



The Black Country Geological Society

Committee

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Vice-Chairman

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Hon Treasurer

Mike Williams

Hon Secretary

Position vacant, see p.5

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Field Secretary

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Newsletter No. 212

April 2012

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Copy date for the next Newsletter is

Friday 1st June 2012

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: 07973 330706 or email: andrewcfharrison@yahoo.com

Monday 23rd April: (Indoor Meeting) 'Midges, Ticks and Smelly Goats: Exploring the Geology and Earth Heritage of the Palaeogene Staffa Lava Formation, Isle of Mull'. Speaker: Dr Ian Williamson formerly British Geological Survey & Natural England. This talk will initially concentrate on describing the results of recent research into the Staffa Lava Formation. It will put the geological story of this magnificent landscape into context with the palaeogene events associated with the opening of the Atlantic ocean and will describe the wonderful Earth Heritage of this amazing place as well as showing some of the more practical aspects of working in the field on Mull. Ian has also very kindly offered to lead a trip for the Society for 10 - 15 BCGS members, particularly focussing on the geology of the Ross of Mull.

Sunday 29th April: (Joint Field Meeting with WGCG) Visit to the Lickey Hills, 'Champions Project' Quarries and the Clent Hills. Led (in the Lickey Hills) by Julie Schroder and other members of the Lickey Hills 'Community Earth Heritage Champions' group. Meet: 10.15 for a 10.30 start at the Lickey Hills Country Park Visitor Centre, Warren Lane, Birmingham, B45 8ER. We will follow the 'Champions Trail' (approx 2 mls.) focusing on the Ordovician Lickey Quartzite formation, its relationship within the local landscape, and some spectacular folding in the Barnt Green Road Quarry. Light refreshments available at the VC, or bring a packed lunch. After lunch we drive to the Clent Hills: start point Nimmings Woods Car Park, GR SO 938 807 (meeting time tbc on the day). Led by Andy Harrison. Trail length approx 2.5 miles, (0.5 miles on foot). Starts on Clent Hill, includes St Leonard's Church and ends at the road cutting at Holy Cross. May include St Kenelm's Church and the source of the Stour if time allows. We will see the Clent and Kidderminster Formations, progressing into the Bromsgrove sandstone and various geologies of the surrounding landscape.

Tuesday 19th June: (Joint Field Meeting with the Geological Society of London) Canal trip into Dudley Limestone Mine. Meet at 6pm, followed at 7.30pm by 'Grey Pays un Baercon' at the Park Tavern Woodsetton sponsored by BCGS. Further details to follow.

Saturday 30th June: (Field Meeting) Visit to Haughmond Hill Quarry (nr. Shrewsbury) and The Ercall (nr. The Wrekin) Led by Bob Bucki. **Locality 1:** Meet at Haughmond Hill Quarry car park SJ 543 149 at 8.40am. All attending must have helmets, boots and Hi Viz jacket or jerkin as this is a working quarry and the manager will not allow access unless we follow the safety procedures. We will look at the Precambrian sediments of the Stretton and Wentnor Groups that comprise the Longmyndian Supergroup. **Localities 2 and 3:** Meet around 1.00pm after a lunch stop (at a local pub maybe? or packed lunch) at Forest Glen car park on the south side of Lawrence Hill, SJ 639093. We shall be looking here at the Uriconian Volcanics of the Upper Precambrian and the unconformity that marks the base of the Cambrian marine transgression.

Field visits in the pipe line:

September: Visit to the Snailbeach Mines, Shropshire, jointly with the Shropshire Geological Society.

October: Visit to Charnwood Forest, Leicestershire, led by Mike Allen.

October to February 2013: Geo-conservation months.

Car Sharing for Field Trips

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. We hope that this will encourage members to attend the more distant field visits.

Monday 15th October: (Indoor Meeting) 'The Geological Photo Archive of the Geologists' Association'. Speaker: Dr. Jonathan Larwood, Natural England, Peterborough. The Geologists' Association has a long history stretching back to 1858. Throughout much of that history it has recorded its activities through written documents and captured its field excursions in many photographic formats including glass plates. This talk will reveal some of the forgotten images of geology through the last century with particular reference to the Black County and its surroundings.

Monday 19th November: (Indoor Meeting) 'Next Steps for the Development of the Lapworth Museum of Geology'. Speaker: Jon Clatworthy of the Lapworth Museum of Geology, University of Birmingham. During 2010 and 2011 the Lapworth Committee have been drawing up plans for a major re-fit and re-display of the Lapworth Museum. Jon will share this vision with us and focus on some of the new initiatives of the redevelopment, and will also give some insight into the gemstone collections on loan from the Birmingham Museum and Art Gallery.

Monday 10th December: (Indoor Meeting, 7.00 for 7.30 start) BCGS Members' Evening and Christmas Social. This will comprise the usual eclectic mix of short presentations, sharing of geological knowledge and experiences, members' collections to be envied, and pleasant conversations within a convivial festive atmosphere embellished with a lovely buffet.

Events at Dudley Museum and Art Gallery

Rock and Fossil identification. Bring your rock and fossil finds along to the Museum and Art Gallery and have them identified by resident experts from **11.00am - 1.00pm** on **Wednesdays**: 11th April (Easter Holidays), 1st, 8th, 15th, 22nd, and 29th August (Summer holidays), and 31st October (Half term), or the same time on **Saturdays**: 12th May, 23rd June, 7th July and 24th November.

Saturday 22nd September 10.00am - 4.00pm: Magical Minerals and Fossil Fair. Admission free. (N.B. Date Changed from 25th August) This event will be held entirely in the Museum and Art Gallery, and will be a smaller event than the two day Festival held last September. Aimed at collectors, this is a chance to meet some of the country's leading fossil dealers and purchase from the amazing array of mineral specimens.

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.

Mid Wales Geology Club

Wednesday 25th April: The arid desert that was Montgomeryshire. Talk: Dr John Davies.

Wednesday 30th May: Life in tropical reefs of the old Welsh Borderland. Talk by Dr Caroline Buttler.

These meetings are in Welshpool at the Methodist Schoolroom. Meet at 7.15 for 7.30pm. Further details: Ed. newsletter & Hon Sec: Tony Thorp: Tel. 01686 624820 and 622517 jathorp@uku.co.uk
Web site: <http://midwalesgeology.org.uk>

Please send material for the next Newsletter to:

julieschroder@blueyonder.co.uk

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

Warwickshire Geological Conservation Group

Wednesday 18th April: Dr. Howard Falcon-Lang (University of London), Coal Forests and Climate Change. (To be held at the Royal Spa Centre, Newbold Terrace, Leamington Spa).

For details of venues/times contact Ian Fenwick swift@ianfenwick.f2s.com or 01926-512531. The WGCG mobile phone (07527 204184) available on the day from 11.00. There is a charge of £2.00 for non-members. For further information visit: <http://www.wgcg.co.uk/>

Shropshire Geological Society

Saturday 21st April (day meeting): Earls Hill, led by David Pannett. An introduction to the landscape. Booking to reserve a place and obtain details from David Pannett; tel: 01743 850 773.

Saturday 5th May (day meeting): Around Caradoc, led by Keith Hotchkiss. Suitable for beginners - a walk tracing Edgar Cobbold's faults and Comley Quarry. Book to reserve a place and obtain joining instructions from Keith Hotchkiss, by email: kah22@btinternet.com; tel: 01694 723 130.

Tuesday 22nd May (evening Rockhop meeting, commencing 6.00 pm): Cardington, led by David Pannett. An opportunity to see building stones around the village. Easy walking. Booking to reserve a place and obtain joining instructions from David Pannett; telephone: 01743 850 773.

Saturday 9th June (afternoon Rockhop meeting, commencing 2.00 pm): Bridgnorth, led by Andrew Jenkinson and Mary Steer. An opportunity to see desert sediments. Easy walking. Book to reserve a place and obtain joining instructions from Eva Peringer; tel: 01746 764 189 e-mail: pertam@vaperinger.plus.com

Anyone wishing to attend should telephone or email the co-ordinator for the meeting at least 48 hours in advance of the activity. A charge of £3.00 is levied for non-members. Further info at: www.shropshiregeology.org.uk/

Herefordshire and Worcestershire Earth Heritage Trust

Through the summer months the H&W EHT and their Geopark partners are running a wide variety of geology related events, with something for everyone. Below is a selected summary of 'GeoFest' events for June, and a 'Rock and Fossil Roadshow' in April. There's much more! Full details of 'GeoFest' events and the 'Rock and Fossil Roadshows' can be found on their website (see box below).

Guided Geology and Landscape Walks (mostly starting at 10.00am) will take place on:
Saturday 2nd June: 'Bromyard Down and Bringsty Common'. **Sunday 3rd June:** 'The Geology of North Hill, Malvern'. **Saturday 9th June:** 'An Ice Age River through an Ancient Desert' (2.00 - 4.30pm starting in Bridgnorth). **Tuesday 19th June:** 'The Mathon River' (starting W. of England car park, Malvern Hills). **Sunday 24th June:** 'Herefordshire Beacon and Broad Down'. **Saturday 30th June:** 'Huntley, Longhope and Hobbs Ridge', Gloucestershire.

The Three Counties Show - Family Event: Friday 15th June - Sunday 17th June. Gloucestershire Geology Trust and H&W Earth Heritage Trust will hold a joint geological display, plus information about projects.

Thursday 12th April, 11-3pm: 'Rock and Fossil Roadshow' Hereford Museum Resource and Learning Centre, 58 Friar Street. Learn about rocks, fossils, minerals and Earth Science. Lots of fun activities, and specimens to examine and handle.

For further information about the Trust's events, roadshows and other activities visit the H&W EHT's web site: www.earthheritagetrust.org/ or phone: 01905 855184.

Stamford and District Geological Society

Saturday 28th April: Ketton Quarry. Meet 10.00am at the quarry offices via Pit Lane. Fossils and new exposures of Jurassic strata and faulting.

Saturday 12th May: Maxey. Meet at the end of Woodgate Lane leading S from village main street. Map ref: Sheet 142: 130 801. Exposures of Pleistocene gravels and Oxford Clay, both with fossils.

Saturday 2nd June: Shorncote Quarry, Nr Cirencester. 7.30am to 1.00pm. There are exposures of Cornbrash and Pleistocene. Let Kenny Nye know when you expect to arrive. He will also give you details of how to get there. Email: knyc@btinternet.com

Visitors are welcome on payment of £3.00. Contact Bill Learoyd: billlearoyd@aol.com
Further information at: www.stamfordgeolsoc.org.uk/

Manchester Geological Association

Saturday 12th May: Fred Broadhurst Memorial Walk: Rowarth - Lantern Pike, led by Jane Michael. Meet at 1030. This excursion will follow Walk 18 in "[Rocky Rambles in the Peak District](#)" by Fred Broadhurst and build on the 2011 trip to Cown Edge.

Saturday 9 June: Dangerous Dinosaurs and Fabulous Fossils. Tribute to Fred Broadhurst at Park Bridge VC, Ashton-under-Lyne, 11.00-3.00. Led by Chantal Johnson and the Broadhurst Family.

Visitors are always welcome. Please book in with Jane Michael if you intend to come along to any of the field events:- Telephone 07917 434598, email: outdoors@mangeolassoc.org.uk
Further information about meetings at <http://www.mangeolassoc.org.uk/>

Woolhope Naturalists' Field Club - Geology Section

Sunday 22nd April: Geology Ancient and (nearly) Modern: the geology of the Llangorse Basin and middle Usk Valley. Led by Duncan Hawley.

Monday 7th May: Walking excursion to the Ledbury area, including Loxter Ashbed Quarry and the Haffield Breccia. Leaders: John Payne & Andy Sims.

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

Honorary Secretary Vacancy

Following on from the AGM, the position of Secretary to the Society remains unfilled. The Committee therefore invite any member who is interested in filling the vacancy to contact the Chairman, Gordon Hensman gwhensman@aol.com or Treasurer, Mike Williams bungalowmike@blueyonder.co.uk who is acting as Secretary at the moment. Duties of the Secretary are to act as a point of contact for the Society and deal with any communications from other parties, as well as organising the Agenda and taking minutes for circulation at BCGS Committee meetings and the AGM.

Annual General Meeting Report

The AGM was held on Monday 19th March at 7.30pm followed by a most enjoyable talk on 'The Permafrost' given by Dr. Richard Waller of Keele University. The following is a summary of the AGM reports.

Chairman's Report

The Chairman, Gordon Hensman, reflected on a very hectic year for the Society, which involved a lot of work by our members and Committee. He thanked all who have been involved for their unstinting support, with a special thanks to our out-going Secretary, Bob Bucki, who has very ably represented us at the meetings of the Geologists Association. He reiterated the Society's deliberate policy to increase public awareness of the BCGS as a valuable asset to their culture and inheritance. In addition to last summer's events (*as reported in the February Newsletter, No. 211, p.7*) the Chairman was pleased to add that the BCGS has now taken control of the 'Geology Matters' website (geologymatters.org.uk/). All this was in addition to our long-established programme of Lectures and Field Visits.

Election of Officers

All serving officers of the committee offered themselves for re-election with the exception of the Honorary Secretary who is standing down. This position remains vacant. (*Please see box on p.5 for more information.*) Martin Normanton was re-elected as the auditor for the Society.

Gordon Hensman, Bob Bucki, Julie Schroder

Treasurer's Report

Although the BCGS Balance Sheet states an increased loss to £385.58 for the year, cash reserves remain at historically high levels due to the extremely successfully membership recruitment drive held at Dudley Rock & Fossil Festival last September. BCGS also does not reflect the value of stock items on the Balance Sheet, and the potential resale revenue to be derived from such goods easily covers the value of the loss.

The Committee has agreed in principle to continuing with expenditure on marketing items and participation in events to further raise the profile of the Society. Any member who can find time to participate in manning the BCGS stall at any events will be most welcome. Please contact the Treasurer, Mike Williams at: bungalowmike@blueyonder.co.uk

Mike Williams

Lord Avebury and the West Park Erratic Boulders

Newsletter 201 (June 2010) contains the report of the BCGS field trip to West Park and Compton in Wolverhampton. Reference is made to the large erratic boulders in the park, some of which can be traced back to the creation of this public open space in 1881.

In 1889 the Minutes of the Parks Cemeteries and Baths Committee (PCBC) record that 'Mr Councillor Langley suggested the desirability of affixing tablets to the large stones in the park containing a description of the same'. However a further 15 years were to elapse before a serious attempt was made to put this resolution into action and then only as a result of the visit of Lord Avebury to the town in 1904. ►

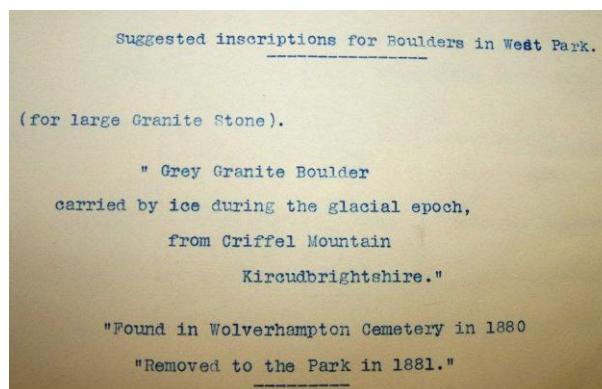


Figure 1

Lord Avebury, FRS FGS (Sir John Lubbock 1834-1913), Polymath, Botanist, and Landscape Interpreter, was a friend and contemporary of Charles Darwin and Sir Joseph Hooker. He introduced the terms 'Palaeolithic' and 'Neolithic' to denote the old and new stone ages, founded the Proportional Representation Society (now the Electoral Reform Society), wrote numerous scientific papers and books including in 1865: 'Prehistoric Times As Illustrated By Ancient Remains And The Manners And Customs Of Modern Savages'. He was also a Liberal Peer involved in the introduction of the Bank Holidays Act 1871 and the Ancient Monuments Act of 1882.

It is therefore no surprise that when the Council received his letter dated 6th November 1904 suggesting the labelling of the West Park Erratic Boulders, the Council Minutes of the 9th November record that a resolution moved by the Mayor be 'cheerfully accepted'. The Council even approached Lord Avebury for his opinion as to the suitability of the wording on the tablet to be used, as further correspondence from Lord Avebury records 'Mr Elliot's suggestions which I return quite seem to meet the case'.

These suggestions are recorded in the PCBC Minutes as:

- 1) Grey Granite Boulder (Figure 1)
- 2) Block of Felsite (Figure 2)
- 3) Syenite Boulder (Figure 2)

It was further resolved on 30th January 1905 that 'proposed inscriptions as approved by Lord Avebury be adopted and that the Borough Engineer report at the next meeting as to the best method and cost of labelling the boulders'.

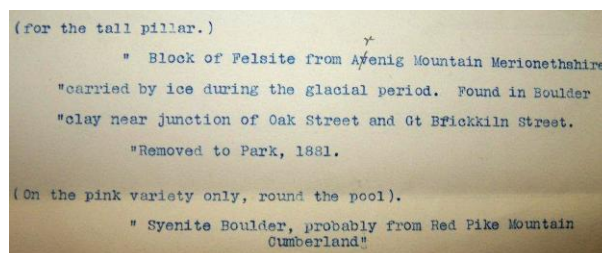


Figure 2

This subsequently led to an initial quotation of £2 for printed boards or £7.10s for inscribed plates with a slight extra for fixing. The Committee did not in fact make a decision on the above, but resolved that Mr Councillor H. B. Jones and the Borough Surveyor make further enquiries and report with regard to the method and cost of labelling the boulders. The Borough Engineer subsequently submitted descriptions which he had settled with Mr Councillor H. B. Jones and the cost of completing the work would be £3.3s.



The 'Grey Granite Boulder' (see Figure 1)

So thanks to Lord Avebury and the good Councillors of Wolverhampton we have the record of how the West Park Erratic Boulders came to have tablets attached to them. However, anyone who has visited the park will know that the Erratic Boulder located closest to the tennis court no longer has its tablet attached. This is the Grey Granite Boulder referred to above.

BCGS in conjunction with Wolverhampton Council are therefore in the process of establishing the cost of reinstating the historically important tablet and it is hoped to make an announcement through the newsletter when this objective has been achieved. ■

Mike Williams

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julieschroder@blueyonder.co.uk

The Dudley Bug

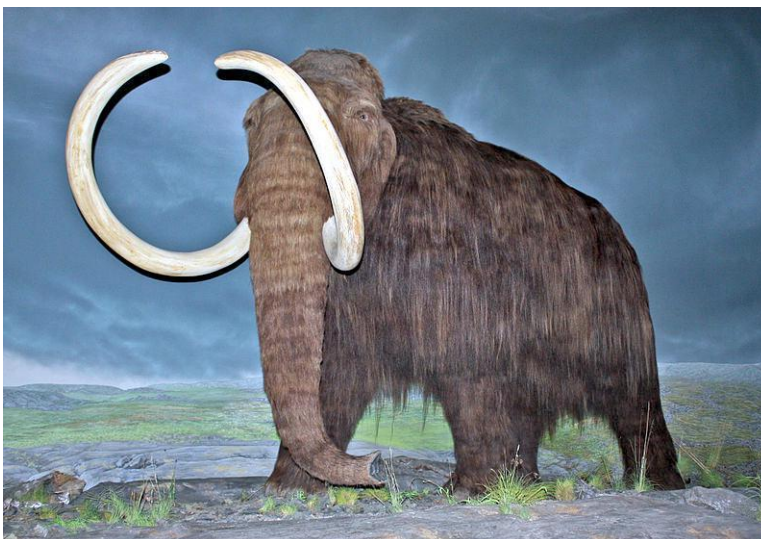
Boring Rocks

As a geologist I can never go anywhere without being easily distracted, for example I'm sure people (mainly women) often think I am 'eyeing' them up, when in actual fact there is an interesting sedimentary structure preserved in the wall behind them. Likewise, walking through the Merry Hill Centre, I am probably branded a complete nutcase when walking across the fossiliferous limestone floor whilst making "oooooooooh" sounds. For the past eight years I have been prejudged as a weirdo because I like to lick rocks, and I just can't work out why these non-rock lovers think geologists are boring and strange.

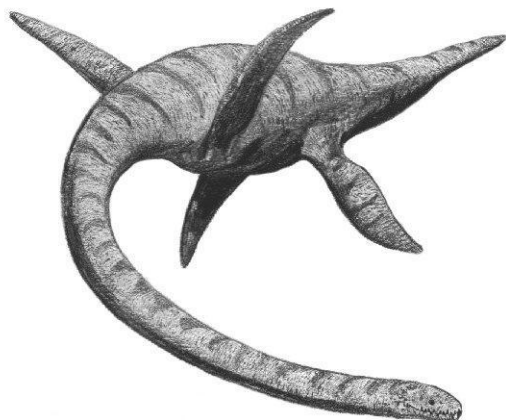
Yet I thought deeply about why geologists are among the sexiest and cleverest people around, and came to the conclusion that if we created a zoo it would be the best zoo in history (ok so I may be a little biased!). "That's random" I hear you cry, and yes it is but that is how a geologist thinks.

So, to prove my theory I have come up with a list of the top 10 animals to put in my geo-zoo.

10. **Mammoth** – I would call him 'Fluffy' and he would create a much better ride attraction than a donkey.



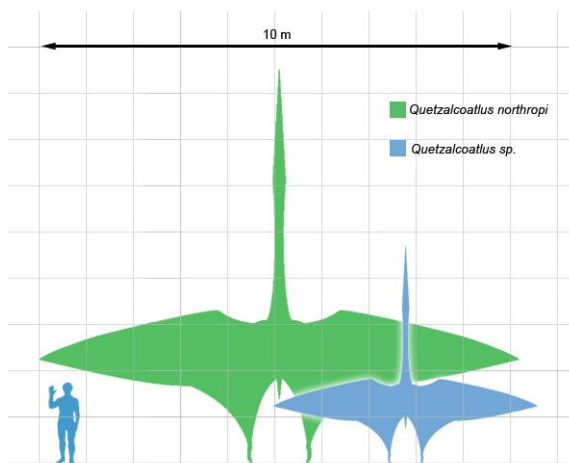
'Fluffy'



9. **Plesiosaur** – Not Nessie, but some of her ancient relatives could provide a water show like no other.

All diagrams and pictures in Dudley Bug are from Wikimedia Commons

8. **Quetzalcoatlus** – The largest of the pterosaurs with a wingspan up to 45ft. By holding the title for the largest creature ever to fly this would be an inspiring sight. ►





7. **Sabre Tooth Tiger** – A legend of the ice age, and a powerful predator. Great for school holiday activities like sharpening a sabre tooth. This would undoubtedly come with a health and safety warning that if attempted no liability can be accepted for eaten children.

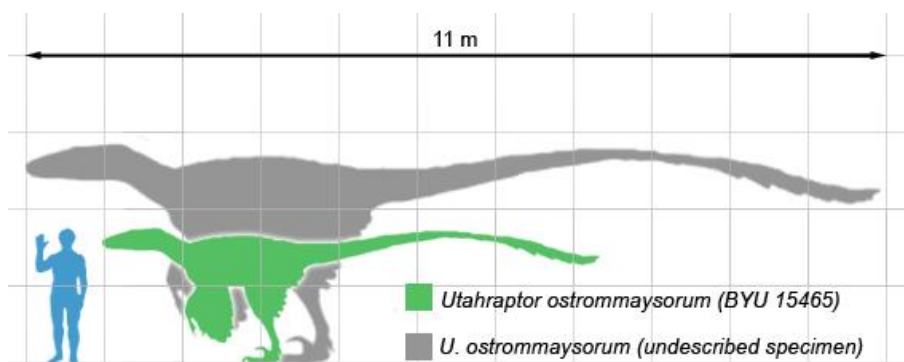
6. **Archaeopteryx** – Half dinosaur and half bird, the perfect way to confuse your kids.

5. **Terror Bird** – This is Big Bird's scary cousin, one of the largest birds ever to have lived. The head was as big as a horse standing 3m high. This beastie could provide a terrifying attraction.



Titanis walleri
a "terror bird"

4. **Utahraptor** – This 20ft long raptor hunted with large claws and is a giant compared to the chicken-sized Velociraptor.



3. **Arthropleura** – A giant 6ft long millipede which roamed the Carboniferous forests.

2. **Trilobites** – These cute critters have an amazing variety of species and no zoo could be without trilobite feeding time.

1. **Tyranosaurus Rex** – The king of the dinosaurs could have been a hunter, scavenger or both. But one thing is for sure it couldn't run very fast. Recent research suggests T-Rex could have had ginger feathers, although this was still one of the scariest pair of jaws in history.

If you're not convinced yet, then in how many other subjects can you learn about cleavage or have your teacher demonstrate hardness to the class?

One of the most bizarre geology lessons I ever had was at college, and one of my classmates mentioned that he had a friend who could take off his underpants while still wearing his trousers. In the end the teacher said to get him in to prove it. I am glad (and relieved) to say he **could** leave his trousers on. What has this got to do with geology? Well nothing at all, apart from proving my point....geology lessons are fun and geologists are cool.

Still not convinced? Well as final proof that geologists are cool, sexy and clever I must start by stating that a true geologist is hard, much harder than a namby-pamby, wishy-washy geographer, especially when sighted in mating plumage. This is indeed a rare sight because geologists are often seen stalking wild rocks to bring them into captivity with a humanely delivered swift blow from a rock hammer. Geologists are extra attractive due to their shiny, sparkly, glamorous specimen collections acquired at great peril to life and limb. When collecting these specimens one of the risks geologists face is being eaten alive by wild animals, but as we earth scientists are so clever we have a solution....take someone who runs slower than you along for the trip.

So the next time somebody says "Geology...isn't that boring rocks?" you can explain that we band of merry scientists are the sexiest, cleverest people alive, and would make Indiana Jones look like a cumbersome wuss. ■

"The Dudley Bug" is written by Alison and Chris.

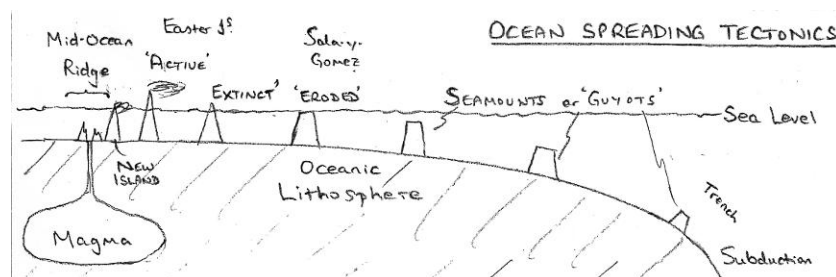
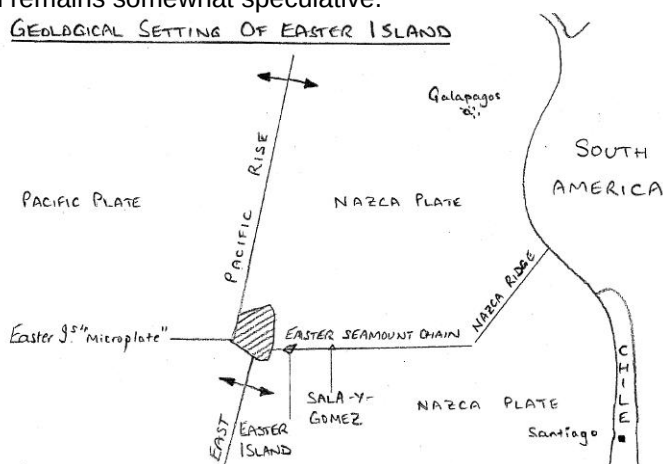
Easter Island - The Navel of the World

Easter Island, also known as Isla de Pascua and, to those who live there, as Rapa Nui is often described as the most isolated permanently inhabited spot on earth. And for good reason: its nearest neighbour, Pitcairn Island (with its own intriguing history) lies some 1,400 miles to the west, while Chile, who administers the island, lies over 2,300 miles to the east. But isolation no longer means ignored or forgotten. Regular flights bring in some 70,000 tourists a year these days - over ten times the fixed population, most of whom reside in Hanga-roa where nearly all the facilities are located. The rest of the island is a UNESCO World Heritage Site, made famous of course by the giant Moai, or carved heads that literally litter the hillsides in places. Many have now been restored to their former glory, surmounted on reconstructed Ahu, or platforms. It is clearly the archaeology that draws most visitors to the island, but much work has been done to understand the origins of the island itself, rather than the human (and other wildlife) settlers; indeed it might be argued that this geological history is clearer than the human history, much of which remains somewhat speculative.

The island is located east of the East Pacific Rise, the main spreading centre in this part of the ocean. At this point the rise is displaced to the left by the development of the Easter 'microplate' which has rotated clockwise and opened up further fractures in the vicinity. The most pertinent of these is the Easter Fracture Zone along which a chain of seamounts extending as far as the Nazca Ridge has been discovered. Lying just off the main line of this fracture one finds both Easter Island and the uninhabited reef of Sala-y-Gomez some 300 miles further east. By the way, if you labour under the

misapprehension that the ocean floors are more or less flat, think again. Side-scan sonar studies of the seabed across a relatively small area (600 by 200 miles or so) around Easter Island has found over 3000 volcanic structures including 60 with heights greater than 1000m (or higher than any English mountain) and therefore classified officially as 'seamounts' or 'guyots'.

GEOLOGICAL SETTING OF EASTER ISLAND



The development of the Easter microplate began some 10 million years ago and has continued at spreading rates of up to 16cm/yr (which is fast for this type of activity); unequal rates around the microplate mean that there is also an element of rotation, estimated

at between 20-70 degrees clock-wise. This general region of the ocean floor is therefore under increased strain, generally explained in rather nebulous terms as being the result of a 'hot-spot' in the underlying mantle. Such a 'hot-spot' eventually initiated localised melting within the ocean lithosphere which led to the birth of a volcano called Poike, some 3 million years ago - the first stage in the creation of Easter Island. Around 2 million years later a second volcano, Rano Kau, grew above the waves and later still a third volcano, Terevaka, developed on an even larger scale, eventually uniting the three volcanic edifices into one landmass. This tri-partite development explains the triangular outline of the modern island, since sculpted by the forces of the sea and wind, as well as being modified by many more smaller cones. Most of these erupted as parasitic outbursts on the flanks of the large Terevaka shield volcano.

Today the island is probably extinct - certainly dormant. There is little evidence of either seismic or fumarolic activity, and the last addition to the volcanic framework appears to have been Maunga Hiva Hiva which produced a flow of olivine basalt on the western flanks of Terevaka down to the coast north of Hanga-roa some 8-10,000 years ago. Another youngish feature is the cratered cone of Rano Raraku on Terevaka's broad eastern flank. This has been dated at around 35,000 years. ►

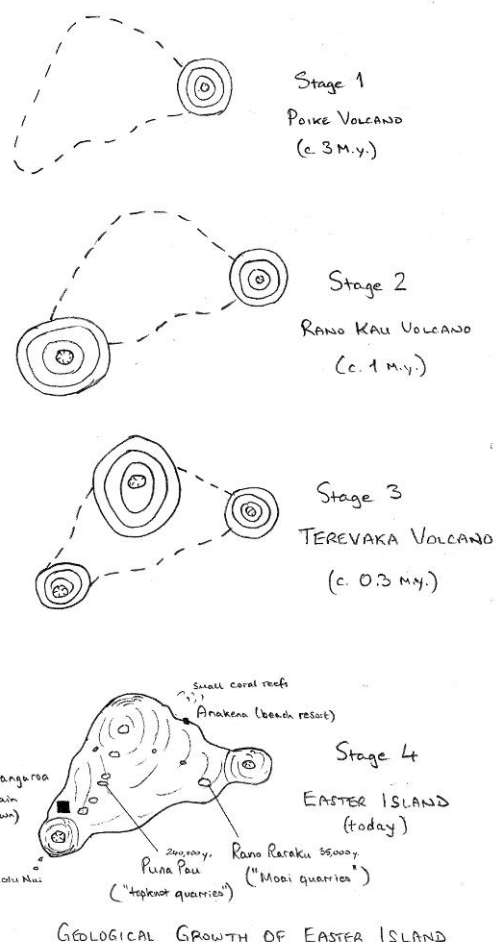
An early view, apparently one expressed even by such an eminent authority as Sedgwick (Adam, I presume!) is that Easter Island represents the foundered remnants of a sunken continent. Such ideas loomed large in the days long before plate tectonic theory - think of Atlantis. We now see that the opposite is the case, with such oceanic islands having risen much more like a mythical phoenix from the sea-floor. Similar eruptions are responsible for all the other irregularities of the sea-bed referred to above, and extending all along the Easter Fracture Zone, much like the more familiar chain of volcanoes associated with Hawaii. From this viewpoint, Easter Island is merely the latest in a chain of events stretching from the Nazca Ridge.

One of the most interesting aspects of the island's structure is the abundance of lava tubes and caves. These reflect the fact that the volcanic pile consists of many superimposed flows and falls of pyroclastic material. Some of these discontinuities give rise to shallow pools of freshwater, and with the absence of any permanent river courses these have proved vital in sustaining life on the island. It has been argued by some that their haphazard distribution probably contributed to the equally fragmented development of agriculture and settlement across the island; only with outside influence has there been a move towards centralised development. It might therefore be said that geology has dictated the pattern of life in this remote corner of the world.

More than this, geology has also influenced the activity that most characterises the Rapa Nui culture: the creation of hundreds of stone carved heads etc. that represent the islanders' former method of venerating the most important members of their society - later becoming an almost familial duty, so widespread was the practise.

The majority of the 900 or so Moai that survive, mostly intact even if tumbled or worse for wear, were manufactured from a relatively soft lapillar tuff quarried on the flanks of Rano Raraku. These became larger as expertise and confidence grew. Less suitable rocks have been used when, presumably, needs dictated: a few smaller Moai carved from a whitish trachyte that forms three small but conspicuous domes on the northern flank of Poike; eight less than perfect basalt Moai (rock too hard); and a handful of weathered Moai (rock too soft) carved from the red scoria usually reserved for the 'topknots' that adorn some of the larger heads. This latter rock was exclusively quarried at Puna Pau, just to the east of Hangaroa, one of a number of younger parasitic cones on the southern flanks of Terevaka which extend along a south-south-west trend as far as the intersection with the Rano Kau volcano.

One final rock type which appears to have special importance occurs only at Rano Kau and on three associated offshore islets ('Motu'). This is obsidian, which was used to produce the black irises of the white eyes inserted into the eye sockets of some (perhaps originally all?) of the Moai. Acidic (in the geological sense) obsidian (of rhyolitic composition) is associated with an uppermost layer of pumice, which probably represents a final degassing and ultimate collapse of this volcano. This produced the finest caldera structure on the island - an almost perfect circular crater one mile in diameter. The white of the eyes was effected from the occasional bit of coral which washed up on the northern shores - unlike many Pacific islands, Easter Island has no sign of any fringing or barrier reef, due to a combination of environmental circumstances. Much more could be said about this fascinating place, but that would fill several books. It was a long way to go for just a three day visit, but the memories will live on for a lifetime. ■



Mike Allen

BCGS Conservation Work 2012

The BCGS is continuing to work alongside the Black Country Living Landscapes Project (BCLLP) on several sites across the Black Country. Staff changes at the BCLLP have seen Paul Stephenson take over the reins of the BCLLP from Julia Morris, who we helped out at Moorcroft Wood last year. Recent volunteering days have included:



Springvale Park, Wolverhampton

11th February 2012: BCGS members helped with vegetation clearance of the dolerite and Etruria Marl outcrops in East Quarry, Barrow Hill. Frozen and icy conditions didn't deter volunteers from clearing away dense bramble, wild rose and hawthorn to improve access and reveal exposures of the columnar jointed dolerite, and:

25th February 2012: BCGS members assisted with bramble and sycamore clearance at Springvale Park, Wolverhampton.

Formerly an opencast coal pit, now backfilled and grassed over, exposures of Middle Coal Measures strata comprising sandstone and shale are visible in the western rim of the site. Some excavation of overlying soil was also required to reveal the layered exposure. (See *Pete Stamper's item in the 'Member's Forum', p.16 for a volunteer's account of the geoconservation work at Barrow Hill. Ed.*)

Much work is still required at both sites. Pleased with the results of recent clearance work, Paul is keen to introduce an annual programme of ongoing maintenance at these and other sites across the Black Country. Paul would also like to hear about other Black Country sites that could be added to this programme. Ecological restraints restrict conservation days to between November and February. With the current session now at an end the BCLLP is planning several guided walks around the recently cleared sites and others later in the year, led by Alan Cutler. Would those interested in helping out with future conservation days and going on the guided walks please contact Andy Harrison (mobile: 0797 3330706, e-mail: andrewcfharrison@yahoo.com). ■

Andy Harrison

Possible bonding between Tectonic plates

Recent research suggests that chemical bonding may be involved across fault lines to account for some of the friction generated at the boundary between tectonic plates. Two objects become harder to slide apart the longer that they sit together in contact. This is known as the 'ageing effect' and there are currently two theories to explain it. One suggestion is that it is due to 'creep' where two surfaces, slowly deform or mould into each other, increasing the area of contact with time. Surfaces are never absolutely smooth at least at the microscopic level. A more recent suggestion is that the interface quality also changes, which may accompany alterations in the area of contact and possibly increase friction. There is a possibility that the strength of binding at the interface between two surfaces, at the atomic level, may be increased as a result of chemical bond formation. To test this theory a research group used an 'atomic force microscope'. Such an instrument measures the friction between two solids: one is in the form of a very sharp tip (about 2nm wide, where 1nm=10⁻⁹m or one thousand millionth of a metre, so it's pretty small) which impacts on the other (flat) surface. The microscope measures the force required for the surfaces to be moved relative to each other.

Silica is a major constituent of many geological materials, so an experiment was conducted in which a 2nm silica atomic force microscope tip was in contact with a flat silica surface. The frictional force required to get the surfaces to move over each other was measured after different periods of time. It was found that the longer the time that the surfaces were in contact the greater was the force required for them to slide over each other. In other words, friction increased with contact time. This could well be due to the formation of chemical 'silicon-oxygen-silicon' covalent bonds across the interface, which would certainly increase the binding and hence friction between the surfaces. When the experiment was repeated with a similar silica tip in contact with either a diamond or graphite surface no ageing was observed i.e. there was no increase of friction with time. The origin of ageing must therefore have some chemical bonding involvement as it requires silica on both surfaces. If ageing was due to increased contact area (creep) then it would happen with diamond and graphite surfaces, which was not observed. ►

There is no doubt that creep plays a significant role in earthquakes, but the chemical aspect is there and should be taken into account in any model of earthquake friction. The chemical evidence is very convincing on the microscopic or nanoscale but some critics question whether it can be carried over to the macroscale. Fault lines can be a messy mix of rock, sand, grains and fluids. We do not yet know how to interpret data from one contact point to a complex geological interface, which includes an enormous number of such points. However, understanding all of the interactions at geological interfaces is important if one is going to ultimately predict and understand the real life situations at tectonic boundaries.

From the chemical viewpoint the formation of covalent bonding across an interface is not entirely unexpected. Silicon forms very strong bonds with oxygen and the thermal energy and pressures that arise at an interface could almost certainly provide the necessary activation energy for bond formation to occur. In chemical speak, there is likely to be chemical bond formation across boundaries. ■

This article was based on one in 'Chemistry World' January 2012.

Pete Stamper

Field Meeting Report

Saturday 28th January: Shorncote and Colne Quarries, Cotswolds. Led by Dr Neville Hollingworth (Science and Technology Facilities Council).

We met Neville Hollingworth on a cold and sunny day in the car park to Shorncote Quarry, south of Cirencester, around 10:00a.m. Because of safety concerns, Shorncote Quarry was a last minute change from our original start point at Round House Farm Quarry. Neville gave us some background to the day, geology and health and safety, then the morning was spent scouring the floor of Shorncote Quarry, and the afternoon at Colne Quarry, near Fairford. Both quarries cut into Jurassic strata with overlying Pleistocene sand and gravels.

FORMATION	LOCATION	AGE		ORIGINS	DESCRIPTION
Glacial Sands and Gravels	Shorncote Quarry	Pleistocene		N. Cotswolds, The River Churn/Thames	Yellow and orange brown fossiliferous sand and gravel.
	Colne Quarry			N. Cotswolds, The River Colne	
Lower Oxford Clay	Shorncote Quarry	Upper Jurassic	Oxfordian/Callovian	Deep marine basin	Grey fossiliferous clay.
Kellaway Beds	Colne Quarry		Callovian	Shallow marine	Grey and orange brown clay with thin layers of lenticular sand.
Upper Cornbrash		Shallow marine/coastal lagoon		Grey sandy limestone.	
Lower Cornbrash			Bathonian	Yellow rubbly fossiliferous limestone and clay.	
Forest Marble				Not seen	-

During the Jurassic Period a shallow epicontinental sea covered much of Britain, which lay at a latitude between 30° to 40°N on the western margins of the Tethys Ocean. This led to the deposition of fossil rich limestone and clay sequences throughout this period. In Shorncote and Colne quarries the rock exposures are generally Middle to Upper Jurassic in age. Together they form part of a stratigraphic sequence that represents a transgression to deeper marine conditions, associated with rifting and graben formation in the North Sea.

The sequence includes the Great Oolite, Cornbrash, Kellaways Beds and Oxford Clay. The Forest Marble forms the upper stratum of the Great Oolite, which is Bathonian in age and was deposited under relatively shallow marine conditions. However we did not see this formation on the day. ►

Shorncote Quarry

Shorncote Quarry has been worked on and off for the past ten years and is currently worked for aggregate to supply Network Rail. After a ten minute walk from the car park we arrived at an area of the quarry where the overlying Kellaway Beds had recently been removed to expose the underlying Cornbrash, which overlies the Forest Marble.

William Smith first coined the term Cornbrash to describe particularly stony, or brashy, soils in Wiltshire that were ideal for growing cereal crops. He first used the name in a geological sense when he observed that different fossils occurred in the lower parts of the formation compared to those in the upper parts. An abundance of ammonite and brachiopod fossils divides this formation into two units: the Lower and Upper Cornbrash.



The Lower Cornbrash is typically described as yellow brown rubbly limestone with abundant shell debris and a marly matrix. It is Bathonian in age and includes ammonite: *Clydoniceras discus*, and brachiopods: *Obovothyris obovata* and *Cererithyris intermedia*. Other fossil faunas include echinoids, bivalves and nautiloids.

The overlying Upper Cornbrash is Callovian in age and comprises grey sandy clay and limestone. This unit's distinguishing fossils include ammonites: *Macrocephalites macrocephalus* and *Paracenoceras*, and brachiopods: *Ornithella lagenalis* and *O. Siddingtonensis*.

In places the Cornbrash Formation can be up to 10m thick, however at Shorncote Quarry it is only 3.0m thick comprising 1.0m of Lower Cornbrash and 2.0m of Upper Cornbrash.

The Kellaways Beds, named after the hamlet of Kellaways in Wiltshire, overlie the Upper Cornbrash and are also of Callovian age. This unit is subdivided into the Kellaways Clay, (a grey clay with thin layers and lenses of sand that weathers to orange clay), and the Kellaways sand.

At Shorncote Quarry, Pleistocene limestone gravels overlie the Kellaways Beds. They were deposited between 15,000 and 64,000 years ago during the Devensian glacial period. The gravels form second river terrace deposits to the River Churn/Thames, which flowed from the Cotswolds to the north, and are derived from the Fairford coral beds. Corals and brachiopods can be found within the gravels along with the remains of more recent animals including mammoth, woolly rhinoceros, hippopotamus and the teeth of sharks and horses.

Colne Quarry

Like Shorncote Quarry, deposits of Pleistocene sand and gravel overlie Jurassic clays in Colne Quarry. These Upper Jurassic strata comprise Lower Oxford Clay (Peterborough Member) and encompass most of the Callovian and the Lower Oxfordian. The Lower Oxford Clay overlies the Kellaways beds, seen earlier, and are described as greenish grey clay/weak organic rich mudstone. Fossils include ammonites: *Binatisphinctes comptoni*, belemnites: *Cylindroteuthis puzosiana*, bivalves: *Gryphea* sp., brachiopods: *Terebratulida* sp., and marine reptiles like plesiosaurs, ichthyosaurs and marine crocodiles.



The Lower Oxford Clay is believed to have been deposited on a deep marine shelf, below the level of any wave activity in fairly nutrient rich waters. The fossils of most animals found within this unit would have been swimmers whilst others, like the bivalves and brachiopods, were probably planktonic, floating around on pieces of vegetation.

Another common feature seen within the Clay here are cone in cone structures. These are a secondary sedimentary feature comprising nests of concentric cones formed one inside the other. There are several ideas for their formation, which generally centre around an association with deep ►

burial, early diagenesis and the growth of conical nests of fibrous calcite that displace the in-situ clay minerals.

The Pleistocene sand and gravels here were deposited approximately 40,000 to 240,000 years ago by the River Colne, which also flowed off the Cotswolds to the north. They generally comprise orange/brown angular to sub-rounded fine to coarse flint and limestone, and include fossils of molluscs (belemnites and gryphea bivalves) and fish teeth from a later Jurassic Period than the Oxford Clay.

We finished the day late in the afternoon, pockets filled with fossils. I would like to thank Dr Hollingworth for his time and a very interesting day. ■

Andy Harrison

Geobabble

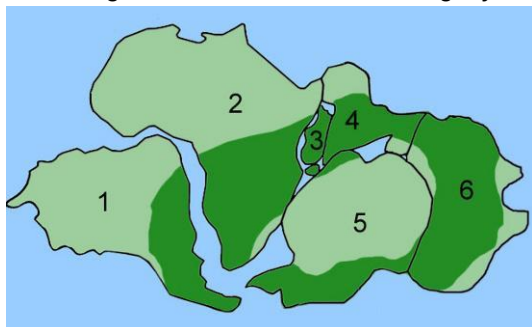
There has been quite an explosion of television programmes about science in the last few years, and geology has had its fair share of exposure. Professor Iain Stewart is well known and his programmes adopt a format where an often complex geological idea or concept is explained in the field, by an expert who is very skilled in communicating ideas to others. Professor Brian Cox has performed a similar function for astronomy and 'big' science generally. It helps if the expert on the screen is relatively young and fit, so that he or she can 'be a geologist' which for Stewart is to climb and scramble over steep slopes in magnificent scenery.

These programmes are invariably on BBC1 or 2 and usually at prime viewing time. They are also given much advance publicity with trailers in the weeks before the programmes start. Professor Richard Fortey recently had a three part series called, *'Survivors: Nature's Indestructible Creatures'*. In it he took three ages in geological history when many species died out, but surprisingly some survived. The middle programme dealt with the K/T mass extinction; he mentioned the dinosaurs, but only in passing as they did not survive. He answered questions such as how come the crocodiles and snakes survived?

Richard Fortey is well known in Dudley and is a great friend of the Museum and of the Wren's Nest. Some years ago he spoke at our own Wren's Nest celebrations, and I wrote down the opening of his short presentation; *"The Wren's Nest is an inspiration for young people studying geology; it is 'Holy ground' for palaeontologists"*. His series was tucked away on BBC4, but it was at a convenient time, so you could watch it.

However, you can find good geology in surprising places, and in programmes that are not presented by experts. There was a recent series *'The Great British Countryside'*, presented by Julia Bradbury and Hugh Dennis. It looked at magnificent scenery and related it to, amongst other things, the geology. I was particularly keen on the episode that dealt with Yorkshire around Ingleton and Malham, as it is spectacular and I have often led field parties there. There was an explanation by Hugh Dennis of the limestone pavement on Malham Scar, a clear explanation of the geological concepts in simple terms, while retaining the science. Hugh Dennis is a comedian, a regular panellist in the satirical news programme, *'Mock the Week'*, and he also plays the harassed father in the sitcom *'Outnumbered'*. However, dig deeper into his CV and you find a first in Geography from Cambridge.

The most frustrating is when you hear of excellent programmes when they have passed you by unnoticed, but nowadays we have the iPlayer on line. I missed a radio 4 programme a couple of weeks ago about Scott's scientific legacy between 1901 and 1912, so I used the iPlayer to listen to a



30 minute gem. Scott visited the Antarctic before the fateful 1912 expedition, but not the interior, and they were not sure what was there: was it a continent? He and his scientists studied the coastal region and started the science of Glaciology, the study of ice. They also made great strides in palaeomagnetism and made several scientific recordings. When Scott knew that Amundsen was in the Antarctic in 1912, some believe that he realised that he would not be the first to the Pole as Amundsen's expedition was - off the ship - get to ►

the pole - back on the ship and home. Scott wanted his expedition to be remembered for the science and discovery.

Geology played an important part in his exploration and when the bodies of Scott and his companions were found, they were still carrying 16kg of geological specimens, mostly Permian fossils with many specimens of *Glossopteris*, the seed bearing tree. These were found to match similar fossils from India and the other land masses we now refer to as Gondwanaland. This was at a time when it was believed that land masses could not move relative to each other, and so Scott's discovery became very significant and made a small contribution to the acceptance of Wegener's ideas. He first proposed Continental Drift in 1912.



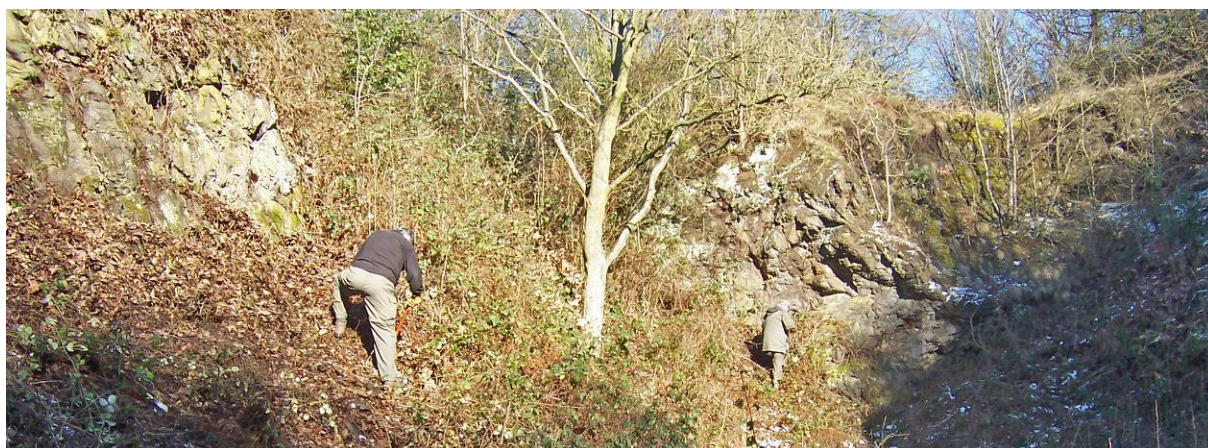
Glossopteris

All these programmes were well researched and make a great contribution to anyone who wishes to increase their knowledge of geology. They all happen to be on BBC and you can draw whatever conclusion you like from that. My only negative observation is that the faces on the screen were nearly always male; as the present crop of young geologists work through the system that should change. ■

Bill Groves

Members' Forum

Barrow Hill Geodiversity clearance day, Saturday 11th February



'Twas on a bright and sunny, but very cold and frosty morn, on 11th February that Paul Stephenson (senior ecologist) met four members of the BCGS outside St. Marks Church at 11.00am. The members concerned were Gillian Chant, Mike Allen, Alan Cutler and Pete Stamper. There was a light, but slippery, covering of snow on the ground so great care was needed in descending the path to the quarry. Our aim was to clear away vegetation in order to keep the quarry faces open for viewing. I remember visiting the quarry last summer and could not even gain access, because the vegetation was so dense. Despite the cold, once we set to work with secateurs, cutters and tree saws we soon warmed up and did not notice the cold. In fact, the conditions were ideal for the work we were doing. On a warm summer's day we would have been uncomfortably hot! We mostly cleared out last year's brambles and numerous saplings that were sprouting up. We achieved a lot of clearance but did not have sufficient time to complete the whole quarry. With a few more volunteers we may have done so. In all it was a most enjoyable day, not too arduous, and we all left with the satisfied feeling of having done a worthwhile job. Now that the job has commenced it is important to keep on top of things and not let vegetation take over again. ■

Pete Stamper

