



The Black Country Geological Society

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**NB. Copy date for the
next Newsletter is
Friday 18 November**

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**Linda Tonkin,
Honorary Secretary,**4 Heath Farm Road, Codsall,
Wolverhampton, WV8 1HT.

☎ 01902 846074

secretary@bcgs.info**Andy Harrison,
Field Secretary,**

☎ 01384 379 320

Mob: 07973 330706

fieldsecretary@bcgs.info**Julie Schroder,
Newsletter Editor,**42 Billesley Lane, Moseley,
Birmingham, B13 9QS.

☎ 0121 449 2407

newsletter@bcgs.info

For enquiries about field and geoconservation meetings please contact the Field Secretary.

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

For all other business and enquiries please contact the Honorary Secretary.For further information see our website: bcgs.info and Twitter account: [@BCGeoSoc](https://twitter.com/BCGeoSoc)

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.

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 17 October (Indoor meeting): 'Update on the Black Country Global Geopark.'
Speaker: Graham Worton.

Saturday 5 November (Geoconservation Day): Sedgley Beacon. Meet at the Sedgley Beacon car park entrance (GR: SO 923943, off Beacon Lane for 10.00. 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 2.30.

Monday 14 November (Indoor meeting): 'Optical Mineralogy.' **Speaker: Frank Wells.**

Saturday 3 December (Geoconservation Day): Portway Hill, Rowley. Meet at St. Brades Close at 10.30. Directions: from Birmingham New Road (A4123) turn left onto 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. Bring packed lunch. Finish at 2.30.

Monday 12 December (Indoor meeting): Members' Evening. This is our annual chance for members to share their geological experiences in a sociable atmosphere with a Christmas buffet provided by the Society.

Contributions needed from you!

We need a few of you to volunteer to do a short presentation - on any topic with geological connections; or perhaps bring some of your specimens for admiration, discussion and identification. Please contact our Secretary, Linda Tonkin if you can contribute to this event (contact details above).

Monday 16 January 2017 (*Indoor meeting*): 'Volcanics in Costa Rica'. Speaker: Andy Harrison.

Saturday 4 February (*Geoconservation Day*): Rubery Cutting. In conjunction with the Lickey Hills Geo-Champions and directed by the Lickey Hills Rangers. Meet at 10.30 at the cutting by the junction of the slip road from A38 Bristol Road South, and Leach Green Lane, B45 9XS (SO 993 775). Parking under the flyover. Tools and equipment will be supplied by the Park Rangers. Bring your own gloves, hard hat, and high viz jacket if possible (not essential). Finish around 2.00.

Saturday 18 February (*Geoconservation Day*): Wren's Nest. Details TBC.

Saturday 4 March (*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 packed lunch. Finish at 2.30.

Monday 20 March (*Indoor meeting, 7.00 for 7.30 start*): AGM followed by 'New fossil reptiles from the Triassic of Tanzania: implications for the origins of dinosaurs and their kin'. Speaker: Richard Butler (University of Birmingham).

Saturday 22 April (*Field Visit*): Mortimer Forest, Herefordshire/Shropshire Border. Details TBC.

Monday 24 April (*Indoor meeting*): 'A Teacher's View of Glacial Geology'. Speaker: David Pannett.

Saturday 20 May (*Field Visit*): Return to the Brymbo Fossil Forest, Wrexham. Details TBC.

Saturday 17 June (*Field Visit*): Visit to the newly refurbished Lapworth Museum, Birmingham. Details TBC.

Procedures for Field Meetings

Insurance

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

Health and Safety

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

Other Local Events

Unveiling of the Great Stone Plaque

**Saturday 8 October, 12.00 at the Great Stone Inn,
Church Rd, Northfield, Birmingham B31 2LU.**

Come along to witness this happy occasion! It will mark the conclusion of many years of determination and hard work on the part of BCGS member Roland Kedge. Assemble within the Pound. Roland will welcome and set the scene. Dr Rob Ixer will unveil the Plaque in the presence of Councillor Andrew Cartwright, District Heritage Officer and Councillor Debbie Clancy, Northfield Ward. The event will last approximately 30 minutes, and after thanks and acknowledgements, if you can stay on, the Great Stone Inn will be open for food and drink. Free coffee will be served in a room set aside. If you wish to visit the old church of Northfield across the road it will be open for coffee from 10.00 until 1.00.



This photo was included in an item about Birmingham's glacial erratics in Newsletter 206, April 2011, p14. See also Newsletter 207 p9 for more on this subject by Roland Kedge. The newsletters are on our web site if you can't find your back copies: <http://bcgs.info/pub/the-society/newsletters/> Ed.

Lickey Hills Geo-Champions

Two events for the Geological Society's 'Earth Science Week' - theme 'Geology in Action'. Based at the Lickey Hills Country Park Visitor Centre, Warren Lane, Birmingham B45 8ER, in conjunction with the Lickey Hills CP Rangers. More information: <http://ehtchampions.org.uk/ch/calendar/>

Saturday 8 October, 10.30 - 2.00: Open Geoconservation Day at Kendal End Quarry. (Quarry grid ref: SP 002747, a short walk south from the Visitor Centre. This is an opportunity to drop in and see the group in action with clearance work in this quarry. They will be happy to answer questions about the quarry, the local geology, the work they do and why they think it's important! No charge - all are welcome.

Sunday 16 October, 10.30 - 3.30: 'Lickey Rocks' Activity Day in the Lickey Hills. The day includes displays, geologically-themed family activities, and a **Guided Walk on the Champions Trail at 1.30.** The walk is about 1.5 miles, and will end at approx. 3.00. Mostly easy walking, but some rough ground and one fairly steep slope with steps. Wear strong shoes. No charge - all are welcome.

Birmingham and Black Country Wildlife Trust

Sunday 9 October, 11.00 - 1.00: Birmingham City Centre Fossil Hunt. Led by Laura Hamilton. A guided walk around Birmingham city centre to delve into the geological past and discover ancient coral reefs in the walls of buildings! For more information and booking: www.bbcwildlife.org.uk/whats-on

Monday 24 October & Wednesday 26 October, 10.30 - 4.00: 'Meet the Geologist' Family Activity Days. Venue: Thinktank Science Museum, Millenium Point, Birmingham, B4 7XG. There will be information about sites of geological interest for you to take away and explore in your own time, fun activities for all ages, and the chance to meet a geologist and learn more about the history of the West Midlands. Thinktank ticket charges apply. For full details for both days go to: <http://www.bbcwildlife.org.uk/whats-on>

Wolverhampton Local History Fair

Saturday 29 October, 10.00 - 4.00: Venue: Molineux Hotel Building, Whitmore Hill, Wolverhampton West Midlands, WV1 1SF. More than 20 stalls representing local history and heritage societies and expert historians from across the Black Country will be accommodated in the refurbished rooms of the historic Molineux Hotel Building. Local history societies from across the region will be attending along with other local organisations including the Black Country Living Museum and the Dudley Archives.

We have requested a stall for a BCGS display at this event (yet TBC). If you could volunteer to help for all or any part of the day, please contact our secretary, Linda Tonkin (contact details on p2).

Voice of the Malvern Hills Conference

Sunday 27 November, 9.45 - 4.00: 'Understanding the Malvern Hills'. Venue: Malvern Cube, Albert Road North, Malvern WR14 2YF. Tel: 01684 575363. There will be a number of geologically themed talks including: 'The Making of the Malvern Hills', 'Springs of the Malvern Hills'. Charge including buffet lunch: Members of Voice of the Malvern Hills: £15.00; Non-members: £18.00; NUS students and under 18 years old: £10.00. Tickets from Malvern Cube. More information: www.voiceofthemalvern hills.org.uk Poster with full details: <http://ehtchampions.org.uk/ch/calendar/>

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

East Midlands Geological Society

Saturday 15 October: 'Mineralisation of the South Pennine Orefield'. Speaker: Noel Worley.

Saturday 12 November: 'Giant marine reptiles & whales during the Eocene-Oligocene cooling event'. Speaker: Dr Nick Longrich, University of Bath.

Non-members are welcome. Meetings are usually at 6.00 in the Geography Dept. of Nottingham Uni, in the Sir Clive Granger Building. Further info: www.emgs.org.uk or email: secretary@emgs.org.uk

Woolhope Naturalists' Field Club - Geology Section

Friday 28 October: 'New research on the Old Red Sandstone of South Herefordshire and Gwent'. Speaker: Dr. John Davies.

Friday 25 November: 'Shropshire's Evolution - Highlights of a Journey through Time'. This talk is essentially Part 1 of the journey covering the Cretaceous to the present day. Speaker: Prof. Mike Rosenbaum.

Talks held from 5.30, in the Councillors' Meeting Room, Committee Room 1 at the Shire Hall Hereford. Guests are welcome with day membership of the Club: £2.00. Contact Sue Olver, 01432 761693 or email: susanolver@hotmail.com or visit: www.woolhopeclub.org.uk/Geology_Section/default.htm

Warwickshire Geological Conservation Group

Wednesday 16 November: 'Caves'. Speaker: Ian Fairchild (Emeritus professor at Birmingham University and an expert in the field of speleology.)

Doors open at 7.00 for coffee before a 7.30 start at St Francis Church Hall, 110 Warwick Road, Kenilworth CV8 1HL. For more details visit: <http://www.wgcg.co.uk/> or email: WarwickshireGCG@gmail.com. There is a charge of £2.00 for non-members.

Mid Wales Geology Club

Wednesday 19 October: 'Diamonds from Peanuts... For Peanuts... And how Geologists can use them'. Speaker: Tony Thorp.

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 13 October: 'Landslides and the work of the British Geological Survey'. Speakers: Dr Helen Reeves and Dr Vanessa Banks (British Geological Survey).

Thursday 10 November: Wolverson Cope Lecture - 'Diversity's Big Bang: Early Palaeozoic radiations and the history of life'. Speaker: Professor David Harper (Durham University).

Non-members pay £2 to cover temporary membership giving them insurance cover. Lecture meetings are held monthly during the autumn and winter, at 7.30 in the William Smith Building at Keele University. Further info: www.esci.keele.ac.uk/nsgga/

Manchester Geological Association

Wednesday 12 October at 7.00: 'The geology of the Indian Himalayas: a view from our new Manchester student field course'. Speaker: Dr John Nudds, University of Manchester.

Saturday 19 November at 10.00: The Broadhurst Lectures: 'The Climate History of the Earth'.

The venue for this meeting only is the Cordingley Theatre, Humanities Bridgeford Street Building, University of Manchester. Registration commences at 10.00, with the first lecture at 10.30. Confirmed speakers are: Catherine Rose (Trinity College Dublin), Richard Twitchett (National History Museum), Alan Haywood (University of Leeds), Michael Hambrey (University of Aberystwyth), Dave Matthey (Royal Holloway, University of London). There is one unconfirmed speaker. Booking is essential (see website). All are welcome and the cost is £10 per person to cover the food (a finger buffet lunch).

Contact Jane Michael: email indoors@mangeolassoc.org.uk For further information about meetings go to: <http://www.mangeolassoc.org.uk/> Visitors are always welcome. Unless otherwise stated, all lectures are in the Williamson Lecture Theatre, Manchester University, Oxford Road, Manchester.

Shropshire Geological Society

Wednesday 12 October: 'Re-interpretation of the sedimentology of the Ludlow Bone Bed and contiguous strata'. Guest speaker: Jane Veevers, Birmingham University.

Wednesday 9 November: 'Cephalopods with special reference to the Welsh Borders'. Guest speaker: David Evans, Natural England.

Generally held in the Conference Room of the Shropshire Wildlife Trust HQ in Abbey Foregate, commencing at 7.00 for 7.30. A nominal charge is levied for attendance by non-Members. Further info at: www.shropshiregeology.org.uk/

Teme Valley Geological Society

Monday 17 October: 'Geology in the Andes'. Speaker: Prof. Donny Hutton.

Monday 21 November: 'Mining the Heritage Part 2'. Speaker: Graham Worton.

Events are held in Martley Memorial Hall. Contact John Nicklin on 01886 888318. For more details visit: <http://www.geo-village.eu/> Non-members £3.

The Peak Lapidary and Mineral Society

Saturday 8 and Sunday 9 October, 10.00 - 5.00: The Bakewell Rock Exchange. Venue: Lady Manners School, Bakewell, Derbyshire DE45 1JA. More than 70 stalls exhibiting a huge variety of rocks, minerals, fossils and gemstones. Admission: £2.00 per day or £3.00 for both days. Accompanied children - free. For further information go to: <http://www.rockexchange.org.uk/>

The Geologists' Association - Festival of Geology

Saturday 5 November, 10.30 - 4.30: Entrance free. University College London, Gower Street, London WC1E 6BT.

Exhibitors from the World of Geology: Fossil and mineral displays, stonecraft, books, maps, geological equipment, jewellery, Building Stones walk around UCL with Ruth Siddall, Tours of the UCL Earth Science Laboratories and more... **Discovery Room:** Rockwatch with activities for children of all ages with fossils, racing trilobites, Jurassic dioramas and more....

Geological Talks: Prof Iain Stewart - 'Sustainable Geoscience - Geology for Global Development'

Jim Richards - 'Gold Rush: Prospecting and Small Scale Mining for Gold and Diamonds now'

Dr Howard Falcon-Lang - 'Marie Stopes: passionate about palaeobotany'

Prof Joe Cain & Sarah Butterworth - 'Iguanodon and the Restaurant'

Sunday 6 November - Festival Trips

GeoWalk in the City of London. Led by Diana Smith

Gilbert's Pit Charlton - exciting new exposures. Led by Jackie Skipper

The Crystal Palace Dinosaurs - Bringing Extinct Worlds to Life (suitable for families). Led by Ellinor Michel of Friends of the Crystal Palace Dinosaurs.

Further Festival details: www.geologistsassociation.org.uk

The Geologists' Association Annual Conference

Friday 21 - Saturday 22 October: 'Jurassic Coast - Geoscience and Education' at the Portland Heights Hotel, Yeates Road, Isle of Portland, DT5 2EN.

Friday talks include: **Triassic:** Mike Benton - vertebrates; Rob Coram - Otter sandstone; Richard Scrivener - Permo-triassic boundary. **Jurassic:** Richard Twitchett - research overview; Malcolm Hart - Oxford Clay 'squid' micropalaeontology. **Cretaceous:** Rory Mortimore - Jurassic Coast chalk. **Quaternary:** Tony Brown - research overview and Jurassic Coast Anthropocene. **Geomorphology:** Denys Brunnsden - coastal geomorphology; Richard Edmonds - landslips in the Undercliffs NNR. **Education:** Anjana Ford - education on the Jurassic Coast; Ashley Cahill - teaching with the Jurassic Coast; Sam Striven - Jurassic Coast interpretation.

Saturday excursion: Museum of Jurassic Marine Life and visit to Kimmeridge Bay or Purbeck dinosaur tracks. Portland walking excursion.

For more info: www.geologistsassociation.org.uk or email: conference@geologistsassociation.org.uk

Lapworth Lectures

Monday 17 October: 'Ocean acidification'. Speaker: Dr Daniela Schmidt, University of Bristol.

Monday 7 November: 'Fracking, other issues/public engagement/oil industry'. Speaker: Dr Graham Tiley, Shell.

Monday 14 November: 'Mass extinctions'. Speaker: Dr Sarah Greene, University of Bristol.

Monday 28 November: 'The ophiolite enigma resolved?' Speaker: Professor John Dewey, University of Oxford.

Lectures at 5.00 in lecture theatre WG5, Aston Webb (R4), 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>

Editorial

This issue brings two more comprehensive field visit reports and we hope you will enjoy reading them. You will see that we have a very full programme of field visits and geoconservation sessions arranged for the 2016/2017 season and we hope to see lots of you taking advantage of these opportunities. Please note these dates in your diaries, and come along to gain first hand experience of geological sites guided by experts, and for 'hands on' geology as we strive to maintain and protect our precious local geological sites. So far, there has been no feedback from my editorial plea in the August Newsletter for your opinions and requests - but still we are finding that our field and geoconservation events are lacking your support. Please let us know why!

We are also asking for some more input from you. Firstly, there is the Wolverhampton History Fair (see p5). Can you spare a few hours to help with our stand? It's good to have two or three people there at once to hand out leaflets, chat to people, and keep an eye on our exhibits etc. Secondly, we need some volunteers to give short talks at the Members' evening on Monday 12 December. These can be ►

powerpoint or simple presentations, or just bring along your specimens for us to admire. This is also a chance to consult the many experts in our midst who may be able to help with any tricky identification! We need your input - so please get in touch with our secretary, Linda Tonkin if you have anything geological you'd like to share with everyone (contact details on p2).

You will also notice that BCGS now has a twitter account, ably set up by newly co-opted committee member Pete Purewal. He has become our Social Media representative. Please read Pete's article (below), and get tweeting! Spread the word and help to develop a network of BCGS followers. This is going to be a tremendous asset to increase awareness of our Society, and to provide a more immediate means of contact for those who subscribe. We thank Pete for taking on this role.

But, finally, this doesn't mean that the Newsletter has become redundant! I'd like to thank all our contributors who continue to keep our Newsletter thriving as an interesting read, and a useful guide to our events and those of our neighbouring societies. Please let's maintain it into the future with all those items, long and short, which we so value from our members. Keep them coming in!

NB: There is an early copy date for the December issue: Friday 18 November. ■

Julie Schroder



BCGS joins the Twittersphere

Those of you who have had the opportunity to visit the Society's website recently will have noticed the new Twitter feed on the right hand side of the site. Before your eyes glaze over and you jump to the next article in this newsletter, please consider what social media can do for us.

Many organisations use Twitter to build and strengthen the reputation of both themselves and their area of work. In short, Twitter can help us to amplify our message by reaching our target audiences more easily and quickly than by only using traditional communications methods. It also provides an opportunity to reach audiences that we normally wouldn't have had access to, or traditionally included in targeted communications.

For those of you who already have a Twitter account, please follow us on [@BCGeoSoc](https://twitter.com/BCGeoSoc)

For those who are new to social media, each account has a timeline and you write (Tweet) your message to here. The maximum number of characters allowed is 140 (plus images) - hence the term 'Tweet'. However, no one can see your Tweet unless they follow you and if they do, your Tweets will automatically appear on their home page. You cannot see other people's Tweets unless you follow them. Hence the terms 'following' and 'followers'. Still with me?

We choose who we want to follow and that currently that includes The British Geological Survey and the Geological Society and we will not follow the celebrity Tweeters (incidentally did you know that the Tweeter with the largest following is Katy Perry with over 93 million).

However we do need to increase the number of followers for our messages and notifications to reach a wider audience. This relies on content and content providers i.e. we need more Tweeters. So if you already have a Twitter account, please follow us and if you post anything geologically related include @BCGeoSoc in your tweet. If you do not have an account and would be interested in contributing and finding out more, please contact me at media@bcgs.info ■

Pete Purewal

See also Pete's preliminary item about Twitter in Newsletter 237, Members' Forum p16. Ed.

Vacancy for Meetings Secretary!

BCGS still needs a volunteer to take on the job of Meetings Secretary. If you can help or if you'd like to know more about the responsibilities involved please contact secretary@bcgs.info.

Field Meeting Reports

Saturday 16 July: Burton Dassett Hills and Cross Hands Quarry. Led by John Crossling (WGCG).

This was a joint meeting between BCGS and Warwickshire Geological Conservation Group. Members met around 10.00 at the 'Beacon' in the Beacon Car park on top of the Burton Dassett Hills (SP 394 522). Here John Crossling provided a quick introduction to the day and gave a health and safety briefing. The day was sunny and fairly warm, but breezy on top of the hills. It started with a guided walk around the Burton Dassett Hills in the morning, taking in the Mid Jurassic rocks. After driving to the Greedy Goose pub (on the A44 southeast of Moreton-in-Marsh) for lunch, the afternoon was spent at Cross Hands Quarry, near Chipping Norton.

Burton Dassett Hills

Burton Dassett Hills are situated within a country park, founded in 1971, in south-east Warwickshire approximately half a mile east of Junction 12 of the M40. The country park predominantly comprises a number of extensively mined ironstone hills that rise some 203m (666 feet) above sea level.

Location 1 was Burton Dassett Hills 'Beacon', the origins of which are uncertain, but it may be the remains of either a windmill or a folly. The Beacon is constructed of the Marlstone Rock Formation, which contains many interesting features such as animal burrows, brachiopods, belemnites, and cross and graded bedding. The blocks appeared a 'rusty' oxidised orange brown; however fresh surfaces were dark grey-green.



Looking WSW away from the Beacon provided views over a prominent Jurassic escarpment towards Edge Hill. This is where the first battle between Parliamentarians and Royalists during the Civil War took place, in 1642. The view also took in the low ground of the Avon Valley, underlain by the clay-rich Charmouth Mudstone (formerly the Lower Lias), and a splendid view of the M40. On a clear day Charnwood Forest may be seen to the east.

Around the Beacon the ground is uneven and humpy, a result of the quarrying for low grade ironstone from the Marlstone Rock Formation, which was predominantly extracted during WWI. However, locally the Marlstone rock was used as a building stone, as most local village cottages testify. A number of industrial railways were built in Oxfordshire and Northamptonshire to carry the ore to smelting works. ►

Location 2 was a small outcrop across from the Beacon and up the slope behind the car park. Within the outcrop was exposed the base of the Marlstone Rock Formation overlying clays of the Dyrham Formation (formerly the Middle Lias). Well rounded pebbles within the Marlstone indicated an erosive surface or unconformity between these two strata. The pebbles were of many different rock types, well rounded and poorly sorted. Much discussion was had as to the source of these pebbles, which show a definite change in depositional environment from soft, fine-grained clays to the harder, medium-grained Marlstone. No pebbles were seen within the Marlstone blocks of the Beacon. ►



PERIOD	AGE	STAGE	NAME	DESCRIPTION
Middle Jurassic	Bathonian	Great Oolite Group	Sharp's Hill Formation	Greenish grey, silty, moderately shelly and calcareous mudstones, pale greenish grey shelly marls and fine-grained shelly limestone with marine and freshwater faunas.
			Chipping Norton Limestone Formation	Limestone, off-white to pale brown fine- to medium-grained ooidal and coated peloidal grainstone, with common fine burrows, medium- to coarse-grained shell debris and flakes of greenish grey mudstone and dark lignite and minor amounts of fine-grained sand.
	Bajocian	Inferior Oolite Group	Clypeus Grit Member	Pale grey to pinkish-brown, fine- to coarse-grained ooidal, peloidal and shell-detrital packstone to grainstone, with large orange-skinned peloids/pisoids and aggregate grains.
	Aalenian		Leckhampton Member	Grey, weathering yellow-brown, rubbly, highly bioturbated, ferruginous, (possibly sideritic), finely shell-detrital, medium-grained peloidal and ooidal sandy muddy limestone.
Lower Jurassic	Toarcian	Lias Group	Whitby Mudstone Formation (Upper Lias)	Medium and dark grey fossiliferous mudstone and siltstone, laminated and bituminous in part, with thin interbedded siltstone or silty mudstone/rare fine-grained calcareous sandstone.
			Marlstone Rock Formation (Marlstone Rock Member)	Sandy, shelly and ooidal ferruginous limestone interbedded with ferruginous calcareous sandstone and mudstone.
	Pliensbachian		Dyrham Formation (Middle Lias)	Pale to dark grey and greenish grey, silty and sandy mudstone, interbedded with silt or very fine-grained sand.
	Sinemurian		Charmouth Mudstone Formation (Lower Lias)	Dark grey laminated shale and dark, pale and bluish-grey mudstone.

Location 3. Next we walked back towards to the car park and down into a gully. This contained a series of small exposures of the Marlstone Rock Formation. Within these exposures a few fragmentary fossils and some sedimentary features, such as cross-bedding, were evident. Sequentially, the Marlstone Rock Formation is overlain by the Whitby Mudstone Formation (formerly the Upper Lias); however there was no evidence of this stratum here or an erosional contact. Together, the Charmouth Mudstone Formation, the Dyrham Formation and the Marlstone Rock Formation represent a change in sedimentary and depositional environments.

Several metres of the Charmouth Mudstone Formation is well exposed at the Napton Industrial Estate (RIGS: SP455616), below the site of the former Napton brickworks (not visited on this field trip). That exposure contains a rich fossil fauna of brachiopods, gastropods, bivalves, ammonites, belemnites and crinoids, which indicate deposition in a relatively shallow, well-oxygenated sea.

The overlying Dyrham Formation marks significant late Pliensbachian regional environmental change. Increased silt and sand content within this stratum and a rich invertebrate fauna suggest a general shallowing marine environment. The presence of scours infilled with shell debris is indicative of storm current activity in shallow water.

The Marlstone Rock Formation seen at Location 3, represents a greater overall rate of sediment accumulation, following a strongly erosive phase represented by its basal pebble bed. The fossils and features contained indicate an estuarine/terrestrial environment where the iron was derived from lateritic soils, suggesting a warm and humid climate.

The overlying Whitby Formation indicates a return to shallow marine conditions, causing erosion of the Marlstone Rock Formation landscape.

Evidence of very localised slickensides on one of the exposure faces indicated that in walking to this location we had crossed a fault.

Location 4. At the far end of the gully there was a larger outcrop, possibly a dome. The exposure still comprised the Marlstone Rock Formation, which had a noticeable dip. The exposure here was more massive, with some well-defined units and some 'nodular' units, which exhibited spheroidal weathering. It is believed that these nodular units may be the result of pressure release jointing and subsequent weathering, which resulted in the nodular appearance. Since the depositional environment was interpreted as shallow water, it is believed that the nodular features are unlikely to be slump material.



Location 5. From the gully the next stop was the summit of Harts Hill. Along the way, members were asked to identify the change in slope where the clay strata of the Whitby Mudstone Formation change into the sandy strata of the Northampton Sands. The summit of Harts Hill provided an excellent view of the surrounding landscape.

Location 6. The final location was the Toposcope across the road from Harts Hill. The Marlstone Rock Formation underlies this location, and looking back at Harts Hill, a fault underlying the road could be inferred to account for the younger Northampton Sands being level with the older Marlstone strata. ►

Cross Hands Quarry, South Warwickshire.

After lunch John led the group to Cross Hands Quarry where the afternoon was spent fossil hunting in the quarry tips, followed by a visit to the main quarry.

The rocks contained within the Cross Hands Quarry are Middle Jurassic, and the boundary between the Inferior Oolite Group (Upper Bajocian) and the overlying Great Oolite Group (Lower Bathonian) is exposed (see photo below). The Inferior Oolite Group is represented by the Clypeus Grit and the Great Oolite Group by the Chipping/Hook Norton Formation.

The Clypeus Grit rests unconformably on the Whitby Mudstone Formation and generally comprises pale coloured ooidal-peloidal micritic limestone capped with a fossiliferous muddy layer. The peloidal limestone indicates deposition in a shallow marine environment with high energy conditions, whilst the muddy capping layer indicates deposition under calmer conditions. This layer contains an abundant fossil fauna including serpulid worms, corals, bryozoans, bivalves, brachiopods, gastropods and echinoids such as *Clypeus ploti*, which gives this stratum its name.

Overlying the Clypeus Grit is a pale off-white ooidal, sandy and flaggy limestone that also contains animal burrows, carbonaceous material (lignite) and much shell debris including gastropods, oysters, and bivalves. This stratum is the Chipping/Hook Norton Formation and the fossils contained and the nature of the rock indicates that it formed under shallow marine, carbonate-rich conditions.



We then walked on to the main Cross Hands Quarry, the final visit of the day. Here barriers prevented us from getting close to the rock face. We studied the formation (see photo) from the pathway above the quarry, and John Crossley

explained the formations. (These are described in detail in Steve Birch's article in Newsletter 224, p8.) John and other members of WGCG were thanked for inviting BCGS to join their field trip, and for a very interesting day. ■

References:

'Warwickshire's Jurassic geology: past, present and future'. Jonathan D. Radley. *Mercian Geologist* 15 (4), 2003.

'Cross Hands Quarry, South Warwickshire'. Steve Birch. *Black Country Geological Society Newsletter* No. 224, April 2014.

Andy Harrison and Linda Tonkin

Saturday 16 July: The Wren's Nest. Led by Graham Worton.

Through the day the weather was cool, cloudy, windy and wet under foot. Members met adjacent to the Warden's offices next to the former Mons Hill College site. The aim of the visit was to provide an introduction to the Wren's Nest Nature Reserve, building a geological picture of the site, showing the current state of affairs, and to introduce some of the new research which has been going on recently. ►

The plan for the day was to follow the route from the former college along Mons Hill Road to the Snake Pit (**Locality 1**). Crossing Mons Hill Road from the Snake Pit the route continued along the former Nature Conservancy Council (NCC) cutting (**Locality 2**), up and over the reserve to the far side, passing the former college campus to the Murchison Lookout (**Locality 3**). Next we followed a route that passed the Severn Sisters Caverns (**Locality 4**), to the 'Ripples Through Time' lookout (**Locality 5**), then down to the main patch reef (**Locality 6**) and finally to the Ripple Beds and fossil trench (**Locality 7**).

Our visit finished with attendees either returning to their cars or hunting for fossils around the patch reef and in the fossil trench. Graham mentioned that during the Members' Evening in December there would be a fossil identification session of the specimens found during the day.

Before starting our tour, Graham gave an introduction to the day, the Wren's Nest and why it is so special. September 2016 represents the 60th anniversary of the Wren's Nest becoming the first National Geological Nature Reserve in the UK, possibly the world, for its fossils.

This came about in 1956 for two reasons that made it a priority for the then Government. The first reason was the site's accessibility and its super abundance of fossils compared to elsewhere in Europe. The second reason was due to the recovery period after the War - the Government was looking for places where people could find reconciliation and inspiration. The Wren's Nest was situated right at the heart of where communities were being built for war damaged families, which was a real priority in a number of areas. Since the Nature Reserve was established, the site has become a very special place as a training ground for geological conservation.

The Snake Pit

Locality 1. The Snake Pit provides an introduction to reading the landscape and applying some basic geological principles that help geologists to understand the rocks. The landscape here reveals an industrial heritage of mining good quality limestone for use as a construction material (Dudley Castle and the Priory), in agriculture and iron production. In turn, the association with important industrial figures such as Dud Dudley and Abraham Darby are revealed.



This locality introduces the sequence stratigraphy of the Silurian Wenlock Limestone (Upper Quarried Member and Nodular Member) and the overlying Ludlow Shale (Lower Elton Member). Looking at the fossils and features, such as ripples, in the rocks provides clues to ancient environments, ecosystems, structural geology and hints at changes in environmental conditions from shallow to deeper marine.

Looking at the rocks introduces two key geological principles. First is the 'Principle of Superposition' which relates the relative position and age of different rock layers in a stratigraphic sequence. Second is the 'Principle of Uniformitarianism', the premise of which is that the present is the key to the past. This location also hints at the occurrence of volcanic activity close to the area, which through new science using zircon crystals from ash layers within the Ludlow Series strata has provided an age for these rocks, of approximately 427.7 Ma. ►

The NCC Cutting

Locality 2. Our next stop, the NCC cutting was excavated in 1977 as part of an exercise to investigate the rocks that are situated behind the face seen at Locality 1. The 35m long cutting follows a sequence of the Nodular Member and finishes at the second limestone unit that the miners were after – the Lower Quarried Member.

Within the sequence, thirty seven ash bands, of greenish bentonite, can be seen along with individual rounded masses of coral (bioherms) that provide more evidence as to the ecology and environmental conditions at the time. The ash bands make this locality a good one to discuss volcanoes and where the volcano that produced them was located. Clues within the ash, such as grain size, hint at this and it is now believed that an ancient volcanic landscape, hidden approximately 2km beneath the Cheltenham area is the likely culprit. Graham also spoke about the two main types of volcano - shield and the strato type - the latter being the more dangerous and most likely responsible for the ash layers seen at this location. This also hints at a tectonic setting of subducting plate margins at the time. Once again radiometric dating has been used, and the ash layers at the base of this sequence have provided a date of 429.1 Ma. This shows that whilst walking through the NCC cutting the visitor walks through approximately one million years of geological history.

The nature of the rocks seen in this sequence suggest that sea levels at the time were becoming deeper. There are two possible reasons for this, either tectonic subsidence of the seabed or melting ice-sheets.

The Murchison lookout

Locality 3. Walking over the reserve we reached the Murchison lookout with its views overlooking Dudley, to Castle Hill, the Rowley Hills and Birmingham. The discerning observer would note that the beds of strata seen at Localities 1 and 2 are dipping in the opposite direction here and at later localities. This reveals the structural geology of the region and that the Wren's Nest hill is a fold. In fact it is one of several folds, which also include Hurst Hill and Castle Hill that together form a ridge stretching from Sedgley Beacon in the north to Northfield in the south, also including the Rowley Hills. Not only did this provide an important historical communication route, but the ridge also forms the watershed for Central England. Rain falling to the north ends up in the River Trent and the North Sea, whilst rain falling to the south ends up in the River Severn and the Bristol Channel.

This locality is named after one of the important figure heads of historical geology. Known as the 'David Attenborough' of his day, this was Sir Roderick Impey Murchison, crowned the 'King of Siluria'. Murchison visited Dudley in the 1830s on the back of the town having a significant fossil trade at the time. The Bentley Directory of 1850 records that among its market stalls and shops, Dudley also boasted three fossil shops. These were being supplied by the local miners from Wren's Nest who were supplementing their incomes with a bit of fossil collecting.

In 1839 Murchison published his book on 'The Silurian System', wonderfully illustrated by his wife Charlotte and including the description and images of many of the fossils he had collected from the Wren's Nest and from local miners. Murchison would go on to encourage the local miners to put together a fossil collection of local specimens and eventually founded the Dudley and Midland Geological Society Institute (1842 to 1867), which was later replaced by the Dudley and Midland Geological and Scientific Society and Field Club (1880s to 1912). Together these two groups formed some of the earliest geological societies and in 1975 would be revived as the Black Country Geological Society. ►

The Severn Sisters Caverns

Locality 4. From the Murchison lookout we walked to the Severn Sisters Caverns. Today the remaining arches are infilled with dolerite from the Rowley Hills to help stabilise and protect them. It was here in 1839 that Murchison launched his book, in the Dark Cavern, in front of 200 philosophers and natural scientists from the Royal Society of London. Also in the throng were his sponsors who included Sir Robert Peel, who founded the police force, the Bishop of Oxford, the Bishop of Durham and the Duke of Normandy. In 1849, Murchison once again spoke in the Dark Cavern, this time in front of 15,000 local people who wanted to hear him speak. The event was reported in the London Illustrated News.



The Severn Sisters Caverns

From the recently constructed gravel viewing platform the observer is introduced to the stability and health and safety issues that have surrounded the caverns. Only five of the Seven Sisters (the support columns) remain, as a result of the Council trying unsuccessfully to blow them up in the 1960's following the death of a local boy. In 2001 the roof of the caverns started to collapse resulting in the lower caverns being grouted up for good.

Along with the construction of the viewing platform a memorial made of granite with metallic motifs was placed in 2006 to commemorate the fossils of Wren's Nest, along with the local miners and other people. Graham spoke of the 'Strata Project', which aims to make the caverns safe for future use and, one day, to open them to the public once again. In 2008 the 'Wrosne Project' was a means of educating local kids about the Wren's Nest and what was so special about it (*see Newsletter 195, June 2009, p3*). The reserve has long been a 'playground' for the locals from the surrounding estates and for years suffered from mistreatment and vandalism. Only by working with the locals have the wardens been able to educate them to respect the reserve, and this in turn has helped to protect it and has given the locals something to be proud of.

'Ripples Through Time Project' - Tilted Beds, Patch Reefs and Ripple Beds

Localities 5, 6, & 7. The last three locations we visited on our tour, concerned looking more closely at the Wren's Nest rocks and fossils and using science to interpret some of the findings. From the size of ripples and the presence of corals a lot can be gleaned about the local environmental conditions and the ecology of the Silurian period, in particular, water depth and temperature, the movements of the continental land masses, the intensity of wave action and wind direction. Counting the growth rings of corals, just like with trees, reveals that during the Silurian, days were shorter, seasons were longer and a year lasted 400 days. The presence of water suggests that the Earth was within the same orbital 'Goldilocks Zone' as it is today and therefore must have been spinning faster. ►



Fossil collecting in the 'fossil trench'

Finally, Graham spoke about an experiment carried out during the Apollo missions, which started with astronauts placing a mirror on the Moon's surface. Firing a high powered laser at the mirror from the Earth and timing the return period has allowed the distance to the Moon to be calculated. Over time this has revealed that the Moon is steadily moving away from the Earth by approximately 4cm to 7cm a year. This suggests that in the past, during the Silurian Period, the Moon was much closer. This would have resulted in more intense tidal strength, influencing to greater depth, and may account for the larger ripples seen on the ripple beds.

We finished our tour of the reserve around 12.30. Whilst some headed back to their cars, others remained to scour the fossil trench and the main patch reef for fossils to present at the Members' Evening in December. I would like to thank Graham for a very interesting and informative field visit. ■

Andy Harrison

The Gram Museum, Jutland

Jutland, as well as being well known for its cliffs of Chalk and Mo Clay (Eocene - see Newsletter No. 233, October 2015), is similarly celebrated for still younger geology. Another clay deposit, of Miocene age, outcrops across most of the Jutland peninsula and is known as the Gram Clay. The Danes clearly value their natural heritage, and just as the Moler Museum is dedicated to displaying the Mo Clay, so does a museum just outside Gram dedicate itself to raising the profile of this younger stratum. In fact, at Gram they positively encourage you (for a modest fee) to get your hands dirty and go search for fossils yourself, offering all the necessary clothing and tools you might need if you show up unprepared, including washing facilities (for your finds!).



That said, bringing to light your own finds does need some determination, patience and some luck! The site is not much to look at; just a broad, rolling swathe of, well, hardened mud. (Be warned, things can get quite glutinous in wet conditions.) But, with those three factors in mind, I have on two occasions now come away with one or two nicely preserved invertebrate specimens - bivalves, gastropods and a bryozoan. You can see the processing of clay samples being examined for small fry in laboratory workshops that form part of the museum, but it is for bigger, grander stuff that the Gram Clay has become celebrated. It has contributed much to our understanding of the evolution of whales, and the main museum chamber illustrates this with some wonderful fossil material (see front cover photo). There are further displays of modern whale bones that have been obtained from unfortunate beasts found stranded along the nearby North Sea coast.

Further displays include the evolution of our own species (not based on local material, of course, although Jutland is also well known for a host of important, well preserved 'bog bodies', which have thrown much light on our late pre-history). ►



Baleen whale skeleton, 2000

The remainder of the display includes a fine cross-section of the associated invertebrate marine faunas - not just the 'shells' I've already mentioned, but also to the less commonplace crustacea such as lobsters and crabs, and also of sharks teeth and otoliths (ear-bones from fish). Rarer still are bird bones and turtle shells.

All in all, this is yet another Scandinavian wonderland from the past brought to life in a committed and well-presented fashion. I should also mention that much of the presentation is also in English, and being 'out in the sticks' means it is very easy to access - no long queues of traffic or parking problems (nor, in my experience, is it ever that busy... one for the 'specialist', perhaps!).

And if you're not yet persuaded, I might also add that Legoland is only some 30 miles to the north! ■

Mike Allen

Mike's Musings No. 5

NOW do you Remember?

I don't know about you, but as the years pass I find it more and more difficult to get things to stick in my memory, or indeed to recall those fascinating gobbets of information that have been faithfully stored away up-top over a mis-spent lifetime of absorbing useless facts and figures.

This is where the use of mnemonics can sometimes help out, though there is equally the danger of forgetting what the mnemonic was there to help you remember in the first place! Still, we can at least have some fun in constructing, or just looking at, some of those mnemonic gems created to help in the geological realm.

There are a couple of very well known examples to help us remember the order of the geological time periods and the minerals on the Moh's hardness scale, which I guess most readers will be familiar with...

'Camels Ordinarily Sit Down Carefully, Perhaps Their Joints Creak; Probably Early Oiling May Prevent Permanent Rheumatism' for the time periods (which I hope don't need to spell out). This was the first one I ever learnt - and has stuck ever since.

'The Girls Can Flirt And Other Queer Things Can Do' is just one version available for *'Talc-Gypsum-Calcite-Fluorite-Apatite-Orthoclase-Quartz-Topaz-Corundum-Diamond'*. **'Many'** may substitute for **'Other'** if *'Microcline'* is favoured over *'Orthoclase'*.

Whilst listing minerals, an associated but more esoteric topic is the common order of crystallisation of minerals from a magma, as given by the Bowen Reaction Series: **'Olivia's Parrots Actually Bite, So Pull Out Finger More Quickly'**. Can you work this one out? Well, the sequence here is given as *'Olivine-Pyroxene-Amphibole-Biotite (dark Mica)-Soda-Plagioclase (Albite)-Orthoclase Feldspar-Muscovite (light Mica)-Quartz'*, and yes, I'm quite aware that there is a little poetic licence taken with this one. What, in particular, happened to Calcic Plagioclase? Perhaps a **'Can Probably'** insertion to read **'Olivia's Parrots Can Probably Actually Bite...'** might be an improvement? ►

Staying with the mineral world, the sequence of skarn minerals developed with rising temperature during the thermal metamorphism of impure limestones must surely be something we all need to have at our fingertips (!) so here goes: **'Tremble For Dire Peril Walks. Monstrous Acrimonies Spurning Mercies Laws'**. This gives us the sequence *'Tremolite-Forsterite-Diopside-Periclase-Wollastonite-Monticellite-Åkermanite-Spurrite-Merwinite-Larnite'*! This sequence has been revised since my day as a callow undergraduate soaking up this soppy stuff, but I don't imagine many readers will care!!

Metamorphic series' are actually a fertile area for mnemonics, what with Buchan trends, Barrovian sequences and Pyrenean progressions. Something of a cop out is the **'C(see)-BiG-KisS'** aid to the *'Chlorite-Biotite-Garnet-Kyanite-Sillimanite'* mineral sequence for the Barrovian zones. But the simplest is probably that related to rocks rather than minerals: **'Slow People Should Get Moving'** might help you to remember *'Slate-Phyllite-Schist-Gneiss-Migmatite'*. The 'qualities' these rocks represent (*'Cleaved-Silky-Foliated-Banded-Molten'*) haven't, to my knowledge, received the mnemonic treatment they perhaps deserve.

I sense people losing the will to read on by this point, so let's revive interest with a final few examples from other areas of the geological world. One pedantic bee I have in my bonnet is the common reference in the media-world to the usage of the term 'species' when they then refer to some higher hierarchy within the tree of life (usually a genus). This gives me a good excuse to introduce you to **'Limping Dreadfully, King Phillip Came Over From Great Spain'**, which helps us to differentiate between *'Life-Domain-Kingdom-Phylum-Class-Order-Family-Genus and Species'*. If you prefer *'Empires'* to *'Domains'* at the top end of Life's tree, you could have the monarch **'Laughing Ecstatically...'**, which would probably make him feel a lot better too.

If you are less into palaeontology, but more inclined towards sedimentology, I can offer you **'Boys Can't Pass Social Studies Class'**. With sedimentology as the clue, this gives us the progression of particle sizes (from the big end down); thus: *'Boulder-Cobble-Pebble-Sand-Silt-Clay'*.

But if American stratigraphy is your thing, we have fresh from the Internet, and a new one to me: **'Know The Canyon's History, Study Rocks Made By Time'**, giving the (Pre-Pangaeon) strata sequence in the Grand Canyon: *'Kaibab limestone-Toroweap Fm.-Coconino sandstone-Hermit shale-Supai group (which seems to include several formations)-Redwall limestone-Muav limestone-Bright Angel shale-Tapeats sandstone'*. (This excludes the Vishnu schist/Zoroaster granite basement, perhaps on the grounds that they do not form part of the conformable sedimentary succession).

If you'll allow me the indulgence of straying into the allied science of astronomy, I particularly enjoy my own invention for the (historical - once again, revisionist forces have been at work) sequence of the planets: **'Mount Vesuvius Erupts, Mighty Jehovah Scorns Ululation (at) Neapolitan Pandemonium'**. Overblown, I know! But fun to dream up.

Finally, one for you to work out and send in your answers on a postcard (*or an email to the Editor will do!*) It, too, came from the Internet, without the answer (until moving to another website). It comes in two versions depending on whether you want the features in size or geographic order (this is meant to be a clue, together with the information that they relate to American geography): **'Sam's Horse Must Eat Oats'** or **'Sergeant Major Hates Eating Onions'**.

And that, I think, is quite enough nonsense for now. ■

Mike Allen