rather than black and white. If you send us your email address you can receive it as a colour pdf and this will save the BCGS the cost of printing and postage.

The Geological Society W M Regional Group and BCGS invite entries for a

Photo Competition

Terms & Conditions

Entrants must be either a member of the **Geological Society** London (GSL), the **BCGS**, a current student of the **University of Birmingham**, School of Geography, Earth and Environmental Sciences, or **Wolverhampton University**, Dept. of Biology, Geography and the Environment. The competition is a bit of fun, aimed primarily at amateur photographers.

You can enter up to 3 photographs, *which must be your own work*, choosing from 4 categories: Geology in Motion, Geology and the Midlands, Geology at Work and Creative/Abstract Geology.

Images must be submitted in print, no larger than A4 (210mm x 297mm). Electronic copies may be requested if an image is short listed. Images **must not** be merged or manipulated. *You **can** crop, enlarge, enhance to remove spots or scratches, make it brighter or clearer. The WMRG reserve the right to exclude any image whose authenticity they believe to be questionable.*

On the back of each photo, write your name, address, daytime and evening phone numbers, GSL Fellowship/University Student number, or state membership of the BCGS. Add a note of where it was taken. Send entries to: Geological Photographic Competition, c/o Graham Worton (Keeper of Geology & Manager), Dudley Museum & Art Gallery, St James Rd. Dudley. DY1 1HU.

The closing date for entries is Friday 29th March 2013

Judging will take place during April/May 2013, following which 12 shortlisted photographs (3 from each category) will be chosen to feature at the 2013 Rock & Fossil Festival (details above) where guests will be invited to vote on the images displayed. **Sorry, we cannot return any entries.**

The winner in each category will receive a **cash prize of £50** and a calendar of all 12 shortlisted photographs. All 8 runners up will each receive a calendar of the shortlisted photographs.

It is also proposed that the 12 images will be reproduced as postcards for sale at the event to raise funds for the WMRG and BCGS.

For more information on this or any other event held by the GS WMRG, email geolsoc_wmrg@live.co.uk or visit our website www.geolsoc.org.uk/wmrg.

Other Local Events

Sunday 27th January at 10am: New Year, New Wren's Nest. Are you interested in fossils? Local History? Wildlife? Join one of the wardens for a free 2 hour guided walk around this fascinating and nationally important site. You will learn all about the famous fossils that were found at the Wren's Nest, and get the chance to hunt for your own. **Meet at the Wren's Nest NNR car park, Wren's Hill Road, DY1 3SB.** Children are welcome. **Booking is essential: please call 01384 812785.** This event is part of the **2013 Year of Geology,** celebrating 100 years of geological displays and activities at Dudley Museum & Art Gallery.

Saturday 30th March, 11.00 - 12.30. Lickey Hills Champions Trail. Free guided geology walk. Meet at the Lickey Hills Visitor Centre, Warren Lane, Rednal, Birmingham B45 8ER. No need to book. Suitable for all the family. One and a half miles. Strong footwear advisable.

Dudley Museum & Art Gallery

Rock and fossil identification 11.00 - 1.00 by appointment on the following Wednesdays: 20th February, 10th April, 29th May, 7th, 21st, 28th August and 30th October. Bring along your rock and fossil finds to have them identified by resident experts. Free of charge. Contact details as on p.2.

Dudley Rock & Fossil Festival: Saturday 28th September 10.00 - 5.00 and **Sunday 29th September 10.00 - 4.00.** More details to follow.

Other Societies

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

Lapworth Lectures

Monday 28th January: Permissive environments or biological innovation? Fresh insights into the Cambrian explosion. Speaker: Dr Graham Shields, University College London.

Monday 11th February: First century of Geochronology, from Holmes to EARTHTIME. Speaker: Dr Daniel Condon, NERC Isotope Geosciences Laboratory.

Monday 25th February: Drilling deep for renewable heat: recent geothermal experiences in northern England. Speaker: Professor Paul Younger, University of Glasgow.

Monday 11th March: In the footsteps of Professor Lidenbrock: a geochemical journey to the Centre of the Earth. Speaker: Professor Rob Ellam FRSE, Director, Scottish Universities Environmental Research Centre.

Lectures at 5.00 in the Palaeontology Lab (G21), Earth Sciences, University of Birmingham. For further info phone: 0121 414 7294 or visit: http://www.lapworth.bham.ac.uk/events/lectures.shtml

Manchester Geological Association

Tuesday 12th March at 18:30: Now that the dust has settled... The Impacts of Icelandic Volcanic Eruptions. Speaker: Professor Fiona Tweed, Staffordshire University. Joint Meeting with the Geographical Association.

Further information about indoor meetings go to: http://www.mangeolassoc.org.uk/ or email lectures@mangeolassoc.org.uk Visitors are always welcome.

The Oxford Colloquium

Saturday 16th March: Day of Lectures. Six distinguished speakers will give illustrated lectures on topics drawn from across the Earth sciences**.** Colloquium goers not only experience a sumptuous smörgåsbord of geo-disciplines, they benefit from meeting like-minded individuals in and around the museum precincts. This event is organised by the Oxford Geology Group.

The speakers are: Prof. Simon Conway Morris, Prof. John Tellam, Prof. Peter Burgess, Dr Dave Waters, Prof. Martin Siegert and Dr. Richard Walker.

Further information: http://oxgg.org.uk/the-oxford-colloquium/ Tickets: £15.00. Purchase (in person) from the Oxford University Museum of Natural History shop, or by mail from Alison Saunders. Contact her at events@oxgg.org.uk.

North Staffordshire Group of the Geologists' Association

Thursday 7th February: How big is your bang? (Volcanoes). Speaker: Dr Dougal Jerram (Dougal Earth).

Thursday 14th March at 7.00: AGM and Chairman's address. How (or how not) to drill an oil well. Speaker: David Osborn.

All talks are held in William Smith Building Room 0.06, Keele University, at 7.30. Further information at: www.esci.keele.ac.uk/nsgga/

Teme Valley Geological Society

Monday 18th February: From Ice to Fire: geology in action in Spitsbergen, Iceland and Galapagos. Speaker: Andrew Jenkinson.

Monday 18th March: Finding gold - from the Solomon Islands to Scotland. Speaker: Gawen Jenkin.

Meetings are generally held in Martley Memorial Hall, Martley. £3 non-members or join on day. For more details visit: http://www.geo-village.eu/ or contact John Nicklin, 01886 888318, 0774 977 4432

Geological Society West Midlands Regional Group

Tuesday 12th February at 6.30: Geohazards in the UK. Speaker: Hon Prof. Martin Culshaw, Birmingham University. At the Lapworth Museum of Geology, University of Birmingham. Refreshments in the Museum from 18:00. The talk will commence in the adjacent Earth Imaging Lab.

For further info, please contact the Group: Secretary, Daniel Welch: geolsoc_wmrg@live.co.uk.

Warwickshire Geological Conservation Group

Wednesday 20th February: Mining the Heritage Seam. Speaker: Graham Worton, Keeper of Geology at Dudley Museum.

Wednesday 20th March: Snowball Earth. Speaker: Dr Emily McMillan.

All meetings will be held in The Lammas Room, Hill Close Gardens, Warwick CV34 6HF and start at 7.00 for 7.30 – coffee beforehand! 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.

Shropshire Geological Society

Wednesday 13th February: Seeing inside the stones: viewing fossils in rock courtesy of the latest scanning technology and red-green 3D glasses (supplied). Guest speaker: Dr Imran Rahman

Wednesday 13th March: **Mesozoic marine monsters.** Guest speaker: Dr Adam Smith

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

Herdman Society Symposium

Saturday 16th February 9.30 - 5.00: 'Geoscience Frontiers 4'

A day of lectures at the Sherrington Lecture Theatre, University of Liverpool, and wine reception from 5.00 - 6.00. Full details will be published in early January. The charge to non-students will, subject to sponsorship, probably be £10, which includes programme, buffet lunch, tea/coffee and wine reception.

Dr Roger Benson (Oxford) **Dinosaur evolution and Mesozoic faunas as a guide to biodiversity**
Dr Gareth Collins (Imperial) **Impact: Earth! The hazard and mitigation of asteroid impacts**
Prof Fergus Gibb (Sheffield) **Nuclear waste: geology has a better answer**
Prof Cor Langereis (Utrecht) **The past and future of the Mediterranean**
Dr Ed Llewellin (Durham) **Bubble, bang, burp! Big experiments in volcano physics**
Prof Paul Wignall (Leeds) **The end-Permian mass extinction and its aftermath**

Persons interested in attending should contact Helen Kokelaar, e-mail: herdman@liverpool.ac.uk

Woolhope Naturalists' Field Club - Geology Section

Friday 22nd February: The Road from Damascus to the Seven Pillars of Wisdom. Speaker: Dr Sue Hay.

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

Wednesday 20th February: The Age of the Earth: A History. Speaker: Colin Humphrey.

Wednesday 20th March: UK earthquakes & the Centenary of John Milne. Guest Speaker: Dr Ian Stimpson.

Indoor meetings are in Newtown, at Plas Dolerw. Meet at 7.15 for 7.30pm. Further information: Tony Thorp (Ed. newsletter & Hon. Sec): Tel. 01686 624820 and 622517 jathorp@uku.co.uk Web site: http://midwalesgeology.org.uk

Volunteers Needed for BCGS Committee

Alan Cutler and Graham Worton will be leaving the committee after the AGM in March, and we thank them for their long and dedicated service to the Society. Indeed, Alan was a founder member when the Society was re-born in 1975, and has remained in office ever since. To ensure the continuing success of the Society, we need new volunteers to step forward for election to the BCGS Committee at the AGM.

Volunteers/nominations are needed for a Vice Chairman and a Meetings Secretary

Additional committee members would also be very welcome. If you would be interested in either of these posts, joining the committee, or for further information please contact:
the Chairman, Gordon Hensman, chairman@bcgs.info
or the Secretary, Linda Tonkin, secretary@bcgs.info

Editorial

The New Year brings a varied programme of events for the BCGS and some changes on the committee. Please see the item above on p.6, and please do give this some serious thought. Could you spare a little time to serve on the committee? Do you have any particular skills which might help with the Society's administration? Or would you just like to know more about how the Society ticks? Please don't wait to be nominated. The Chairman or Secretary would love to hear from any of you, and we are particularly hoping to attract some of our younger members. Do you have any ideas for the future of our Society?

Chris Broughton has appealed for some more help with the BCGS blog for the 'Geology Matters' web site. Can you help? If so, please contact the Secretary.

In our Newsletters we have made a point of drawing our readers' attention to any outside geological events which may be of interest, particularly those organised by other geological societies. Please contact me (Newsletter Editor) or the Secretary if you know of any geology-related forthcoming events, (especially local ones) which could be publicised in these pages.

There are two Conservation Days planned. Do come along if you can. These are proving to be highly successful events, where we can get to know each other in a friendly atmosphere and make a very positive contribution at the same time. It's amazing how much difference can be made in one short day by an enthusiastic team of helpers. Already, significant progress has been made at places such as Barrow Hill and Springvale Park. The next one is in the Rowley Hills (details on p.2).

Finally, please note the exciting Photo Competition which is being organised by the Geological Society West Midlands Regional Group. If you need an incentive, there are **prizes! (**Details on p.3.) ■

Julie Schroder

National Publicity for BCGS

The monthly BBC Science magazine Focus, in its October edition 2012, carried a question about the possibility of melting lava. The answer given, informed us that it was done in 1993 in the laboratories of Massachusetts Institute of Technology. It struck me that they had no idea about the successful melting of Rowley Rag (olivine dolerite) in Victorian times in the Black Country. In fact they probably have no idea of the significance of the Black Country in creating the world's first industrial region and being the birthplace of the Industrial Revolution. Further, it is entirely possible that they have never heard of the Black Country! Please forgive a little cynicism.

Had they done their research thoroughly they would have found that in 1851, Henry Adcock, in an arrangement with Chance Bros. of Smethwick, used their reverberating furnaces to melt the local olivine dolerite from the Rowley Hills. He was able to cast a variety of articles such as slabs for steps and tables, window heads and sills, mantelpieces, doorway steps, and lintels.

Unfortunately, the cost of melting the stone was prohibitive, and so by 1866 production had ceased. There are some remaining examples of his products such as the Old Vestry, Edgbaston (at the Five Ways B'ham), and terraces at Aston Park and Wolverhampton. It seems likely that there are other examples still extant, so if you know the location of any of them, please let us know.

Prior to Adcock's efforts, Sir James Hall (1761-1832), a friend of Lavoisier and James Hutton, also experimented with melting lava at the end of the 18th and beginning of the 19th centuries. The apparatus he used, such as his crucible and specimens of marble he produced from chalk, are in the Geological Museum, London.

I sent this information to Focus and they published it in the January edition, No. 250 p.12, complete with reference to the Black Country Geological Society. ■

Gordon Hensman

(See the Member's Forum p.18 for more on the Rowley Rag. Ed.)

The Oxford Natural History Societies Symposium

My husband John and I represented the BCGS at this event which was held at the Oxford Natural History Museum on Saturday 1st December 2012. Attended by around 50 delegates, there were representatives from a wide range of Natural History and Geological Societies covering an area within reach of a day's visit to the Museum.

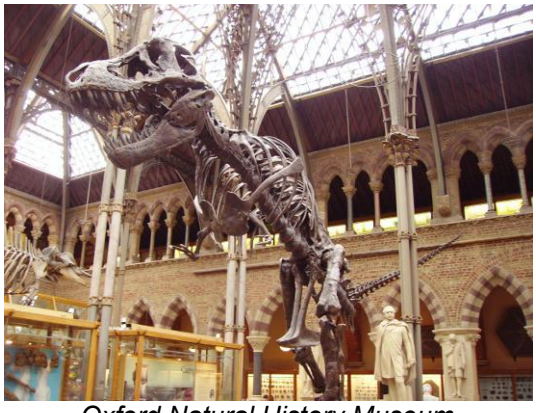
Paul Smith, recently appointed as Museum Director, explained that the aim of the Symposium was to explore ways in which the Museum exhibits and facilities might better serve the local community and special interest groups from the surrounding area. With the Museum closed to the public for roof restoration during 2013, outreach work takes on a new significance. Paul emphasized that the Museum is first and foremost an international centre of excellence, where collection based activities are paramount. Research, interpretation of exhibitions, public engagement, education, and a close partnership with volunteers all play an important part in the strategic vision for the future.

A lively talk by Darren Mann, Assistant Curator of Entomology, revealed that the Museum is home to around 6 million insect specimens, and Chris Jarvis, the Education Officer, gave us an insight into the wide variety of educational initiatives on offer for all age groups: there are objects to handle, family friendly lectures, opportunities to talk to experts and things to make. Oxford University students are on hand to do experiments for children on 'Science Saturdays' and they get professional support to help with delivery of speeches and talks to visitors. There is an after school club and a good relationship with local schools, though Chris recognises the need to focus more on engaging with secondary school pupils. With over half a million visitors a year, and a spectacular range of exhibits, Chris admitted that motivation is not a big problem here. But it is evident that all this would not happen without the enthusiasm and dedication of the Museum staff.

There was a choice of 'behind the scenes' tours based on the Museum's four distinct collections: Geology, Mineralogy, Zoology and Entomology. Paul Smith took us round the labyrinth of corridors housing geological specimens, books and historic documents. He specially mentioned that most of the Silurian fossils in the collection came from Dudley, and there are numerous drawers containing these. The highlight for us was a bound volume of the William Smith 1815 map presented as an atlas measuring about 2 feet by 18 inches. Lack of exposure to the light has resulted in exceptional preservation of the detail and colours - a beautiful work of art as well as a remarkable record of our geological history.

Monica Price escorted us around the behind-the-scenes mineral collection with breathtaking specimens on display, too numerous to mention. This is the second largest mineral collection in the country, and Monica emphasized its great importance. Many of the specimens were obtained during the heyday of the mining and quarrying industries in the 19th and 20th centuries, and with their decline this source has now virtually dried up.

After the guided tours we congregated in a newly opened education facility, and a lively discussion ensued. We learned that this facility can be booked at very low cost, and it became clear that many of the delegates were unaware that the Museum could offer them so much support. Each of us was asked to fill in a questionnaire to help the museum understand how they might support our organisation.



Oxford Natural History Museum

After the doors had closed to the public, the afternoon ended with an excellent buffet in the surreal surroundings of the museum exhibits, with the drinks table set disconcertingly under the gaping maw of Tyrannosaurus Rex. This was a most enjoyable, informative and thought-provoking event, and we felt very privileged to be a part of it. We will look forward to Paul Smith's talk at our indoor meeting on 29th April, and to another chance to see behind the scenes on our field trip to the Museum in May - watch for the date and don't miss this opportunity! ■

Julie Schroder

The Dudley Bug

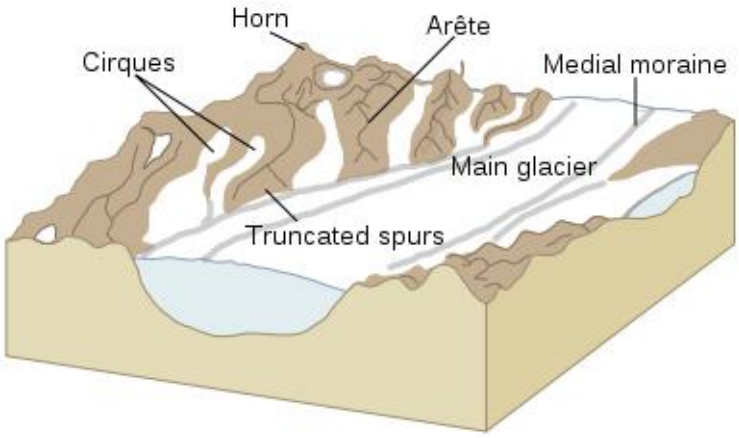
Welcome

Happy New Year, we hope you all had a great Christmas and New Year. In this issue of the 'Dudley Bug' we are bringing part one of two articles about glacial environments. Part one is focusing on the typical features of a glacial environment. Part two, which will be in the next newsletter focuses on periglacial environments.

Alison and Chris

Glacial Environments

Ice has the power to transform landscapes, creating unique landforms which are specific to glacial environments. Glacial ice is continually moving, eroding the rocks over which it is flowing. A number of glacial landforms can be identified, for example:



Typical glacial valley features (Image from Wikipedia)

Arête: Formed by two cirques/corries eroding backwards to form a sharp edged ridge which runs from the summit.

Corrie/Cirque/Cwm: The rotational movement of ice at the starting point of a glacier which erodes the rock beneath to leave a circular depression with a relatively smooth surface. A good example of this is Cwm Idwal in Snowdonia, Wales. It is important to note that different countries have different names for these features; Corrie in Scotland, Cirque in France and Cwm in Wales.

Corrie lochan/Tarn: A small lake which forms in the hollow at the base of a corrie/cirque.

Glacial trough/U shaped valley: The main valley glacier has flowed down the river valley eroding the sides to form a valley which is wider, with steeper sides compared to before the glacier had formed. A good example is the Nant Ffrancon Valley in Snowdonia, Wales.

Hanging valley: A neighbouring valley which once had a smaller glacier joining one of a larger volume is left hanging high up over the main glacial valley.

Nant Ffrancon Valley, Snowdonia (From WikiCommons)

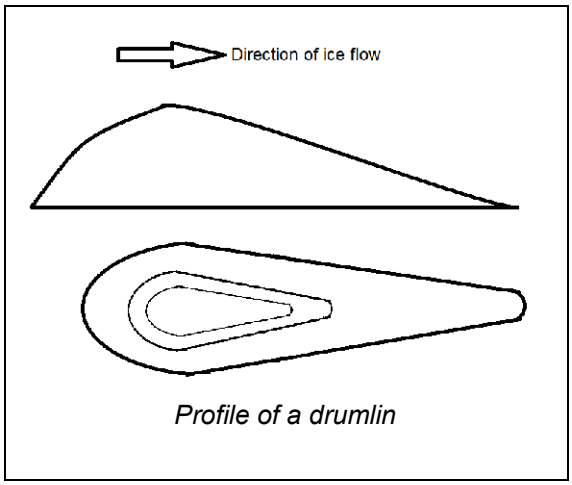
Pyramidal peak/Horn: Three or more corries/cirques/cwms have eroded backwards forming a peak in the centre e.g Snowdon.

Truncated spur: The interlocking river valley spurs formed during normal periods when rivers are present and eroded backwards.

The formation of these landforms leaves behind debris which can range in type, size and composition. The position within the ice in which the debris forms can be classified as **supraglacial debris** (transported on the ice surface), **englacial debris** (transported within ►

the ice) or **subglacial debris** (transported at the base/below the ice). Debris deposited directly by the glacier is identified as a **glacial deposit.** Debris which has been deposited by the meltwater from the glacier is called **fluvio-glacial debris.**

Glacial deposits are often easy to identify because they are unsorted deposits, which contain a wide range of grain and clast sizes from fine clay or silt to large boulders (up to several metres in size). These types of deposits are known as **glacial till** or **boulder clay**. Glacial till is split into different types, depending on where it was deposited:



Profile of a drumlin

Lodgement till: Formed due to the pressure of the ice on the base of the glacier. This leaves a form of till which can be identified by the aligned clasts which align themselves to the flow direction of the ice.

Ablation till: Formed through supraglacial, subglacial and englacial debris deposition. Ablation till is typically unsorted, unstratified and very poorly compacted, which can lead to slumping.

Modified till: Till which has been reworked by glacial advances which will move material deposited by earlier cold phases. Glacial meltwater may also alter previous till deposits.

When you visit a post glacial landscape, such as those seen in the Highlands of Scotland or Snowdonia in Wales, there are many landscape features which tell you that a glacial landscape once existed there. Features include:

Drumlin: An elongated elliptical hill which is made up of poorly consolidated debris. Drumlins are formed beneath the moving ice and typically align themselves to the direction of ice movement. They can be up to many tens of metres in length, up to 60m in height and typically form in 'swarms'. The steep side faces towards the oncoming ice.

Erratics: Large boulders of rock which are transported huge distances (sometimes hundreds of kilometres) within the ice, before being deposited as the ice melts and retreats. Erratics are easy to identify because they are usually of a different composition to the rocks on which they are deposited.

Moraine: Rock deposits formed at the side of the glacier (**lateral moraine**) or in the centre of the ice on the surface (**medial moraine**). This is formed by the frost shattering and abrasion of rocks on the valley side. The rock falls onto the surface of the ice and is carried down the valley. Medial moraine is formed when two valley glaciers meet and merge forming a central deposit. One final type of moraine is **terminal/recessional moraine** which is when the sediment is deposited at the furthest advance of the glacier before it retreats.


Granite glacial erratic on dolostone deposits on the Isle of Skye (Photo taken by A Roberts, 2008)

The meltwater within a glacial landscape forms a number of landforms including **eskers** (long narrow ridges of sorted sands and gravels), **kames** (deposited on the edges of glaciers) and finally **kettle holes** (formed by detached blocks of ice left behind as the ice has retreated). These are usually buried into the fluvio-glacial deposits and leave upturned kettle-like depressions where they have melted).

Varves are formed in proglacial lakes by the deposition of fine sediment into the water. These display seasonal variation through distinct bands. A proglacial lake is found at the front of a glacier's snout. Within the varves there are occasional pebbles which have been dropped into the water from blocks of floating ice on the surface of the lake. These pebbles are known as **drop stones**. ■

Please send material for the next Newsletter to:

newsletter@bcgs.info

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

Field Meeting Report

Sunday 14th October 2012: Charnwood Forest, Leicestershire, led by Mike Allen (BCGS).

After a cold and frosty start we met Mike Allen at the M1 Junction 22 services at 10:00 am. From here we drove east to **Markfield (Stop 1**), and piled into two cars. Next we drove north and west to **Charnwood Lodge Drive (Stop 2),** then north to **Morley Quarry (Stop 3)** where we stopped for lunch. Driving south and east we spent the afternoon walking round **Bradgate Park (Stop 4)**, before heading back to Markfield around 17:30.

The Charnwood Forest is a region of Leicestershire bounded by Leicester, Coalville and Loughborugh with the M1 motorway cutting through it between Junctions 22 and 23. The topography of the area is gently undulating with isolated hills, including Cliffe Hill, Spring Hill, Beacon Hill and the highest, at 180m, Bardon Hill. A centuries old legacy of mineral extraction has left behind numerous quarries, including Bardon Hill, Markfield and Morley, which pock-mark the area.

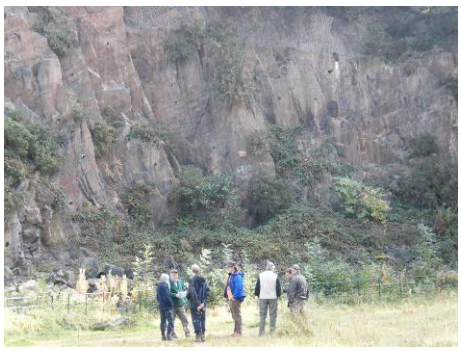
Generally the rocks of Charnwood Forest belong to the Charnian Supergroup. This is split into three main groups that include the Blackbrook Group (oldest), Maplewells Group (middle) and the Brand Group (youngest).

Age	**Group**	**Charnian Super Group**
Permo-Triassic		**Mercia Mudstone Group**
Cambrian	**Brand Group**	Swithland Greywacke Formation, undivided
		Hanging Rocks Conglomerate/Stable Pit Quartzite
Precambrian	**Maplewells Group**	Swithland Camp Conglomerate
		Bradgate Tuff Formation, undivided (Stop 1: Markfield, Altar Rocks. Stop 4: Bradgate Park)
		Sliding Stone Slump Breccia (Slate Agglomerate or Outwoods Breccia Member) (Stop 1: Markfield, Altar Rocks. Stop 4: Bradgate Park)
		Park Breccia
		Buck Hills Greywacke
		Dacites and Andesites
		Charnwood Lodge Agglomerate (Sandhills Lodge Member) (Stop 2: Charnwood Lodge Drive)
		Beacon Hill Tuff Formation, undivided
		Benscliffe Agglomerate (Felsitic Agglomerate)
	Blackbrook Group	One Barrow Breccia
		Blackbrook Formation, undivided (Stop 3: Morley Quarry)

Stop 1: Altar Rocks (west of Markfield Quarry, NW of Markfield). The rocks here are stratigraphically within the upper part of the Maplewells Group and are Precambrian in age. They comprise two units of grey volcanic breccia overlying finer well-bedded ash deposits, which represent the boundary between the Bradgate Tuff and the underlying Sliding Stone Slump Breccia (or Slate Agglomerate). The presence of well defined cleavage, minor faulting and slickensides indicate that these rocks have been subjected to regional tectonic movements, possibly Caledonian or later. ►

Stop 2: Charnwood Lodge Drive. The rocks here are older than those of Stop 1, occurring towards the base of the Maplewells Group and still of Precambrian age. Here the rocks comprise a very coarse mottled volcanic agglomerate, which early geologists described as a 'bomb rock'. To the south and west of Stop 2 intruded sheets of diorite, dacite and andesite provide the elevated areas of Bardon Hill, Spring Hill and Whitwick. The age of the Charnwood Supergroup has been determined through radiometric dating of these intruded sheets. No ages are based on fossil evidence and the rocks of the 3 groups have been aged in terms of their relative positions to each other. However, things are still not that simple. The results of radiometric dating have provided two rather conflicting dates of approximately 603 (±2) Ma, i.e. Adelaidian, and 566 (±1) Ma, i.e. Ediacaran. If the age of these rocks is the latter then this would put them at a similar age to the Uriconian Volcanics and Longmyndian Supergroup rocks seen in Shropshire.

Precambrian volcanic agglomerate



Morley Quarry

Stop 3: Morley Quarry. Here we observed some of the oldest and youngest rocks seen in the Charnwood area. The oldest rocks are Blackbrook Formation, Blackbrook Group, made up of sequences of bedded volcanic breccia dipping towards the NE. The youngest rocks of the area belong to the Triassic Mercia Mudstone Group (formerly Keuper Marl), which could be seen unconformably overlying the Blackbrook Formation within the southern face of Morley Quarry. A British Geological Survey borehole sunk within the Quarry has apparently proved that the Charnian Supergroup is over 830m thick.

Stop 4: Bradgate Park. Here the rocks are of similar age to those of Stop 1, within the top of the Maplewells Group and the base of the Brand Group. They generally comprise the mottled, pebbly Hanging Rocks Conglomerate/Stable Pit quartzite, interpreted as the base of the Cambrian. This unconformably overlies the fine brecciated volcaniclastic rocks of Precambrian Bradgate Tuff and Sliding Stone Slump Breccia. Once again cleavages, minor faulting and slickenslides were obvious. Careful study of the cleavage shows how Bradgate Park is at the nose of a single regional anticlinal fold plunging southeast-wards and dominating Charnwood Forest.

In a large sub-vertical bedding plane of the Bradgate Tuff we were able to see what makes the Charnwood Forest famous. The ideally low angled sunlight revealed round, concentric shapes interpreted as holdfasts, called Bradgatia discus. Feathery patterns have also been found here, which are believed to be feathery, sea pen like quills, which would have been held in place on the sea bed by the hold fasts. These fossils are called Charnia masoni, which local schoolboy, Roger Mason, first discovered here in 1957.

No-one is totally sure what these fossils represent. Are they are animal, vegetable, fungi or a new kingdom? How did they feed? What did they eat? How did they reproduce? Other fossils have been found and identified as Bradgatia linfordensis, Ivesheadia lobala, Shepshedia palmala. All comprise disc shapes and feathery fans, but it is unknown what exactly they are.

Precambrian holdfast, Bradgate Park

All the Precambrian/Cambrian rocks of the Charnian Supergroup appear to have a volcanic origin, as volcanic bombs, tuff, or ash deposited on relatively gentle volcanic slopes. Some of these deposits also show evidence of interaction with water suggesting that either they were deposited in shallow water or were transported there later. It is believed that the volcanic source of these rocks was close and towards the northwest. Towards the west (Whitwick) and the ►

southwest (Bardon Hill) low level acidic rocks were being intruded into wet sediments to produce features such as laccoliths and sills.

Like Shropshire's volcanic sequences, the Charnian Supergroup has been interpreted as being deposited within a volcanic island arc setting associated with Avalonia. At the time, Avalonia was approximately 60°- 65° south of the equator and had just broken away from Gondwanaland. Tectonic activity later resulted in folding, cleavage formation and faulting of these strata into a Precambrian/ Cambrian basement desert landscape. It would have been into this landscape that wadis, (temporary water courses subjected to seasonal flash flooding), cut their course during the Permo-Triassic. During the Triassic, Mercia Mudstone Group sediments infilled the wadis, and desert winds polished the underlying Precambrian/Cambrian rocks.

Charnwood Forest is a complex place full of many questions. I would like to thank Mike Allen for a very interesting day. He has offered to lead a trip to another part of the Forest next autumn, and I look forward to this. ■

Andy Harrison

Volcano Adventure in Weather-beaten Italy

Part 3: The Aeolian Islands - and Naples again

The charming little town of Lipari on the island of the same name was our base for the final stage of the GA's Volcano Tour in April 2012. (See Newsletters 214 and 215 for Pts 1 and 2, 'Naples' and 'Sicily'.) Lipari is one of seven inhabited Aeolian islands which form part of a volcanic island arc rising from the Tyrrhenian sea to the north of Sicily. Along with several sea mounts, these mark the subduction zone where the African Plate plunges steeply below the Eurasian Plate. The islands have all become sub-aerial within the last million years, and display a wide and complex variety of magma types. Broadly, these form a spectrum ranging from basic to acidic with decreasing age, many with high potassium content.

Lipari emerged from the sea around 200,000 years ago, and has erupted magmas of most typical Aeolian types. A trip around the island focussed on the north eastern corner, scene of the most recent activity. Here, the rhyolitic Monte Pelato has been built entirely within the last 10,000 years. A late explosive phase produced a vast pumice cone, followed by flows of obsidian lava, and both of these products have been exploited commercially for many centuries. The old pumice quarry workings extend high up the mountain side, and in a roadside cutting we saw some spectacular flow-banded and 'snow-flake' obsidian in various stages of devitrification.

Pumice quarry on the island of Lipari

We headed south to the 'Belvedere di Quattrocchi' viewpoint. The dramatic west facing cliffs on the south west coast follow the line of a major north-south trending fault system, and cut through the two rhyolite lava domes of Mount Giardini and Mount Guardia, emplaced 13,000 to 25,000 years ago. The fault can be traced southwards to the island of Vulcano, and we could see steam rising enticingly from Vulcano's active Fossa cone, our next day's destination.

Though unimpressive in height, Vulcano has a deadly history and worryingly unpredictable future, amply justifying its distinction as the original namesake of all the world's subaerial magmatic ►

Vulcano's active Fossa cone, looking towards Lipari

edifices. Under welcome blue skies we gathered on the rim of the Fossa cone and it felt very satisfying to reach, at last, the summit of an active volcano - unthwarted by weather or human intervention! Vulcano arose above the sea about 160,000 years ago, and like Lipari has experienced many different phases and varieties of volcanic activity. La Fossa and the smaller cone of Vulcanello nearby are its most recent volcanic edifices, dating back 6000 years and to 183 BC respectively.

Reaching a discreet height of 391m above sea level, La Fossa lies roughly within overlapping craters of earlier volcanoes. The Piano caldera to the south is evidence of an early collapsed volcano, and to the west the Monte Lentia hills are the remains of a series of rhyolitic lava domes emplaced 25-15ka. These are connected with the lava domes in southern Lipari, visible to the north. Further collapse (15-8ka) formed the Fossa caldera and exposed a magnificent cross section through one of the Monte Lentia domes. Radial jointing is spectacularly displayed radiating like the spokes of a wheel from a central point.

A 'breadcrust bomb'

The Fossa volcano is the product of a number of cycles of activity, and last erupted in 1888-90. The cone is made up of layers of ash, surge and flow deposits, and some huge 'breadcrust bombs' scattered around the rim bear witness to the intensity of the explosions which characterised that eruption. The throat of the caldera is blocked, but there is activity on the northern rim where a row of fumaroles belch poisonous gases. The wind was blowing the fumes away from the rim, and we were able to get close to watch the magical process of sulphur deposits crystallising before our eyes, some forming exquisite needle-like structures.

Needle-like sulphur crystals

After a brief visit to Vulcanello, it was pay-back time for the morning's beautiful weather conditions. The wind rose, then came the rain, and the sea became wild and angry. Our scheduled hydrofoil didn't appear. A car ferry was unable to dock, and our characteristically unflappable leader, Paul Olver, looked increasingly worried as he phoned for ferry news. We wondered if he had a 'Plan B' for the impending prospect of being marooned on Vulcano - but we were assured that one brave hydrofoil was on its way! We huddled on the quay and waited for what seemed like hours, and breathed a sigh of relief when we were finally back in Lipari after a long and very bumpy journey.

Clear skies, but a choppy sea accompanied our journey to Stromboli, the most northerly of the Aeolian islands. But the towering cone of Stromboli remained resolutely truncated by persistent cloud cover as we arrived mid-afternoon, after a brief visit to Panarea en route. It was too late for all but a few mountain goats amongst us to attempt the summit (924m) so most of us settled for a walk around to the western flank, hoping for a view of some action from the edge of the huge land-slip scar known as the Sciarro del Fuoco ('Ski slope of Fire').

Stromboli, 'the Lighthouse of the Mediterranean' has been in a state of almost permanent activity throughout recorded history, with occasional violent outbursts of devastating intensity. Most of the recent activity has been concentrated on the north-western flank of the volcano, with regular explosions of potassium-rich basaltic lava sending pyroclastics and lava flows cascading down the Sciarro del Fuoco.

Stromboli

The clouds remained depressingly low as we reached the optimum viewpoint at 400m, but just before dusk the sky cleared to reveal the entire length of the Sciarro del Fuoco and several active craters near the summit. A few rumbles heralded further excitement as it went dark, and we were treated to some spectacular fireworks plus the sight and sound of ejected material bouncing down to the sea. Magic! and well worth the long journey. ►

From Palermo we caught the overnight ferry to Naples, looking forward to our final chance to complete unfinished business on Somma-Vesuvius. (Remember? we were comprehensively thwarted in our attempts to get up there at the start of this volcano adventure.) Looming over Naples harbour as dawn broke, the summit was clear but a stormy sky was not encouraging. We got as far as the ticket office, hungry after a very early start, only to find that the strikers were still barring the way, and there were no open food outlets open to cheer us up! From this vantage point high on the north flank of Vesuvius we could see numerous dykes opposite in the steep inside wall of Somma, the parent volcano which spawned Vesuvius after the great eruption of 79 AD. Vesuvius last erupted in 1944, and below we could see the lava flow from this eruption which followed the pathway of the Atrio del Cavallo valley down to the lower slopes of the volcano.

Eventually we were allowed to climb the short track to the rim in the company of a guide from the Vesuvius Observatory, and at last got our chance to peer into the vast crater of Vesuvius. Layers of pre-1944 lavas are exposed in the wall of the crater, capped with fast-eroding 1944 tephra deposits. Before the 1944 eruption the volcano was higher, and there was no crater. In the pathway round the rim we found many samples of the mineral augite, lava bombs, and other ejected material including limestone fragments from the basement country rocks. But our luck ran out just as we reached the end of the 'tourist' section of the rim. The weather had the last word as the clouds gathered around us, and suddenly the view was gone.

Vesuvius

During two short weeks we had visited numerous volcanoes, and learned to treat them with the cautious respect they deserve. But less predictably we'd been forced to come to terms with the vagaries of the Italian weather - not to mention the wrath of disgruntled workers. This was a roller-coaster adventure holiday with many challenging moments, but with highlights too numerous to mention, and a perception of Italy changed forever. ■

Julie Schroder

References:
Italian Volcanoes, Kilburn and McGuire, Terra Publishing.
A Geological Study tour to the Italian Volcanoes, Geologists' Association, 2012

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

Global Warming! I have done my bit - well perhaps not. It was a fuelish notion.

After a career of 32 years in my last employment I have always taken some comfort from the fact that earning a living enabled me to do my bit to combat Global Warming. I can say this as my job involved the purchase and resale of the world's most beautiful natural product, one which mother nature allows to grow in almost any environment, which can be easily regenerated and provides mankind with a hugely versatile material. More importantly it is an enormous repository for Atmospheric Carbon thanks to transpiration. This natural product is of course Timber and in my case specifically Northern European and Canadian Softwoods.

These arboreal forests are today farmed in a very scientific way. For every mature tree felled and sent to the sawmill, five new seedlings will be planted. Now, not all these will make it to become 80/100 years old; many will be removed during thinning of the plantations and find their way to the pulp factory for Cellulose manufacture, eventually ending up as paper or packaging products. Today sylviculture (tree production) is a fully integrated system, from the seedling nursery to its final expression in the production of hot water from the kilns (fired by wood chips, of course), which is then circulated as a ►

source of central heating to buildings and houses in the communities close to the sawmills. This system also provides much needed employment in northern latitudes by utilising the vast natural resource of the forest.

Forestry work in Austria, Photo by Queryzo, Wikimedia Commons.

So, to be involved in the importation of well over a million cubic metres of sawn timber which would be replaced by five times as many new seedlings absorbing carbon from the atmosphere seemed to be a good credential towards reducing Global Warming. Then along comes a 'Clever Dick' who says you have been wasting your time, mate. According to the author Matt Ridley, any timber which gets used to generate power or heat (which is increasingly the case with recycled wood products and biofuel), is more carbon rich than even coal or gas. Take into account the cost of transporting trees to be turned into biofuels, then it makes even less sense; diesel and fertiliser come from fossil fuels so trees cannot be carbon neutral.

Austrian Professor Helmut Haberl of Klagenfurt University goes even further and claims that the idea that trees grown in the place of those chopped down are 'carbon neutral' whereas fossil fuels are not, makes no sense: carbon is carbon. Felling trees to burn oxidises the tree's carbon atoms decades before they would be released by decay, and up to 200 years would be required to break even in carbon terms by planting new trees. So it is a ludicrous myth that biomass including trees cuts carbon emissions.

So, wrong again Williams, but I can take some solace out of the fact that as I sit at my solid wood kitchen table, in front of my wood burning stove, looking out of my high performance wooden windows I shouldn't become too FRACKED off, as that might be a different story. ■

Mike Williams

Geobabble

A New Year, and over the holiday break we have been reminded in the media of various anniversaries, be it 150 years of the London Underground or the start of the Falklands conflict and it is always interesting to look at how we got to where we are today. Scientists tend to spend most of their time looking forward, proposing hypotheses that might be tested and developing new ideas. Geology comes into this category, and there is research going on in all areas of the discipline, and we see examples of this in our own backyard. However, we cannot help looking over our shoulders to see how the subject has developed; there are very active 'History of Geology' groups, and we have had talks at our meetings focussed on geological champions of the past such as Murchison and Lapworth.

I thought it would be interesting to look at geology 50 years ago; it is a nice round figure and it is easy for me as I was a keen student in 1963 studying the subject I love. It is beyond the scope of little Geobabble to look at the whole of geology at that time so I am going to focus on Plate Tectonics, or rather the absence of it. Much of the modern geological vocabulary had not been coined, not only 'plate tectonics' but also 'lithosphere', 'sea floor spreading' and many other terms; they may have been used in other contexts but the idea of a 'plate' did not exist.

There were, at that time, some arguments amongst geologists over the theory of Continental Drift, and we are all familiar with the evidence of the fits of the continent coastlines, the matching of structures and rock types together with fossil communities across wide areas of ocean. There were still some who sought to explain these features without any movement of the continents, but they were dwindling in number and the student of 1963 saw them as being a bit of a joke.

The way forward was going to be through geophysics, a growing discipline. In 1963, Sir Edward Bullard published a paper entitled 'Continental Drift' in which he produced the evidence he had obtained through Palaeogeomagnetism to plot polar wandering curves. In short, he showed that the ►

magnetic north poles in Permo-Carboniferous times were shown to be in the North Pacific for European and North American data but in the North East Atlantic for Australian rocks. Discussion was about whether the Earth's magnetic field was always an axial dipole close to the axis of rotation; if it was, the continents had moved.

Some traditional geologists objected to any theory involving movement of continents and sought to explain geological anomalies by land bridges, lost continents or novel climatic belts, but as Bullard pointed out, that seemed more fantastic than continents moving. Geologists knew about ocean ridges with high heat flow and they were sure that the continents were moving away from them. They had evidence of big horizontal movements in the crust; a study of the Great Glen Fault in 1946 had shown this. Bullard had also recognised that the magnetic field reversed from time to time. Arthur Holmes had proposed a mechanism for movement: convection in the mantle coming to the surface at the mid ocean ridges and descending under the continent, pushing the lighter continental crust before it. So close to Plate Tectonic theory but not quite there.

All were agreed that the solution would come from studies of the ocean floors, and it was difficult to explain why they could not find any sediment older than Cretaceous in the deep oceans that had been explored at this time. However, there was one principle that was generally accepted, which was that any horizontal movement must be along the Moho between the crust and mantle. Light continental crust must 'float' on heavier ocean; sial upon sima - an understandable but major misconception. Plate tectonic theory eventually emerged from the geophysical investigation of the ocean floors.

Harry H. Hess

As interesting as this might be, it is important to put all this information into its historical context. 1963 was just eighteen years after the end of the Second World War. Most men, and many women who were in their forties and fifties had seen active service and this included many teachers, research workers and of course geologists. Physics contributed much to the war effort; one only has to look at the development of radar. Sir Edward Bullard was in his late thirties during World War II and became an experimental officer in the Royal Navy researching ways in which shipping could be protected from magnetic mines. There were other eminent geologists of the same vintage who had similar experiences, and one was the American geophysicist, Harry H. Hess.

Hess was the same age as Bullard and was also in the Navy, a Captain of a transport ship in the Pacific. His ship was equipped with the new technology that was Sonar. He was involved in supplying the landings on the Marianas, Philippines and Iwo Jima and used his Sonar to make maps of the submarine topography. He identified the large features that were to be called 'transcurrent faults' as well as mapping the mid ocean ridges. Hess, and his pupil J. Tuzo Wilson are two more of my geological heroes. Their work and research at this time laid the foundation for the breakthrough that was about to come. ■

If you wish to follow up any of this, Bullard's paper is:
Quart. J. geol. Soc. Lond. Vol.120, 1964.
Other papers include:
Kennedy, W.G. 1946. 'The Great Glen Fault'. Q.J.G.S Vol 102 pp41-72
Wilson, J. T. 1963. 'Hypothesis of Earth's Behaviour'. *Nature, London.* Vol 198 pp925-9

Bill Groves

Member's Forum

Zoom in on Mount Everest (on the Guardian website)

Just look at those sedimentary rocks close to the summit.
http://www.guardian.co.uk/travel/2012/dec/19/mount-everest-gigapixel-zoom-photograph

Pete Stamper

Rowley Rag and Threlkeld Quarry

Threlkeld Quarry and Mining Museum lies in the long sweeping valley between the towering mass of Blencathra and the micro-granite intrusion of Threlkeld Knotts, close to Keswick in the Lake District. What, you might ask is the connection with Rowley Rag?

4 inch setts at Threlkeld Museum

A visit to this fascinating museum last summer provided the answer. We were shown around by Donald Angus, a former quarry employee. The museum is housed in an unprepossessing building, but inside is an Aladdin's cave of historical and geological treasures. We learned that the quarry opened in the 1870's, initially to supply ballast for the Penrith - Keswick railway. The stone is a light grey in colour and was also used for kerbs and as dressed stone to face buildings. But there was also a demand for 4 inch 'setts' for roadways, which required the expertise of skilled stone dressers.

And where better to find this expertise than in the quarrying community of Rowley Regis. In the 1870's some skilled quarry workers answered the call from far away Cumbria and took their skills to Threlkeld. One of these was our guide Donald's grandfather. In Donald's words: "My Grandfather on my mother's side moved from Rowley in the 1870s as a sett maker. My Grandmother was a Levett. I believe they were butchers in Black Heath". That was all Donald could tell us, but I felt that there's a story here waiting to be unearthed.

I wonder how big was this exodus from the Black Country? Do you have any connections with the sett makers who went to Threlkeld? Please let me know if you can add anything to this story. But either way, if you're anywhere within reach, don't miss an opportunity to visit this little gem of a museum. You'll get a friendly welcome, and find a mine of information about the local geology and lots more.

Further information and contact details: www.threlkeldquarry.co.uk Threlkeld Quarry Museum, Keswick, Cumbria CA12 4TT, tel: 01768 779747, email: threlkeldquarrymuseum@btconnect.com ■

Julie Schroder

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