# Newsletter No. 235

# February 2016

The Black Country Geological Society



**Copy date for the next Newsletter is Friday 1 April**

## Contents:



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| For enquiries about field and geoconservation meetings please contact the Field Secretary.<br>To submit items for the Newsletter please contact the Newsletter Editor.<br>**For all other business and enquiries please contact the Honorary Secretary.**<br>For further information see our website: bcgs.info | | |


# Future Programme

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

***Visitors are welcome to attend BCGS events but there will be a charge of £1.00 from January 2016.***

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

**Monday 15 February *(Indoor meeting):* 'The Debitage Dilemma - the Distribution of the Lithologies at Stonehenge'. Speaker: Dr Rob Ixer.**

**Saturday 20 February *(Geoconservation day):* Saltwells Nature Reserve.** Meet at 10.00 at the Nature Reserve car park on Saltwells Lane (Grid ref: SJ 934 868). 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 a packed lunch or hot food can be acquired from the Saltwells Inn adjacent to the car park. Finish at 14.30.

**Saturday 12 March *(Geoconservation day):* Barr Beacon, Pinfold Quarry.** Meet at 10.30 at the entrance on B4154 Beacon Road, opposite Bridle Lane (the southern entrance to Barr Beacon), grid ref: SP 060967. Wear old work clothes, waterproofs and stout footwear. Please bring gloves and garden tools: loppers, secateurs, forks and spades if you have them. Also bring lunch. Finish at 14.30. *(Postponed from November 2015.)*

**Monday 14 March *(Indoor meeting, 7.00 for 7.30 start):* AGM** followed by **'The Minerals of North Wales'. Speaker: Tom Cotterell.**

**Monday 18 April *(Indoor meeting):* 'Microfossils of the Wren's Nest'. Speaker: James Inman.**

**Saturday 23 April *(Field Visit):* Churnet Valley, led by Ian Stimpson,** Keele University & NSGGA. Meet at 10:30 in Froghall Wharf Car Park SK 0271 4766 just off the A52. Walking a section of the Churnet Valley Geotrail looking at Carboniferous geology (Gritstones and Coal Measures) and associated geologically related industrial history. Also the geomorphology of the Churnet Valley associated with the end of the last Ice Age. Walking ~ 6km along public footpaths (with stiles) across rolling North Staffordshire terrain. Bring a packed lunch, or food available at the Fox & Goose Pub, approximately half way round the walk.

**Saturday 21 May *(Geoconservation Day):* Portway Hill, Rowley.** Meet at St. Brades Close at 10.30. Directions: from Birmingham New Road (A4123) turn left on to Tower Road if coming from Birmingham, right if coming from Wolverhampton. Just after Bury Hill park, turn left onto St. Brades Close. Wear old work clothes, waterproofs and stout footwear. Please bring gloves and spades, brushes and trowels in order to excavate and expose more of the dolerite. Also bring lunch. Finish at 14.30.

**Saturday 11 June *(Field meeting):* Oxford University Museum of Natural History, led by Paul Smith,** Curator. (Details tbc.) *Please note change of date from previous newsletter.*

## Archiving BCGS Records

**We still need your help!**

The BCGS records are currently housed at Himley Hall. The Dudley Archivist has agreed that they can be transferred to the Dudley Archive, and members of the committee have been tidying them up ready for transfer. After it has been moved, we would appreciate some help to catalogue the material.

We first asked for help in December, but **no-one has volunteered so far!** If you can spare a little time for this task, please contact our secretary, Linda Tonkin at: secretary@bcgs.info

## Procedures for Field Meetings

**Insurance**

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

**Health and Safety**

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

# Other Societies and Events

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

## Woolhope Naturalists' Field Club - Geology Section

**Friday 18 March: 'The Carboniferous under the Southern North Sea'.** Speaker: Dr John Collinson.

All indoor events are held in the Woolhope Room, Hereford Library starting at 5.30 unless otherwise specified. Guests are welcome, but must take day membership of the Club: £2.00. Further information: Sue Hay on 01432 357138, email svh.gabbros@btinternet.com or visit their web site: www.woolhopeclub.org.uk/Geology_Section/default.htm

## Mid Wales Geology Club

**Wednesday 24 February: 'Sea level Change in the Geological Past: recognising the record in the rocks'.** Speaker: Prof. Jerry Davies.

**Wednesday 16 March: 'Remote Sensing in the Historic Environment '.** Speaker: Chris Martin (CPAT).

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

## North Staffordshire Group of the Geologists' Association

**Thursday 11 February: 'The growth of the Continental Crust over Geological Time: from consensus to controversy.'** Speaker: Professor Hugh Rollinson (University of Derby).

**Thursday 10 March (Note 7:00pm start for AGM): 'Tales of Middle Earth'.** Speaker: Dr Ian Stimpson (Keele University). AGM and Chairman's Address.

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

## Warwickshire Geological Conservation Group

**Wednesday 17 February: 'Minerals, Magmas & Man'.** Speaker: Dr Paul Olver (Hereford & Worcester EHT).

**Wednesday 16 March: 'Rivers, lakes, swamps and seas: exploring an early Carboniferous environment'.** Speaker: Prof. Sarah Davies (Leicester).

Doors open at 7.00 for coffee before a 7.30 start at St Francis Church Hall, Warwick Road, Kenilworth CV8 1HL. 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.

## Lapworth Lectures

**Monday 15 February: 'Geology of the 5/22-1 exploration well, Rockall Trough, offshore NW Ireland: the role of break-up magmatism on trap development'.** Speaker: Professor Christopher Aiden-Lee Jackson, Imperial College, London.

**Monday 29 February: Title tbc**. Speaker: Professor Emily Rayfield, University of Bristol.

**Monday 14 March: 'The ophiolite enigma resolved?'.** Speaker: Prof. John Dewey, Oxford University.

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

## East Midlands Geological Society

**Saturday 13 February: 'Sinkholes and the media'.** Speaker: Vanessa Banks, BGS.

**Saturday 19 March: 'Chalk of the Paris to London fast railway route'.** Speaker: Rory Mortimore, Professor at Brighton University.

Non-members are welcome. Meetings will be held at 6.00 in the Geography Department of Nottingham University, room A48. Further info at: www.emgs.org.uk or email: secretary@emgs.org.uk

## Teme Valley Geological Society

**Monday 8 February: 'From the Depths: How Cave Deposits tell us about Past Environments and Climates'.** Speaker: Prof. Ian Fairchild.

**Monday 21 March: 'Exotic rocks and fossils from NE Arabia, glimpses of a former Permian Ocean'.** Speaker: Dr Alan Heward.

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

## Manchester Geological Association

**Wednesday 10 February at 19:00:** AGM followed by Presidential Address. Refreshments from 18:30. **'Diamond Formation - Where, When and How?'** Speaker: Dr Ray Burgess, MGA President.

**Wednesday 2 March:** start time tba. Joint meeting with the Geographical Association. **'Past Eruptions and Future Risks - should we be concerned about Iceland's volcanoes'.** Speaker: Professor Fiona Tweed, Staffordshire University.

**Saturday 12 March: The Broadhurst Lectures. Talks on New Zealand tectonics.** This is likely to be an all-day event.

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

## Open University Geological Society, West Midlands

**Saturday 27 February: Day of Lectures. Registration from 9.30, first lecture 10.30.** Dome Lecture Theatre, Department of Earth Sciences, University of Birmingham.

**'Reconstructing the life-cycle of an island-arc volcano; an integrated approach to investigating the development of volcanism on Montserrat?'** Dr Seb Watt (Birmingham University).
**'Sinkholes and the work of the British Geological Survey'.** Dr Vanessa Banks BGS.
**'Himalayan rock forensics'.** Dr Clare Warren (Open University).
**'Mining: a risky business'.** Dr Sarah Gordon (Director at Sataria).
**'The causes and effects of climate change - a meteorologist's perspective'.** Jim Galvin (Senior Operational Meteorologist, Met Office).

Booking essential - contact David Green davepgreen@btinternet.com OUGS Members free, Non-members £5. Bring a packed lunch.

## The Oxford Colloquium

**Saturday 5 March 10.00-17.00.** Doors open at 9.30.

**'The origin and evolution of *Homo sapiens*'.** Professor Chris Stringer, Natural History Museum.
**'The origin, residence and migration of carbon-rich fluids in the crust'.** Professor Christopher Ballentine, University of Oxford.
**'The use of forensic geoscience to reveal buried ancient landscapes'.** Professor John Underhill, Heriot-Watt University.
**'The rise of the terrestrial ecosystem: insights from the Carboniferous'.** Professor Sarah Davies, University of Leicester.
**'Latitudinal biodiversity patterns in Deep Time'.** Professor Paul Upchurch, UCL.
**'Volcanology and the role of the Citizen Scientist'.** Professor Hazel Rymer, Open University.

Tickets for the Oxford Colloquium cost £20. More information and tickets go to:
http://www.ogg.uk.com/#!the-oxford-colloquium-2016/c8qx

## The Herdman Symposium: 'Geoscience Frontiers 2016'

**Saturday 27 February: Day of Lectures.**

**'Deep Earth Geophysics and the origin of the inner Core'.** Dr Andy Biggin (Liverpool).
**'Why did the Dinosaurs go extinct? New insights into an age-old mystery'.** Dr Steve Brusatte (Edinburgh).
**'Terra Infirma; what is Salt and why should we care?'** Prof Chris Jackson (Imperial).
**'Core Blimey! What drilling holes in Ocean floors can tell us about Volcanoes'.** Dr Sue Mahony (Bristol).
**'Rare Earth Ore Deposits – Carbonatites, Clays and Critical Minerals'.** Prof Frances Wall (Exeter).
**'Communicating Climate Change'.** Dr Bob Ward (LSE).

Tickets: £10 - includes talks, abstracts, refreshments, buffet lunch and wine reception. Central Teaching Hub, Faculty of Science & Engineering, University of Liverpool Off Brownlow Hill, Liverpool, L69 3BX. Advance Registration Essential - go to http://tinyurl.com/q54hukv for more info and to register and pay.

## Shropshire Geological Society

**Wednesday 10 February: 'Ordovician Cephalopods'.** Speaker: Dr Dave Evans, Natural England.

**Wednesday 9 March: 'Mapping the glacial deposits of North Shropshire'.** Speaker: Professor Geoff Thomas, Liverpool University.

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

# Editorial

You may have noticed that there is no 'Geobabble' in this issue. Bill Groves has entertained and informed us with this column in (as far as I know) every issue since its inception in Newsletter 159 (June 2003). Initially Bill intended the column as a place "where we can do our own glossary of tricky geology techno-speak". He hoped at first that others would send contributions: "now I can't be alone in struggling with some of the bigger words used in modern geology-speak so write in and let us know your favourite word or phrase that we can pass on to our membership in the plain speaking version". In the event very few 'Geobabbles' have been contributed by other members.

We are sorry that Bill will no longer be able to continue with this commitment, but thank him heartily for his unfailing loyalty, and his ability to come up with something interesting 6 times a year. It's quite an achievement to have sustained this for more than 12 years!

However, I am pleased to present in this issue the first of a new series: 'Mike's Musings'. Mike Allen has been a regular contributor over the last few years with substantial features based on his geological travels and themes of particular interest to him. Appropriately, in this issue he muses on the term 'ignimbrite' - following up the debate about the 'Sgurr of Eigg' engendered by Mike's Members' Evening presentation and article: 'Bloodstone Sweat and Tears' (issue 234, p6). Roy Starkey drew our attention to some new research (issue 234, Stop Press, p9), and there is more on this in the Members' Forum (below). Mike can't promise to 'Muse' in every issue, but we thank him for taking on this role, and will look forward, hopefully, to many more 'Musings' from time to time.

All this does not diminish the importance of hearing from **all** our members! We have the 'Members' Forum' where you can comment, share small items, ask questions, or perhaps take up Bill's mantle on geological terminology. And there's always room for longer features too. So please get typing and send your contributions to: newsletter@bcgs.info

Another new venture recently was to incorporate a discussion session during the Members' Evening in December. Members made some interesting and useful suggestions, and the main points are summarised on p8. If you have any further comments or suggestions to make to us, please send them to me for the Members' Forum. Members' suggestions are very helpful to the Committee in deciding the future programme and direction of our Society.

It has been a pleasure to welcome a number of new members recently. Some swelled our numbers at the very successful geoconservation session at Sedgley Beacon on Saturday 30 January, and we hope that more members - new and well-established - might feel inspired to join us at the forthcoming sessions of this enjoyable and worth-while volunteer work. Only with regular clearance sessions can ►

we maintain the integrity of our local geologically important sites. Getting up close and personal to a rock face is surely the only way to gain any meaningful understanding of the world beneath our feet - so come and join us and learn as you work!

Please note that subscriptions are now overdue, and may have been overlooked by some of you! (Payment details are on p16). ■

*Julie Schroder*

# Members' discussion summary

## Monday 7 December

*The discussion was chaired by Graham Worton, who started by asking for any suggestions for speakers and subjects for indoor meetings. This was followed by a discussion about field trips, and finally an up-date from Graham and disscussion about the future of Dudley Museum and Art Gallery. Ed.*

**Barbara's Wollemi Pine**

The meeting started on a very positive note from Barbara Russell reporting the splendid progress of her Wollemi Pine. This was presented to Barbara when she 'retired' from official duties with the Society, most recently as Honorary Secretary and our refreshments organiser.

**Indoor meetings**

Suggestions included: a talk about Wren's Nest micro-fossil research *(already on our programme);* an overview of local glacial deposits - perhaps by the PhD student known to BCGS and currently engaged in this research; optical mineralogy; planetary geology.

There was a comment (backed up by at least one other member) that some speakers seemed to be too erudite - talks could be aimed at a lower base level of knowledge.

**Field Trips**

One member was particularly inspired by the trip to Oxford Natural History Museum with Paul Smith. *(A repeat visit is scheduled on 11 June.)* Other Museum visits were suggested, including the Sedgwick Museum in Cambridge. Other suggestions were: town walks - perhaps an evening walk in Dudley where there has been a lot of new development in the town centre; coach trips to more distant places; more special trips with access to places not normally available to the public.

It was noted that field trips are not always well attended, and there was a reminder that members should contact Andy if they need help with transport.

**Dudley Museum and Art Gallery**

It was proposed that there should be a BCGS letter expressing support for the Museum and against the threatened closure. A show of hands gave unanimous support for this proposition. Another suggestion: could we send a BCGS representative to a council cabinet meeting to put our case re: museum closure? Unanswered questions: What would happen to the Museum's geological collection? How can they close the Museum and yet support the Geopark? ■

*Julie Schroder*

# Geoconservation: October 2015 to January 2016

The arrival of the autumn / winter months saw the start of the new session of geoconservation works. In October we returned to Doulton's Clay Pit within the Saltwells Local Nature Reserve, and December saw our return to Portway Hill Quarry in the Rowley Hills. Unfortunately, the planned work for Pinfold Lane Quarry at Barr Beacon in November had to be postponed (until March) due to ill health. We started the new year of 2016 with our first visit to Sedgley Beacon. *(Photos by Andy Harrison unless otherwise stated. Ed.)*

## Saturday 3 October 2015, Doulton's Clay Pit, Saltwells LNR

It was a cool and grey day when we met at 10.00 in the main car park adjacent to Saltwells Inn. Once again our leader was Alan Preece, the Head Warden, who was only too keen to show off his new toy - a Polaris Ranger 4x4 vehicle - acquired by the Council. Although very useful, it proved a little tricky getting it in and out of Doulton's Clay Pit.

*Doulton's Clay Pit, Saltwells LNR*

Alan's plans are to clear much more of the clay pit to expose the sandstone at the far end of the quarry and around the pool at the bottom. Our day involved clearing scrub and saplings from the slopes of the Coal Measures exposures, which had become overgrown again since our last visit. Alan pointed out that much work needs to be done within the cutting of the incline and at the Brewin's Bridge Cutting. During our visit to this part of the site on the 40th anniversary field trip last July, it was noticeable how overgrown this had become, in particular the exposures of dolerite that are no longer visible. Given the sensitive nature of the Brewin's Bridge Cutting it is hoped that we can return there this coming February to start clearance works. Doulton's Clay Pit will require much clearance and ongoing maintenance to keep on top of it.

## Saturday 5th December 2015, Portway Hill Quarry, Rowley

*Portway Hill Quarry, Rowley*

This was a cool, cloudy and windy day when we met Paul Stephenson (Birmingham and Black Country Wildlife Trust) at St. Brades Close at 10.30. Paul, along with regular work parties from the 'Friends of Rowley Hills' have been keeping on top of the vegetation at this site. The plaque on top of the monument cairn has been replaced, as the last one was vandalised, and the adjacent seat has undergone some repair and strengthening work.

The vegetation in front of the main dolerite exposures had been cut, cleared and treated to keep down the undergrowth such as brambles. This has allowed the protected grass and wildflower species to recolonise the area. We continued to clear more bramble and undergrowth from the exposures and up towards the boundary of the nature reserve. Efforts were also made to excavate down the face of the dolerite exposures. Not only has this revealed more of the dolerite exposure, but excavated material soils are being use to form a level platform in front of the exposed face. *(See 'Portway Hill Dolerite' by Alan Richardson on p11 for more on this quarry. Ed.)* ►

## Saturday 30 January 2016, Beacon Hill, Sedgley

It was a cold, sunny and very windy start when 10 BCGS members met at the main entrance to Beacon Hill, Sedgley at 10.00. Our leader was Gabriel Mason-Dixon from the BBC Wildlife Trust. He provided access and ran through some information about the site, and health and safety business.

*Beacon Hill Quarry, photo by Mike Allen*

Beacon Hill forms the northern end of a ridge, known as the Sedgley-Northfield Ridge, which forms a natural watershed for Central England. Rainfall to the north and east drains towards the River Trent and out to the North Sea, whilst rainfall to the west and south drains towards the River Severn and out of the Bristol Channel. The Hill is formed of a folded unit of Silurian Aymestry Limestone (part of the Ludlow Series) which is approximately 10 Ma younger than the Wenlock Series rocks seen at Wren's Nest. The rocks are grey-brown in colour, thinly bedded and nodular with occasional bands of bentonite and muddy horizons. The limestone is also fossiliferous and contains many brachiopods and bivalves. This strata makes the site an important one for limestone grassland. It supports a variety of plants, including greater knapweed, carline thistle and bristly ox-tongue, whilst attracting rare butterflies like the brown and green hairstreak.

Like Wren's Nest, the site has been heavily quarried for purer limestone in the past, which has left behind an undulating landscape. From the top of the hill a marvellous panorama can be viewed of the Shropshire Hills, Birmingham, and across the Black Country, all representing a feast of varied Palaeozoic strata. Our day was spent clearing saplings and bramble from one of the many hollows on the hill, where a good exposure of the Aymestry Limestone could be viewed. Some clearance had clearly been undertaken before, but some time ago.

*Brachiopods, Beacon Hill Quarry*
*Photo by Gabriel Mason-Dixon*

Gabriel pointed out that although Sedgley Beacon is owned by Dudley Council there are not the funds or personnel to keep someone on the site looking after it all the time. Therefore, the most the Council can do is to maintain access to the site and deal with any complaints. The BBC Wildlife Trust acts on behalf of the Council to maintain the site and is grateful for any voluntary help they receive.

*Beacon Hill Quarry after clearance*

We will return to Portway Hill Quarry in May with spades and brushes to expose more of the main dolerite rockface at this site. In the meantime, future geoconservation days until March include Saltwells in February, and the postponed Pinfold Lane Quarry work at Barr Beacon in March. *(For a historic look at Beacon Hill Quarry, see 'GeoScenic' in the Members' Forum, p16. Ed.)* ■

*Andy Harrison*

# A puzzle in the Portway Hill dolerite

During our recent conservation work at Portway Hill, I was intrigued by a narrow, dark, sub-horizontal band cutting across the outcrop. While I cleaned the beautiful spheroidal weathering in the dolerite, my attention kept returning to the band. No-one could offer an explanation for its origin, so I was left to conjure my own. It is coarser than the dolerite above and below, but although it is deeply weathered and very friable, its crystalline nature is still apparent. It is mafic and contains obvious white phenocrysts which are likely to be plagioclase feldspar. The upper and lower margins of the band are not parallel: the upper margin has more peaks and troughs than the lower, and these undulations have a consistent asymmetry.

The mafic composition suggests a magmatic rather than a hydrothermal origin. However, if it was an intrusion through an older consolidated dolerite, its large surface area would have led to rapid cooling and a very fine grain size. In addition, the undulations in the upper and lower margins would match precisely.

It therefore seems likely that the dark band is a cumulate formed by fractional crystallisation and crystal settling. For this to be true, the dolerite exposed in this outcrop must represent two distinct intrusions. The rock below the band would be the earlier emplacement. Once cooled and solidified, it would have been followed by a second intrusion of magma that had resided at depth sufficiently long for relatively large crystals to form during slow cooling. After emplacement, the low viscosity associated with mafic magmas would have allowed these crystals to settle downwards to accumulate as the layer now observed.

This being so, it conjures a possible explanation of the asymmetric undulations on the upper surface of the band. Magma moves in intrusions: if there are accumulations of loose crystals, they will be moved in the same way as sand in a current of water, and will develop analogous structures (there are many examples of cross-bedding in layered gabbro intrusions). As viewed in outcrop, each undulation slopes gently to the left, and steeply to the right. If these are indeed current-formed asymmetric ripples, they must be the result of magma flowing through the intrusion at this point from left to right.

The decayed state of the rock prevents retrieval of a specimen for thin section preparation, so it will not be possible to identify any of the small-scale textures characteristic of cumulates. If the observed ►

structures are asymmetric ripples, they will extend back into the outcrop, and will be preserved as sole marks on the underside of the overlying dolerite. Removing a small part of the band under one of the undulations would confirm its three-dimensional shape.

If anyone would like to join me in revisiting this outcrop to pursue the investigation, do get in touch. ■

*Alan Richardson (as.richardson@virgin.net)*

*(Note also that another geoconservation session is scheduled for Portway Hill, on Saturday 21 May. Ed)*

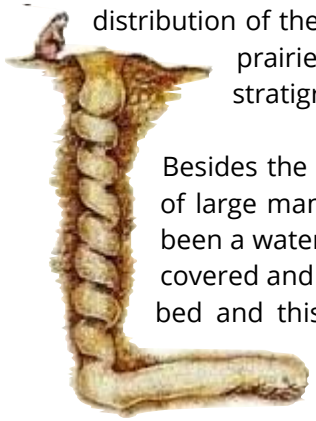
# The 'Devil's Corkscrew'

On a recent trip to the USA I encountered a very large and unusual trace fossil in the shape of a giant corkscrew (pictured left). The features are approximately 2-3m long.

Trace fossils, also called 'ichnofossils' from the Greek 'ichnos', are the impressions and tracks left in the sediments from biological activity. They range from impressive dinosaur footprints, to small borings on fossil wood, to feeding burrows or scratch marks. In fact, if your local high street has some natural flag stones the chances are you can find some ichnofossils on the way to the shops.

The giant corkscrew ichnofossils are preserved in Miocene sandstones with a high windblown volcanic content. They are protected in what is now the Agate Fossil Beds National Monument, in Nebraska, USA. They were first described by the palaeontologist Erwin Hinckley Barbour in 1891 who interpreted them as the remains of giant taproots and named them 'Daemonelix', the 'devil's corkscrew'. In 1904 another palaeontologist, Olaf Peterson, found a fossil rodent skeleton inside a horizontal extension to one of the corkscrew features and offered an alternative hypothesis that they were the burrows of a large rodent.

The photo (right, courtesy of Agate Fossil Beds National Monument) is of F.C. Kenyon, a member of Barbour's field party in 1892. It shows two freshly excavated adjacent burrows and lateral inclined passageways. The accepted interpretation is that the ichnofossils are the burrows of an ancient beaver-like rodent called 'Palaeocastor'. The spatial ►



distribution of the burrows suggests that they lived in communities, similar to the modern day prairie dog. It is also interesting to observe that the burrows terminate at a common stratigraphic layer which would have been the ground surface at the time.

Besides the Palaeocaster devil's corkscrew burrows, the park has an absolute abundance of large mammal fossils which were recovered from a 2ft bone bed, interpreted to have been a watering hole where the animals died during a severe drought. Their remains were covered and preserved in volcanic ash and mud. Agate occurs in a bed just above the bone bed and this is what gives the Park its name. As with all National Parks, collecting is forbidden but there is plenty to see, touch and photograph. Well worth a visit. ■

*Graham Hickman*

References:

1. Agate Fossil Beds National Monument website: http://www.nps.gov/agfo/index.htm
2. ND State Geological Survey Palaocastor Poster: www.dmr.nd.gov/ndfossil/Poster/PDF/Palaeocastor.pdf
3. Barbour (1895): 'Is Daemonelix a Burrow? A reply to Dr. Theodor Fuchs' http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1337&context=geosciencefacpub
4. Lugn (1941): 'The Origin of Daemonelix' http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1366&context=geosciencefacpub
5. Kenyon (1895): 'In the region of the new fossil Daemonelix'. American Naturalist XXIX, June 1895, 213-227. http://www.mocavo.co.uk/The-American-Naturalist-an-Illustrated-Magazine-of-Natural-History-Volume-Xxix/214425/868#270

# Mike's Musings No.1 - Ignimbrites

In 1902, a calamitous volcanic eruption on the Caribbean island of Martinique destroyed the capital, Saint-Pierre, in a matter of seconds. The culprit was an avalanche-like emulsion of pyroclastic particles propelled by incandescent gas, which raced across the island claiming everything in its path. This material collapsed out of the volcanic plume and flowed instead like a wave across the land surface because it was more dense than the surrounding atmosphere. It was given the distinction of a new name, **'nuée ardente'**, a term much used ever since to describe the mechanism of such eruptions.

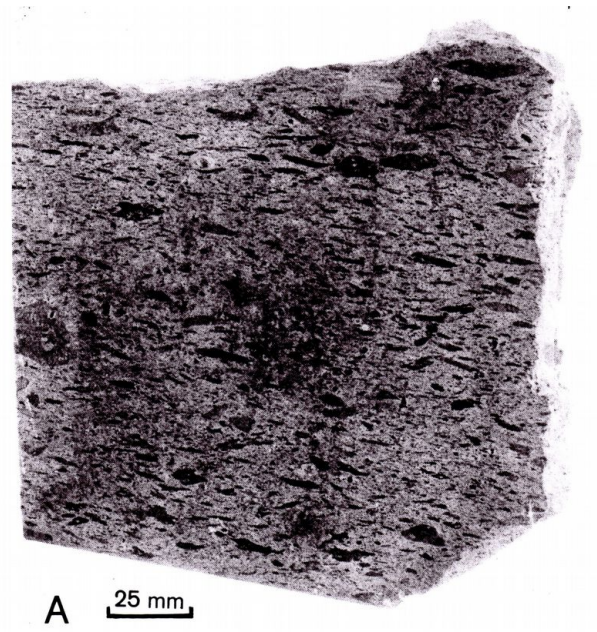


*Fig 1: Ignimbrite from Owharoa - cut and polished section showing streaky 'welded' internal texture*

The rocks produced by such events were more fully described in reference to certain outcrops on New Zealand's North Island in 1932 and 1935, where they were first given the name **'Owharoite'.** Such rocks were characterised by having a distinctly streaky internal texture (fig. 1), containing a good proportion of glassy material, and often forming the familiar columnar structure in outcrop (fig. 2), more commonly associated with lavas.

The streaky texture arises from a mass of glass shards which fuse, collapse and weld together due to the high temperatures within the nuée ardente, and being the most conspicuous feature in hand specimen, these rocks were referred to as **'welded tuffs'**. This welded texture had, in fact, been described in these New Zealand volcanics as long ago as the 1910's, but were thought to be either a special type of lava flow or a flow breccia. The descriptions **'ash flow'** and **'tuff flow'** were also in use.

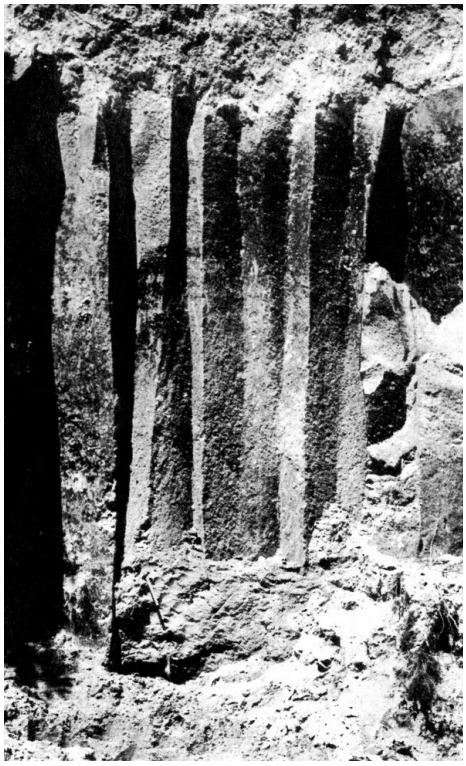


*Fig 2: Owharoite in disused quarry, Auckland Province - showing columnar jointing (note hammer for scale)*

Meanwhile the term **'lenticulite'** had also been used in connection with some of these rocks, in particular certain rhyolitic rocks which contained lenticles of glassy material.

This confusion of different terms seems to have been brought under some sort of control with the introduction of the single term **'ignimbrite'** in the 1930's literature, again in respect of these volcanic rocks from New Zealand.

Since then, ignimbrites have been recognised in many other volcanic settings, most notably, perhaps, in respect of Vesuvius (Pompeii, Herculaneum, etc.) and Mount St. Helen's. Further work has subsequently shown that not all ignimbrites are necessarily 'welded'; a **'non-welded ignimbrite'** is composed predominantly of pumice fragments in which glassy particles preserve a high proportion of interstitial gas (or air) bubbles, giving a frothy appearance not unlike a solidified foam. ►

A 'welded ignimbrite' represents material that has changed its appearance rather more from its unlithified parent than a 'non-welded ignimbrite'. These changes are due in part to the physical, chemical and thermal nature of the parent magma, partly to the movement of escaping gases from the parent magma, and partly to the degree of compaction applied during solidification. Thick ignimbrites are likely to be more highly welded towards the base because of the greater overlying weight of material. They are also likely to be more variable in make up, resulting in still more complex jargon like the terms **'heterolithic'** ignimbrites and **'zoned'** ignimbrites.

Recognising the subtle and varied processes that may take place within a nuée ardente has resulted in the term ignimbrite embracing more than just the original streaky 'owharoites', 'lenticulites', etc. so that they have become far more common in the volcanic record than was first appreciated.

*Fig 3: Welded Tuff from the Lake District (background grid of centimetre squares for scale)*

An interesting example of this is seen in the history of our understanding of the Lakeland Borrowdale Volcanics. Some of these volcanics had been described as **'streaky rocks'** as long ago as 1876. One (not widely held) opinion suggested that they had been formed under pressure, by late-stage solfataric action. It wasn't until the 1950's that visiting geologists from New Zealand (where else!) made the connection and described them as ignimbrites (fig. 3), thereby solving a puzzle as to their misunderstood origin.

This brings me round to making a final connection with the problem of the origin of the Sgurr of Eigg, outlined in my item on 'some curious rocks of the Hebrides' *(Issue 234, pp 6-9).* Having woken up to the wider range of the ignimbrite phenomenon, the notion that the Sgurr of Eigg pitchstone was deposited as a nuée ardente valley infil does bear consideration. It explains, for instance, the apparent mobility of this highly acidic, viscous, magma. *(See 'Members Forum' below for more on the Sgurr of Eigg. Ed)* ■

*Mike Allen*

# Members' Forum

## New interpretation for the Sgurr of Eigg

If you were at the Members' Evening and Christmas Social on 7 December, you may be interested in a brief epilogue to the discussion which followed Mike Allen's talk on the Sgurr of Eigg pitchstone and the 'Small Isles'. The Sgurr of Eigg pitchstone has previously been interpreted both as a lava and as a sill. A recent paper by David Brown & Brian Bell (2013) interprets the pitchstone as an erosional remnant of an extensive ignimbrite sheet that formed during a sustained pyroclastic eruption, the first such unit recorded within the North Atlantic Igneous Province. This explanation envisages deposition from a pyroclastic flow - essentially a cloud of hot sticky material which infilled the valley and laid down the sequence we see today. ■

*Roy Starkey*

Reference: Brown, D.J. & Bell, B.R. (2013): 'The emplacement of a large, chemically zoned, rheomorphic, lava-like ignimbrite: the Sgurr of Eigg Pitchstone, NW Scotland'. Journal of the Geological Society, London, Vol. 170, 2013, pp. 753–767. *Go to http://eprints.gla.ac.uk/79502/ to read the abstract. Ed.*

**GeoScenic**

For those of you who have read all through the Newsletter wondering where and when the front page photo was taken, let me put you out of your misery! It is Beacon Hill Quarry (disused), about ½m. north of Sedgley, and was taken in July 1921. You can find the photo in the BGS GeoScenic collection by going to their website: geoscenic.bgs.ac.uk and searching for P201925. This photo has also been used on the new Black Country Geopark's website for Geosite No 008 'Sedgley Beacon and Beacon Hill Quarries': www.blackcountrygeopark.org.uk/sites-to-see/sedgley-beacon-and-beacon-quarries/

The GeoScenic photo archive is a vast collection of geological photographs which you can view and download freely for all non-commercial use. You can search for specific sites using place names or by using a map. Please let the editor know if you find any other photos that you think members would be interested in.

A link to the GeoScenic website and many others of geological interest can be found on the links pages of the Society's website: bcgs.info ■

*John Schroder*

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