



Committee

Chairman

Graham Worton

Vice Chairman

Andrew Harrison

Hon Treasurer

Alan Clewlow

Hon Secretary

Robyn Amos

Field Secretary

Andrew Harrison

Meetings Secretary

Roy Starkey

Newsletter Editor

Julie Schroder

Social Media

Peter Purewal

Webmaster

John Schroder

Other Members

Christopher Broughton

Bob Bucki

Dave Burgess

Newsletter No. 246

December 2017

Contents:

Future Programme	2
Other Societies and Events	4
Editorial	5
Graham Worton awarded Brighton Medal	6
Field Meeting Report:	
Huntley Quarry and Hobbs Quarry	7
Dinosaurs of China	10
Return to Bernissart	13
Mike's Musings No.12, Geological Howlers	15
Members' Forum	17

A very Happy Christmas to all our readers!



'Iguanodon' near Bernissart Museum. Photo (minus hat!) by Mike Allen

**Copy date for the
next Newsletter is
Thursday 1 February**

**Robyn Amos,
Honorary Secretary,**

☎ 07595444215

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 11 December (Indoor meeting, 7.00 for 7.30 start): Members' Evening - Christmas Social and Quiz! This is our annual chance for members to share their geological experiences in a sociable atmosphere with a Christmas buffet provided by the Society. This year we are venturing into new pastures with a team quiz (with prizes!) rather than the usual short presentations. But please bring along your specimens for admiration, discussion and identification as usual.

Monday 15 January 2018 (Indoor meeting): 'King Coal'. Speaker: Alan Hill, author of 'The South Yorkshire Coalfield: A History and Development'. Alan is a retired manufacturing engineer, who has worked in the UK and overseas. In semi-retirement he worked for Warwick University, particularly in Hong Kong. Born at Barrow-in-Furness, he was brought up in a mining village in South Yorkshire and later spent much of his career working in Birmingham.

Saturday 27 January (Geoconservation day): Barrow Hill. Directed by Mark Williams. Meet on Vicarage Lane off High Street, Pensnett (A4101), at the top end near to the nature reserve and the church (St. Marks), for a 10.30 start. The day will involve vegetation clearance in the East Quarry. Wear old clothing and bring stout boots and gloves. Tools and safety glasses will be provided. Bring a packed lunch. We will aim to finish around 2.30.

Saturday 10 February (Geoconservation day): Wren's Nest. Directed by the reserve wardens. Meet at the Warden's house on the Mons Hill College ground for a 10.30 start. The day will involve scrub clearance and a Geo-blitz to record findings. Bring gloves, stout footwear and packed lunch. Wardens will provide tools, hard hats if necessary and a hot drink. Finish around 2.30.

Monday 19 February (Indoor meeting): 'Gemstones'. Speaker: Gwyn Green, FGA, DGS.

Gemmologist and gemstone collector Gwyn Green has a lifetime of experience in gemmology. Her teaching has inspired many industry professionals and long-term gemstone enthusiasts. A former tutor and examiner for the Gemmological Association, Gwyn was Chairman of the Midlands Branch for ten years. She was also responsible for inauguration of the HND in Gemmology at Birmingham City University School of Jewellery. She is a passionate and knowledgeable speaker about her subject.

Saturday 3 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 clothes, waterproofs and stout footwear. If possible, please bring gloves and spades, brushes and trowels. We aim to excavate and expose more of the dolerite. Also bring a packed lunch. Finish at 2.30.

Monday 19 March (Indoor meeting, 7.00 for 7.30 start): AGM followed by 'Archival Research'. Speaker: Roy Starkey.

Saturday 4 April (Field meeting): Forest of Dean or River Severn, led by John Moseley, Gloucestershire Geology Trust. Details tbc.

Monday 16 April (Indoor meeting): 'My favourite science: James Parkinson's *Organic Remains of a Former World*'. Speaker: Cherry Lewis, winner of The Geological Society of London's Sue Tyler Friedman medal. Some of you may know her as a result of her book 'The Dating Game'. She is the author of a recently published book on James Parkinson: 'The Enlightened Mr. Parkinson: The Pioneering Life of a Forgotten English Surgeon'.

Saturday 12 May (Field meeting): Calton Hill, Miller's Dale and Tideswell Dale, Derbyshire, led by Mike Allen. 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 Societies and Events

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

Shropshire Geological Society

Wednesday 13 December: 'Lapworth Museum re-development and its engagement with schools'.

Speaker: Anna Chrystal, Learning and Community Outreach Officer, University of Birmingham.

Wednesday 10 January: 'The origin and rise of dinosaurs'. Speaker: Richard Butler, Professor of Palaeobiology, School of Geography, Earth and Environmental Sciences, University of Birmingham, and Academic Keeper, Lapworth Museum of Geology.

Some events have an attendance charge, indicated where known. An additional daily membership charge of £3 is levied for attendance by those who are not existing Members of the Shropshire Geological Society. Lectures are generally held in the Conference Room of the Shropshire Wildlife Trust HQ in Abbey Foregate at 7.00 for 7.30. Further info: www.shropshiregeology.org.uk/

Teme Valley Geological Society

Monday 15 January: 'Scotland's Greatest Ice Age'. Speaker: Prof. Ian Fairchild.

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.

Mid Wales Geology Club

Thursday 18 January: 'Building of the Clywedog Dam'. Speaker: Nick Platt.

Thursday 15 February: 'Building History: materials and styles of buildings of Mid Wales'. Guest Speaker: Edward Parry.

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

North Staffordshire Group of the Geologists' Association

Thursday 11 January: 'The great 1815 eruption of Tambora and future risks from large-scale volcanism'. Speaker: Dr Ralf Gertisser, University of Keele.

For enquiries: Steve Alcock, Longfields, Park Lane, Cheddleton, Leek, Staffs, ST13 7JS. Tel: 01538 360431 or 07711 501028. Email: steves261@aol.com More info: www.esci.keele.ac.uk/nsgga/

Woolhope Naturalists' Field Club - Geology Section

Friday 26 January: 'Life of an Oceanic Volcano'. Speaker: Dr. Sue Hay.

Meetings normally held in Hereford Shire Hall 5.00 - 7.30. Guests are welcome (£2.00). Contact Sue Olver. email: susanolver@hotmail.com or visit: <http://www.woolhopeclub.org.uk/Programme.html>

East Midlands Geological Society

Saturday 13 January: 'Dinosaur hunting in Morocco'. Speaker: Dave Martill.

Non-members are welcome. Further info: www.emgs.org.uk or email: secretary@emgs.org.uk

Warwickshire Geological Conservation Group

Wednesday 17 January: 'Pterosaurs, teeth and a fossil festival'. Speaker: Jordan Bestwick (Leicester - Holloway Bursary recipient).

For more details visit: <http://www.wgcg.co.uk/> or email: WarwickshireGCG@gmail.com. There is a charge of £2.00 for non-members.

Manchester Geological Association

Saturday 13 January at 13.30: 'Flying Fossils'. Speakers: Dr Stephen Brusatte, Dr Mark Wilton, and Elizabeth Martin.

Contact email: outdoors@mangeolassoc.org.uk For further information about meetings go to: <http://www.mangeolassoc.org.uk/> Visitors are always welcome.

Lapworth Museum Events

Spring Lecture series. No information yet. Please check the Lapworth web site (details below).

Lectures are usually at 5.00 - 6.00 and all are welcome to attend. There is no admission charge. For more information: <http://www.birmingham.ac.uk/facilities/lapworth-museum/events/lectures.aspx>

Editorial

2017 has been a proud year for BCGS as we report yet another honour awarded to one of our members. This time we congratulate our Chairman, Graham Worton, who has recently been awarded the prestigious Brighton Medal (*see Dudley Council press release, below*).

In the February issue (No. 241), we reported on Alan Cutler's MBE. Alan is a founder member and former Chairman of our Society. He received the award from Prince Charles at Buckingham Palace at the end of March, and you can read more about Alan's award on p.8 of the most recent issue of Earth Heritage magazine (EH 48): <http://www.earthheritage.org.uk/ehpdf/EH%2048%20-%202017.pdf> Hot on the heels of this, in the April issue (No. 242), we brought you news that our Meetings Secretary, Roy Starkey, had received the Marsh Award for Mineralogy. ►

Congratulations to all - and a big thank you on behalf of all of us, for all you have done and continue to do for our Society. This is a very happy note indeed on which to end the year. We hope that you will enjoy reading the varied mix of items we have for you in this bumper issue, including a little light-heartedness for the festive season - there are more dates for your diary to add to our full programme of meetings in 2018. Happy reading, and Happy Christmas! ■

Julie Schroder

Graham Worton awarded the Brighton Medal

Borough geologist Graham Worton has worked for Dudley Council for 17 years and has been closely involved with Dudley Museum for more than 35 years. He has dedicated his life's work to promoting the area's geological heritage, and in recognition of this work, Graham has been awarded the prestigious Brighton Medal. This is awarded every three years to a geological curator by the outgoing chair of the Geological Curators' Group*, following nominations from a committee of senior geological collections professionals. This group is affiliated to the Geological Society of London.

The award was set up in 1992 in memory of the renowned Bertie Brighton, a curator of the Sedgwick Museum who through his lifetime catalogued more than 375,000 specimens at a rate of more than 10,000 a year and was known for his inspirational teaching.

Giles Miller, outgoing chair of the Geological Curators' Group and a curator at the Natural History Museum, said:

"Graham is a well known and respected geologist. In the time I've known him, I have experienced first-hand his inspirational teaching and how he is able to capture people's imagination with his eloquent and engaging talks on geology and local heritage. He has dedicated much of his time to outreach work, sharing his love, passion and knowledge with local schools, colleges and universities, inspiring the next generation. I've heard Graham describe his work in Dudley as an opportunity to weave the local geological heritage and collections into an amazing array of projects and he has certainly been enormously successful in achieving this. He is a true credit to Dudley and a deserving recipient of this award."



Graham Worton & Giles Miller (& Fluffy!)

In presenting the award, Giles recognises the breadth of Graham's work to engage with local communities through local fun days, art projects and the rock and fossil festivals. The award also acknowledges Graham's involvement in regional and national geoconservation programmes and his research on collections, geoconservation and local geology.

In acknowledgement of the award Graham said:

"Dudley is a special place and I'm fortunate to have done a job that I love for many years in a borough that I have called home all of my life. It's an honour to be recognised in this way by my peers but I must share this award with all the colleagues, volunteers, visitors and students that I have worked with over many years, who share the same passion and drive to protect and celebrate our world class geology and heritage." ►

Councillor Ian Kettle, cabinet member for planning and economic development, said:

“Over many years Graham has worked tirelessly in his role as borough geologist to protect and enhance the geology, culture and heritage of the borough. His passion and dedication is commendable and I would like to congratulate Graham on receiving this award on behalf of the authority and our partners.” ■

* The Geological Curators' Group (<https://geocurator.org/>) aims to improve access to and knowledge of geological collections from leisure to tourism to education and science. The group is also committed to improving the status of geology in museums and the standard of geological curation.

Dudley Metropolitan Borough Council press release, November 2017

Field Meeting Report

Saturday 22 July: Field Visit to Huntley Quarry and Hobbs Quarry, Gloucestershire. Led by John Moseley, Geowarden for the Gloucestershire Geology Trust.

Introduction

It was a cloudy and windy day with heavy showers, when members of the BCGS and Lickey Hills Geo-Champions met John Moseley at 10.30 in the parking area next to Huntley Church and a former garden centre, for a guided tour of Huntley and Hobbs Quarries.

John provided an introduction to the day's activities and an overview of the geography and geology for the local area and wider region. From the car park we would head westwards past the church and along woodland paths to Huntley Quarry and Ackers Quarry, examining small exposures along the way. After a pub lunch, we would drive west via the A40 to Hobbs Quarry, reached along another woodland path, to finish the day around 3.30.

The Gloucestershire Geology Trust is a registered charity and founder member of The Geology Trusts. This was set up in 1992 to survey and record Regionally Important Geological Sites (RIGS) including Huntley Quarry (which it purchased in 2007), and Hobbs Quarry. The Trust owns and manages both sites with the help of a Geowardens system set up in 2012 to maintain footpaths and the sites.



Bromsgrove Sandstone and Bathstone used in Huntley Church

Location and Geography

Huntley Quarry is situated just north of the A40, approximately 400m west of the Huntley Country Garden Centre (now permanently closed) on the southern slopes of Bright's Hill. Hobbs Quarry is approximately 2km further west, south of the A40 and north of the village of Longhope.

Huntley and Hobbs Quarries are surrounded to the north, south and west by low undulating hills covered in a mix of woodland and fields, and they sit at the southern end of a roughly southeast - northwest trending belt of high ground. This includes May Hill to the northwest of Huntley Quarry and Bright's Hill, and the high ground continues in this direction to the Woolhope Dome approximately 20km (12.5 miles) away near Hereford. ►

To the east the ground falls gently into the Vale of Gloucester and the Severn Valley, through which the River Severn flows on its southward journey to the Bristol Channel. On the far side of the Severn Valley lies the western escarpment of the Cotswolds.

Geology - Stratigraphy

The rocks of the area generally range from the Palaeozoic to the early Mesozoic and include examples of Ordovician, Silurian and Triassic strata. No superficial Quaternary or more recent deposits are present in the Huntley and Hobbs Quarry area. However, glacial and river terrace deposits are present covering the bedrock geology of the Vale of Gloucester and the Severn Valley.



*Draped Wenlock Limestone and Bioherm
Hobbs Quarry*

The Cotswold escarpment, forming the horizon east of the Vale of Gloucester and the Severn Valley represents Lower and Middle Jurassic strata that once covered this area prior to erosion. The escarpment strata comprise mudstone and oolitic limestone and include the famous Bathstone as a capping rock. Examples of Bathstone can be seen in the architecture of Huntley Church where it has been used in the surrounds to the doors and windows.

The youngest strata seen at Huntley are Middle to Upper Triassic (c230Ma) in age. Representing the Upper Triassic are red-brown mudstones and brecciated mudstones belonging to the Mercia

Mudstone Group. These rocks are exposed in the eastern wall of Huntley Quarry and are associated with a major structural feature called the Blaisdon Fault (see Geology – Structure, below) which has become hidden due to landslips since the quarry was originally cleared. From the Middle Triassic are very weak red-brown sandstones belonging to the Bromsgrove Sandstone. This is exposed in small outcrops within the woodland floor and in Ackers Quarry to the east of Huntley Quarry. The Bromsgrove Sandstone was quarried as a building stone, which can be seen in several local buildings. This stratum forms the western flanks of Bright's Hill and together with the Mercia Mudstone trends eastwards to underlie the Severn Valley.

Devonian and Carboniferous Rocks are absent from the Huntley area. However, looking to the south and southwest, rocks of these periods can be seen represented in the high ground of the Forest of Dean, and the Black Mountains and Brecon Beacons.

Middle Silurian (c424 Ma) rocks of Wenlock Limestone are exposed at Hobbs Quarry. This quarry once produced limestone for burning in kilns and only stopped production in the late 1800s. The workings have left behind long and extensive exposures of several tall, rounded, conical masses interpreted as bioherms that the miners called 'ballstones'. The bioherms are non-bedded and fine-grained, show little internal structure and contain algae (*Givanelia*), corals (*Halysites*, *Favosites* and *Heliolites*) and Stromatoporoids. Draped over the bioherms are thinly bedded fine to coarse-grained fossiliferous limestones containing brachiopods (*Atrypa*, *Meristina*, *Leptaena*, *Salopina* and Rhynchonellids), trilobites (*Calymene* and *Dalmanites*), gastropods (*Poleumita*) and crinoid ossicles. Differential compaction resulting from the loading of overlying sediments over the bioherms has been put forward as a theory to explain the formation and appearance of the draped limestone layers. However, flaws in this theory are apparent and there is no watertight explanation yet. ►

Early Silurian rocks (c435 Ma) of May Hill Sandstone and Huntley Hill Beds are exposed in Bright's Hill Quarry, situated west of Huntley Quarry. These rocks comprise folded and fractured siltstone and fine to coarse-grained sandstone with abundant slickensides. However, we did not visit Bright's Quarry on this trip.

The oldest rocks seen at Huntley, the Huntley Quarry Beds, date from the End Ordovician to Early Silurian (c443 Ma). These rocks consist of up to 10m of massive and crudely laminated fine to very coarse-grained volcanoclastic arkose, lithic sandstone arenites, and breccia with thin layers of shale and mudstone. Analysis of the grains indicates that some are derived from Malvernian Complex rocks and others are of reworked pyroclastic and volcanic origin. Analysis in 1988 by the BGS of acritarchs and chitinozoa microfossils, came up with an age of Upper Hirnantian (End Ordovician) to Rhuddanian (very early Silurian) for these beds. Exposed examples occur within the west and northwest walls of Huntley Quarry, to the west of the Blaisdon Fault. They show evidence of considerable deformation from folding, thrusting and faulting, due to their close proximity to this fault. Towards the eastern edge of the quarry, the fault has downthrown the younger Triassic rocks (Mercia Mudstone) up against the Huntley Quarry Beds.



Huntley Quarry Beds in Huntley Quarry

Geology - Structure

The rocks and landscape around the Huntley and Hobbs Quarries hint at much structural deformation having occurred in the past. Indeed Huntley sits at the junction of two major structural features belonging to the Malvern-Abberley Axis and the Woolhope-May Hill Pericline-Anticlinal Axis.

Representing the Malvern-Abberley Axis is the north-south trending Blaisdon Fault seen in Huntley Quarry, which is downthrown to the east. The fault sits at the southern end of the Malvern-Abberley Axis. This includes the Malvern Fault, and has been subject to several stages of movement over time. Most significantly, trans-extensional movements during the Triassic resulted in normal movements along this axis, which formed the Worcester Basin, or Worcester Graben to the east. Today this feature is seen as the Vale of Gloucester and the Severn Valley.

Not all movements along the Blaisdon Fault were normal. The landscape north of Bright's Hill and the geological map, show a clear area of low-lying ground comprising Triassic rocks offset to the west of the Blaisdon Fault and the Malvern-Abberley Axis. This off-set has been interpreted as listric faulting, which is characteristic of strike-slip duplexes. However, limited exposure in the area makes determining the nature of faulting difficult and open to debate.

The Woolhope-May Hill Pericline-Anticlinal Axis trends towards the northwest from Huntley, through May Hill and northwards to the Woolhope Dome inlier. A valley separates this feature from the Malvern-Abberley Axis to the east. Hobbs Quarry is situated on the western limb of this structure.

The May Hill Anticline generally comprises Silurian strata with a core of Llandovery Series rocks that progress upwards through the Wenlock and Ludlow Series. The Limestone strata seen in Hobbs Quarry are Gloucestershire's equivalent of the Wenlock Limestone and form the western limb of the anticline, which dips away at approximately 25°. ►

Environment and Tectonics

The nature of the Ordovician-Silurian strata indicates relatively shallow fluctuating marine conditions with occasional exposure to air, possibly in response to global glacio-eustatic sea level changes and the Shelvian/Caledonian tectonic events. At the time, the area was situated towards the far edge of the Midland Shelf Platform, which sat on the northern coastline of the Avalonia micro-continent. To the north and west was an arc of volcanic islands associated with the closing Iapetus Ocean. Together the actions of fluctuating sea levels and volcanic eruptions produced a varied sequence of volcanoclastic, sandy, muddy and limestone sediments as seen in the Huntley Quarry Beds.

The end of the Silurian to the Late Carboniferous saw a chain of major tectonic movements, which closed the Iapetus and Rheic Oceans and built the Caledonian and Variscan Mountain chains. The result was burial, uplift, folding, faulting and erosion of Silurian, Devonian and Lower Carboniferous strata. The folding and faulting associated with the Malvern-Abberley Axis and the Woolhope-May Hill Pericline-Anticlinal Axis resulted from compressional forces associated with the Variscan Orogeny.

During the Permo-Triassic, the Huntley area would have been landlocked within the supercontinent of Pangaea. From early Triassic times, trans-extensional forces associated with the opening of the North Atlantic created numerous fault bounded basins, including the Worcester/Cheshire Graben and these resulted in the more recent movements along the Blaisdon Fault. It is believed that subsidence of the Worcester/Cheshire Graben was at a rate similar to that of the accumulating Triassic sediments such as the Bromsgrove Sandstone and Mercia Mudstone.

The Triassic strata of the Severn Vale are covered with a thick layer of superficial river terrace deposits that are not seen in the Huntley area. These deposits were produced from a number of events starting with the establishment of a glacial meltwater lake covering the Vale of Gloucester and the Severn Valley during the Anglian Glaciation, approximately half a million years ago. During the Devensian Glaciation which ended around 12,000-13,000 years ago, the River Severn was diverted from its route northwards to flow south along its current course, and in the process deposited the river terraces seen today.

I would like to thank John for a very interesting field visit and look forward to our next outing in 2018. Thanks also go to the Lickey Hills Geo-Champions for their participation. ■

Andy Harrison

Dinosaurs of China - Special Exhibition

In October I visited a special exhibition of dinosaurs from China that was held at Wollaton Hall in Nottingham. The theme was 'Dinosaurs - Ground Shakers to Feathered Flyers'. Wollaton Hall is an Elizabethan mansion and houses the Nottingham Natural History Museum; it has also featured in the Batman movies as Wayne Manor.

The exhibition was enabled by a partnership between Nottingham University, Nottingham City Council and the Institute of Vertebrate Paleontology and Paleoanthropology (IVPP) in Beijing. Around 26 uniquely preserved specimens were selected for the exhibition and made the 50 day journey by sea to the UK. The last time China loaned specimens to the UK was 1986! This exhibition was a unique opportunity as some of the fossils have not been on public display before, even in China. ►

The discovery and scientific identification of dinosaurs in China, until recently, has lagged behind the western world. However in the last 20-30 years it has led the field, particularly since the discovery of soft-tissue preservation and feathered dinosaur fossils. Many of these exceptionally preserved fossils come from north-eastern China and are termed the **Jehol Biota**. The environment is believed to have been dominated by wetlands and lakes with seasonal rainfall. Periodic volcanic ash falls created conditions whereby fossilization took place quickly and anoxic conditions prevented decay and scavengers. The formations where these conditions prevailed are dated as Early Cretaceous 133-120Ma.

The exhibition starts with familiar large 'ground shakers' and includes the tallest mounted skeleton ever to be displayed in the UK, at 13m. The neck and tail of the ***Mamenchisaurus hochuanensis*** had to be bent in order to fit it into the great hall. This dinosaur was named by Young and Zhao in 1972. It was found in Hechuan County, north of the metropolis of Zhongqing and dates to the late Jurassic, approximately 160Ma.



Another display describes one of the first dinosaur discoveries made in China, during 1939. Initial discoveries were put on display in Chongqing City in 1941 during WWII and proved to be a moral boost to the local population. Similarities between the China dinosaurs and USA/European dinosaurs should come as no surprise as the continents were more connected in the Jurassic before the break-up of Gondwanaland.

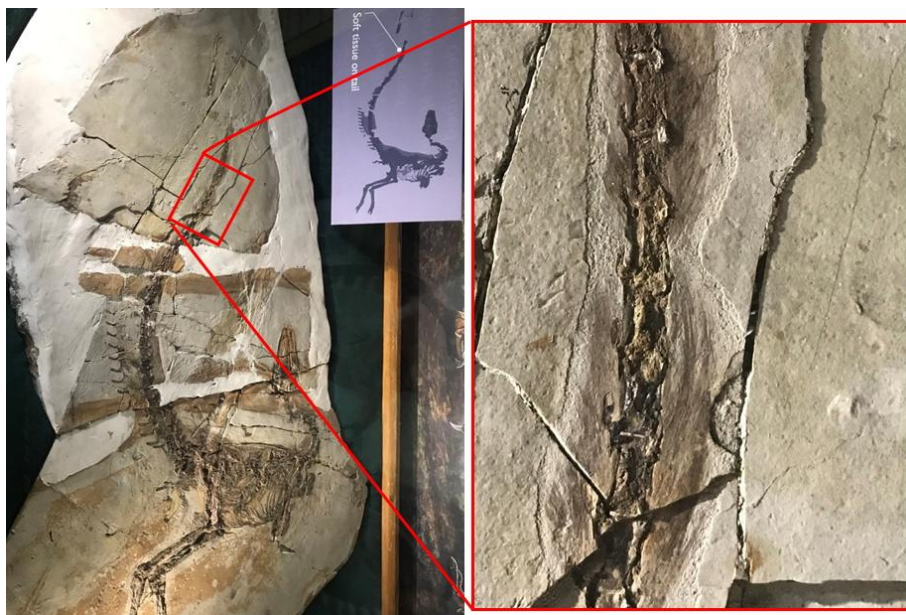
The Exhibition also examines the evolution of dinosaurs into birds. This is the exciting part of the exhibition and what I went to see. The three themes on display present skeletal similarities, the nesting habits and the fossil feathers.



The habit of dinosaurs to nest was shown by a remarkable specimen of a small, 15cm, dinosaur called ***Mei long*** (*sleeping dragon*). It is preserved in life position with the head under an arm (wing) and tail coiled as though it was asleep, similar to a modern nesting bird. Although no feathers are preserved in this specimen, feathers have been found on closely related species.

Another characteristic of dinosaurs is that of laying eggs in nests. Dinosaur eggs, like dinosaur footprints, are very difficult to match to the dinosaur skeletons. Interestingly, the dinosaur ***Oviraptor*** (*egg-stealer*)

was found associated with a nest of eggs and was initially interpreted to have been caught in the act of stealing them, but now appears to have been a good parent, guarding them. Unfortunately the name stuck. Oviraptor eggs and skeletons found in life position on top of a nest have enabled the match of eggs to skeletal remains. ►

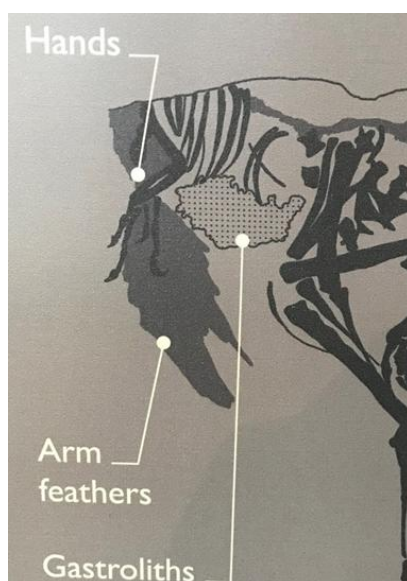


The remarkable discovery of feathers on dinosaurs was made in 1996. The fossil was found in Liaoning Province, China, and was named ***Sinosauropteryx prima*** (*China dragon bird*). It is Early Cretaceous dated at 125Ma and was the first feathered dinosaur to be identified. It is approximately 1m long and soft tissue fossilization shows that it had 'downy-like' feathers. Alternating dark and light banding in the tail has also been interpreted to be the

fossilized remains of colour. (See photo - close-up on right hand side.) Its discovery provides evidence for an early ancestor of the class Aves from Theropod dinosaurs.

The most remarkable specimens on display are two holotypes. (A holotype is the specimen that was first used to describe the species and from which other specimens should be compared. It is of immense scientific importance and cannot be superseded, even if better specimens are subsequently found). These were allowed out of China under strict conditions - they could only be studied under glass cases. Chinese technicians were brought over to set up the displays and would return to dismantle them.

Caudipteryx dongi - holotype. This was the first specimen to be described for this species, in 1998. It was found in Liaoning Province, north-eastern China and is Early Cretaceous in age. It is interpreted to be a flightless feathered dinosaur about the size of a turkey (artists impression on the right). The presence of gastroliths in the stomach area suggest this dinosaur ate small stones to help it digest, similar to modern birds. The dark wing feathers are extremely well preserved. The bone structure and wing size suggest this was a flightless dinosaur and so feathers were an adaptation for mating and insulation. Like an ostrich it would have used its long hind legs for running. ►



Microraptor gui – holotype. This specimen was found in western Liaoning, China. It is Early Cretaceous in age and was first described by Zing in 2003 as a new species of *Microraptor* (*tiny thief*). It is believed that this dinosaur was carnivorous. The fossil clearly has long feathers on all four limbs and tail. It essentially has 4 wings and is interpreted to have been able to fly or at least glide because the feathers resemble modern flight feathers.



Overall the exhibition leaves one with overwhelming evidence for feathered dinosaurs. It demonstrates that feathers were not just an adaptation for flight and that many large dinosaurs possessed them too. The last part of the exhibition also shows the adaptation of dinosaurs to birds and a number of early 'true' birds which still retained the dinosaur-like features of teeth and bony tails. The exhibition has had over 100,000 visitors in the three months that it has been open and has been a unique experience for those who have been able to visit it. I'm glad I went. ■

Graham Hickman

References:

Exhibition website: <http://www.dinosaursofchina.co.uk/>

Ji, Q.; Ji, S. 1996. 'On the discovery of the earliest fossil bird in China (*Sinosauropteryx* gen. nov.) and the origin of birds'. Chinese Geology. Beijing: Chinese Geological Museum. 10 (233): 30–33 [translation at] http://paleoglot.org/files/Ji&Ji_96.pdf

Xing, X., Zhou, Z., Wang, X., Kuang, X., Zhang, F., and Du, X. (2003). 'Four-winged dinosaurs from China.' <https://projects.ncsu.edu/cals/course/zo501/Readings/4WingedDino.pdf>

Return to Bernissart

One of the most impressive fossil finds I have come across is the cluster of some thirty iguanodons housed in the Museum of Natural Sciences in Brussels. Although probably one of the most common dinosaurs ever discovered (largely thanks to this collection), it is the sheer scale of this serried rank of largely complete specimens that inspires amazement. ►



Bernissart Museum



* Natural pit in the neighbourhood of Tournai

Where did these specimens come from? Remarkably, they were all discovered in more or less a single site, a former coal mine at Bernissart, situated within the Hainaut coalfield on the Franco-Belgian border between Tournai and Mons, Belgium. But, I hear you ask, what are dinosaurs doing in a coal mine? The explanation for that conundrum lies in the fact that the Coal Measures overlie Carboniferous Limestones that have been affected by dissolution, creating large voids below. Over time, these have allowed substantial collapses of overlying rock, including lower Cretaceous dinosaur-bearing strata. Often these collapses

extend all the way to the surface producing sink-holes known locally as 'crans'. One such 'cran' collapse was later intersected three times at slightly different levels by coal miners and it is this mass of infill that proved to contain the remains of those iguanodonts. The site was thereafter christened the 'Cran aux Iguanodonts'.

You may recall my reference to this occurrence in an earlier newsletter (No.208, August 2011) after visiting the purpose built museum that first housed some of these beasts near their natural resting place in Bernissart itself. It took over three years to fully excavate the site and retrieve all the bones, five years to prepare the first specimen for display (firstly in Brussels) and a further thirty years for the next dozen skeletons to be pieced together and put on display. The other twenty or so less complete specimens remain partially entombed in their clay matrix. All this was made possible by the lifelong work of one man, Louis Dollo, for whom this discovery proved to be a full career move. At first he worked in the most discouraging of circumstances, relegated (as an outsider) to a tiny cold room in the museum cellar; but his fortitude paid off - he became Director of the Brussels Museum, a professor at the nearby University, and his name lives on, inextricably linked to the iguanodonts of Bernissart.

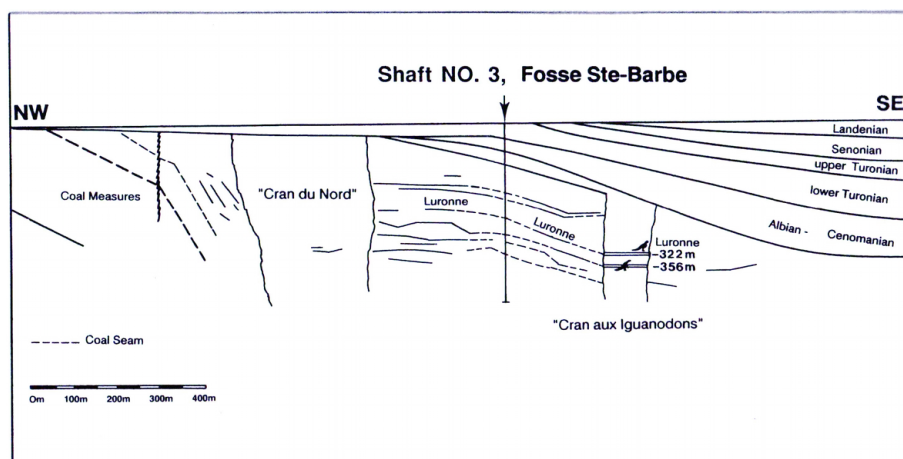
As work on this material progressed, it began to dawn on the palaeontological world that some of the earlier reconstructions of this animal were wide of the mark. You may be familiar with the celebrated life-size models of *iguanodon* and other dinosaurs that still adorn the park at Crystal Palace in London. These were originally commissioned for display after the Great Exhibition was moved to Crystal Palace in 1854. They were depicted as ungainly, lumbering beasts, crawling on all fours, and, in the case of *Iguanodon*, with a nose-spike or small horn; all this was under the watchful guidance of Richard Owen, who had first coined the term 'dinosaur' a few years earlier.

Together with other discoveries, it became clear that iguanodonts were far more likely to have stood on their hind legs, using their tails to help support them and maintain balance. This is the posture adopted by Dollo's reconstructions, perhaps for the first time. (I nearly fell into the 'howler' trap there (see *Mike's Musings No. 12, below*), omitting the word 'reconstructions'!) Further study revealed that there were at least two 'types' represented: they might perhaps be sexual ►



Iguanodon in the Bernissart Museum

dimorphs (i.e. a male and female of a single species) or two separate species. Oddly, however, there appeared to be no juveniles within this sizeable collection of individuals which might be of significance in terms of how the animals died, or at least how they accumulated after death. It has been suggested that they were husbanded into a kind of cemetery rather like elephants are reputed to do in their familial groups. The relative size of the *iguanodon* brain would however suggest otherwise, such behaviour being far above their likely affective capacity. Dollo also demonstrated that the nose-spike was in fact a thumb-spike (there were two of them per animal, of course!). This amazing find also brought other new insights into the open, though not all have stood the test of time.



Cross-section through the Coal Measures and younger strata at Bernissart (after a figure by A. DELMER and P. VAN WICHELEN, 1980). The three levels with Iguanodons are shown; two at a depth of 322 m, and one at 356 m. *

Eventually one of the better specimens was relocated to the museum at Bernissart where it takes centre stage in an ever-improving museum, and this is where my return visit last summer comes in. Since my first visit in 2006 the museum has undergone substantial refurbishment, and has a much brighter aspect. The display has increased in size and has diversified, now including other local material as well as displays of

minerals and fossils from further afield. One gallery atmospherically reconstructs Dr. Dollo's study (i.e. fusty and rather old-fashioned) and another records the building changes to improve the museum. There are also exhibits aimed at children and a refreshments area. My one gripe would be that the sales counter seems to have gone backwards, being rather dumbed down and full of 'souvenir' stuff, with less useful literature, though this might only be a temporary lapse. All in all, it's worth making a detour if you are ever heading that way. ■

* From 'The Iguanodons of Bernissart', by F. Martin and P. Bultynck, trans. (from French) by W.T. Dean. Institut Royal des Sciences Naturelles de Belgique, 1990.

Mike Allen

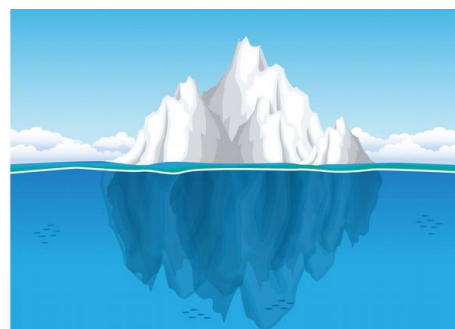
Mike's Musings No. 12

Time for a Laugh - Geological Howlers

The festive season is upon us once more, so I thought entertainment rather than education might receive greater favour. Thus, a light-hearted theme gives me the excuse to tell you about some of the great lines that have appeared in an assortment of geology examination answers.

Humour, like love, is of course in the 'eye, (or mind), of the beholder', so I appreciate that my choice will sometimes fall on stony ground. For this reason I have also included material that doesn't particularly tickle my funny bone, in the hope that it will at least fall on fertile ground elsewhere. Of course, 'howlers' come in all guises. Many are little more than 'typos' - errors of spelling, punctuation, grammar or malapropisms, that result in unintended humour... ►

'The enormity of geologic time.'
'Nine-eighths of an iceberg is beneath the sea.'
'Salt is essential for the well being and consumption of humans.'
'The dating of rocks depends very much on the superstition principle.'
'The gas chambers (of an ammonite) were used as a bouncy mechanism.'
'Coal is formed under anaesthetic conditions where bacteria cannot function.'
'From Llandrindod you proceed along the lovely valley of the Ithon, growing more beautiful as you go.'

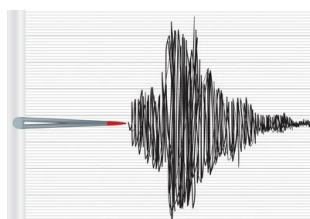


Occasionally the humour arises from incongruity, or vacuity, of a perfectly accurate statement of fact...

'When India collided with the Asiatic block, the Himalayas were formed; when Africa merged into Europe, the North and South Downs were formed.'
'Mountains are altitudinous.'
'A skeleton is a man with his inside out and his outside off.'
'Feldspars can be crushed to be put in several items if needed, for various reasons.'

Some are clearly the result of confusion or miscomprehension...

'The Earth would have taken a long time to cool had it not been for ice-ages during the Pre-Cambrian.'
'Evidence of an unconformity (on a map) is seen when the contour lines cross one another.'
'Mudstone is mainly composed of sand and gravel.'



'Rhyolite is an extrusive rock formed in igneous intrusions. It is sometimes coarse and sometimes fine in grain. It is often light coloured though it may be dark. It is basic sometimes, but more usually though not often it is acid. It is a common constituent of sedimentary rocks.'
'Seismographs are machines which pick up the vibrations of an earthquake before it happens.' or... 'Before an earthquake occurs shock waves are given off.'

Those last two perhaps ask questions of the teacher? Occasionally there are clear signs of panic! (or is it exasperation?)...

'An esker is formed under conditions. These conditions are very exceptional and no-one has ever seen them. Even lecturers don't know how eskers were formed. I have never seen an esker.'
'Kaolin is so well known that everybody has seen it in a poultice, and I shall not waste the examiner's time by describing it in detail. I expect the examiner has seen quarries of kaolin too, and probably could say how it formed better than I can.'
'Rock specimen A is oolitic limestone. It's texture can best be described as oolitic. The rock consists of the small ooliths, thousands of them, cemented together so the rock has the texture of lots of little small ooliths, i.e. oolitic texture.' ►

Am I getting through to you? Others are so contrived that they must be deliberate...

'The limestones of which the Houses of Parliament are made are changing to dolomite and this is causing Parliament to dissolve.' (A partially true statement in the Industrial Age, in that Magnesian Limestones were unwisely selected for their construction.)

'G.B. is losing about 10 feet of coast a year with the effect that Blackpool is getting nearer to Skegness.' (Not only contrived, but incorrect too!)

...and not always particularly clever!

'Darwin's theory is based on three points – the struggle for exists, survival of the fattest and maternal selection.'



'A dinosaur (well, they had to show up somewhere!) **was so large it had to eat night and day to keep itself from starving. This did not give it time to eat its meals properly and it never got enough sleep, so it became frustrated and defeatist and finally extinct.'**

Still others are just plain absurd, and beg the question of what was going on in the writer's mind!!

'The North Sea is salt (sic) because of the Yarmouth bloaters.'

'Dolorite (sic) is a mineral which has a value of 12 when hit with a heavy object.'

'The 920 feet (river) terrace is well given by $y = 1121 - 175 \log(160x) + 1.1x$ where x is measured in sixths of a mile from Totnes railway bridge.'

And finally, the perfectly reasonable contention that: **'Sedimentation is a rather lengthy affair'...** puts me in mind of a fellow student on my university course who regarded sedimentology lectures as: **'the opiate of the masses'** (with apologies, as I discovered later in my education, to Karl Marx). However, another student clearly disagrees, stating quite categorically that: **'The Torridonian series was laid down in a hurry'** which just shows how confusing geology can be at times!

I must end by acknowledging The Geological Society of Glasgow, from whose 1980 publication most of these examples have been taken. This might also explain why some quotes might appear rather dated! I'd be delighted to hear of any other 'funnies' people have come across, either the written word or heard in conversation... perhaps we have the germ of a regular feature here? ■

Mike Allen

Clip art courtesy of Vecteezy.com.

I wholeheartedly endorse Mike's request for more 'funnies'. Humour is for all times – not just for Christmas! Please send any contributions to me in the usual way: newsletter@bcgs.info Ed.

Members' Forum

We are grateful to long-term BCGS member, Hilary Giltrap for sending us this poem. It was written by her mother, Elizabeth Barker. Elizabeth came from a relatively poor background in Lincolnshire, and enjoyed only very basic schooling. Hilary says that "she was quite talented in a lot of ways but never had the confidence to follow things through, though sitting and writing home was easy for her". Whatever inspired her to write this poem, we are pleased now to be able to bring it to you in her memory. Ed. ►

The Stone

by Elizabeth Barker

This stone I hold -
Where was it when the cold-fingered
Glaciers crept across the grasses
And the bitter winds of old
Screamed and moaned
through mountain passes.

In distant ages was it spurned
By huge and armoured reptile feet
In bellowing cold-blooded rage
Of dull-brained victory or defeat.

This stone I hold -
Perhaps an ape-child
Threw it to his brother
And then his dark and uncouth sire
Passed it to the mother
Who kept it as a hearthstone
For her caveman's fire.

When men have gone
Where will this stone be?
When mankind has sung his last sad song
Will my stone be covered by a mighty sea?
Or will it still lie among the flowers.
~A thing to ponder
By a kinder race than ours.

Subscriptions 2018

Your next subscription is due on **1 January 2018** and there has been no increase. It would be helpful if members paid their annual subscription by standing order. A standing order form for your bank may be requested from the Treasurer or downloaded from the BCGS website:

<http://bcgs.info/pub/wp-content/uploads/2013/11/Bankers-Order-Form.pdf>

Otherwise please pay at the indoor meeting on 15 January 2018 or post your subscriptions to the Treasurer:

Alan Clewlow,
19 Manor Court Road,
Bromsgrove,
Worcestershire,
B60 3NW

email: treasurer@bcgs.info

Subscription rates:

Individual	£20 per annum
Family	£30 per annum
Full time student/Unemployed	£5 per annum
Group/Company	£35 per annum

For members with a printed copy please enclose the completed slip below.

For members with an emailed copy please print this page and enclose with the slip completed. Cheques should be made payable to **'The Black Country Geological Society'**.



Please print clearly. Name: Mr / Mrs / Miss / Ms

Date: Email Address :

Address: Telephone:

I/we enclose £..... for Individual / Family / Student / Group membership (please circle)