Newsletter No. 251
October 2018

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To find out more about this photo - read on!

Copy date for the next Newsletter is Saturday 1 December

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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, Twitter: @BCGeoSoc and Facebook.		

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 15 October *(Indoor Meeting):*

'Catastrophic Volcanoes'. Speaker: Sebastian Watt, lecturer in Earth Sciences, University of Birmingham. Volcanic eruptions have the capacity to cause extreme destruction, but the impact of individual events is not always simply related to their size. In this talk, Sebastian will use past examples to explore some of the factors that lead to volcanic catastrophes, and discuss how our capacity to forecast and mitigate the impacts of such events has changed in recent decades.

Chaitén Volcano, photo by Carlos Gutierrez

Saturday 3 November *(Geoconservation Day):* Wren's Nest. Directed by the Reserve wardens. Meet at the Wardens' office adjacent to the former Mons Hill College ground at 10.30 (access beside the Caves Pub on Wren's Nest Road). The day will involve scrub clearance followed by a fossil hunt not far from the Wardens' base. Bring gloves, stout footwear and a packed lunch. Wardens will provide tools, hard hats if necessary and a hot drink. Finish around 2.30.

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.

Monday 12 November *(Evening Field Meeting and 'social'):* Building Stones of Birmingham from the Bullring to Grand Central, led by Julie Schroder. Meet 6.00 for 6.15 by the Bull statue ('The Guardian') at the head of St. Martin's Walk, near the Rotunda. Following our walk earlier this year around the Victorian civic heart of Birmingham, Ray Pratt from the Geol Soc WM group asked Julie to lead another walk, this time around the shops. This walk will focus mainly on the newer developments which have brought some fabulous geology to the retail heart of Birmingham. It is mostly inside - so no need to worry about the weather or the dark! The walk will closely follow the last section of the web-based version of Birmingham Building Stones Trail 3, which you can find on our web site here: bcgs.info/pub/local-geology/building-stone-trails/ There is also a pdf which you can download or print, but the web version has maps, additional photos, and gives more detail of the route we will follow through the Bullring. Following the walk we will retire to a local pub for refreshments. **Numbers limited to 20. Booking essential** via Ray Pratt from the Geol Soc WM. Text: 07867785779 or email: geostart@btinternet.com

Monday 19 November *(Indoor Meeting):* 'Abberley & Malvern Hills Geopark: its history, growth and expansion to include the Woolhope Dome'. Speaker: Georgia Jacobs. The talk will include initiatives undertaken at A&MH Geopark visitor centres and the annual summer programme of Geofest activities. There will be a range of display materials, including textiles based upon exhibitions at Bewdley Museum, plus textile sample books and a photograph album showing the last few years of Geofest activities.

Saturday 1 December *(Geoconservation Day):* Saltwells Local Nature Reserve. Meet at the Nature Reserve car park (Grid ref: SJ 934 868) on Saltwells Lane at 10.30. Wear old work clothes, waterproofs and stout footwear. Please bring gloves and garden tools: hand brushes, trowels, loppers, secateurs, forks and spades if you have them. Either bring a packed lunch, or hot food can be purchased from the Saltwells Inn adjacent to the car park. Finish at 2.30.

Monday 10 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. Following the success of last year's quiz (which was postponed due to adverse weather) we will be asking you once again to get into teams, put your thinking caps on and be prepared to answer a mix of geological and Black Country themed questions – something for everyone, and no pressure! Please also bring along your geological specimens for admiration, discussion and identification as usual.

Saturday 16 February 2019 *(Geoconservation Day):* Wren's Nest. Directed by the reserve wardens. Meet at the Wardens' office on the Mons Hill College ground at 10.30. The day will involve some scrub clearance and fossil hunting not far from the Warden's base. Bring gloves, stout footwear and a packed lunch. Wardens provide tools, hard hats if necessary and a hot drink. Finish around 2.30.

Saturday 2 March *(Geoconservation Day):* Barrow Hill. Directed by Mark Williams. Meet at 10.30 on Vicarage Lane off High Street, Pensnett (A4101), at the top end near the nature reserve and St. Mark's Church. The day will involve vegetation clearance in the East Quarry. Bring gloves, stout footwear and a packed lunch, and (if possible) tools such as loppers, saws, and rakes for vegetation, and stiff brushes/trowels for rock faces. We will aim to finish around 2.30.

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.

Warwickshire Geological Conservation Group

Wednesday 21 November at 7.30: 'The Secret life of your Mobile Phone' The geological make-up of a typical I-phone. Speaker: Dr. Andrew Bloodworth (BGS).

Venue: St Francis Church Hall, 110 Warwick Road, Kenilworth, CV8 1HL. There is a charge of £2.00 for non-members. For more details visit: http://www.wgcg.co.uk/ or email: WarwickshireGCG@gmail.com.

Manchester Geological Association

Saturday 10 November at 1.30: The Broadhurst Lectures: Earth's Distant Past. Speakers: Dr Stefan Schroeder, University of Manchester, Prof Richard White, University of St Andrews, Dr Matthew Warke, University of St Andrews.

Thursday 22 November at 6.30: 'Melting Ice - Rising Seas: Antarctic Climate Change and the Environment'. Speaker: Dr Colin Summerhayes, Scott Polar Research Institute, Cambridge. Joint Lecture with Manchester Geographical Association at Manchester Metropolitan University, Brooks Building, 53 Bonsall St, Manchester, M15 6GX.

Venue (unless otherwise stated): Lecture Theatre, the Williamson Building, University of Manchester, 176 Oxford Road, Manchester, M13 9QQ. Contact email: outdoors@mangeolassoc.org.uk For further information about meetings: http://www.mangeolassoc.org.uk/ Visitors are always welcome.

The Geologists' Association

Annual Conference: The Geology of 'Mordor', Friday 19 - Sunday 21 October 2018

Exploring the incredible geology and mineral wealth of the Black Country that powered the 'workshop of the world' and inspired iconic art and literature. Venue: University of Birmingham, B15 2TT and the Lapworth Museum of Geology.

Friday 19 October from 5.00

Tours of the redeveloped Lapworth Museum of Geology and an informal evening get together with the conference team at a convenient Birmingham pub.

Saturday 20 October

9.00 - 9.45: Registration

Morning session: Chair - Dr Colin Prosser, Natural England

9.40 Welcome and housekeeping (Anna Chrystal – Lapworth Museum)

9.45 - 10.20 **'Heritage behind Mordor - defining roots of the Black Country UNESCO Global Geopark project'.** Speaker: Graham Worton (Dudley Museum and Art Gallery)

10.20 - 10.55 **'The Geology of Mordor'.** Speaker: Dr Oliver Wakefield (British Geological Survey)

11.00 - 11.30 **Morning Coffee Break**

11.30 - 12.05 **'Mining in Mordor'?** Speaker: Colin Knipe (Johnson Poole and Bloomer)

12.05 - 12.40 **'Fossil Plants of Mordor'.** Speaker: Dr Lil Stevens (Natural History Museum)

12.40 - 13.00 **'Two Minutes of Fame'.** Opportunity for people with posters to speak

13.00 - 14.00 **Lunch Break.** Time to view posters, stands and/or visit the Lapworth Museum

Afternoon session: Chair - Graham Worton, Dudley Museum and Art Gallery

14.00 - 14.35 **'Cleaning up the legacy of Mordor'.** Speaker: Elizabeth Withington (ESI/Stantec)

14.35 - 15.10 **'Geoconservation in landscapes like Mordor'. Speaker:** Ben Evans (National Museum of Wales)

15.10 - 15.45 **Afternoon tea break**

15.45 - 16.20 **'The artistic legacy of Mordor'.** Speaker: Dr Will Tattersdill (University of Birmingham)

16.20 - 16.55 **'Mordor - an amazing geological landscape'.** Speaker: Prof Paul Smith (Oxford University Natural History Museum)

16.55 Closing comments

Sunday 21 October

Range of excursions to include:

The limestone geology and fossils of the Black Country (Wren's Nest National Nature Reserve), including a canal trip into the limestone caverns.

The Coal Measures geology of the Black Country Coalfield.

Building Stones Tour of Birmingham City Centre.

Further information and registration:

Visit: www.geologistsassociation.org.uk Email: conference@geologistsassociation.org.uk

Saturday 3 November 8.00 - 5.00: Geologists' Association Festival of Geology. University College London, Gower Street, London, WC1E 6BT.

For more details, email: sarah@geologistsassociation.org.uk

Geological Society, West Midlands Regional Group

Monday 12 November, 6.00 for 6.15: A geological look at the Building Stones of Birmingham - Trail 3. Led by Julie Schroder. Joint with BCGS. See BCGS programme above for details.

Tuesday 13 November, 6.00 for 6.30: 'The UNESCO Black Country Geopark'. Speaker: Graham Worton. Venue: The Birmingham & Midland Institute, 9 Margaret St, B3 3BS.

Tuesday 11 December, 6.00 for 6.30: 'Fracking in the UK - Opportunities and Threats'. Speaker: Prof Mike Stephenson (British Geological Survey). Venue: The Birmingham & Midland Institute, 9 Margaret St, B3 3BS. Followed by AGM and drinks at Birmingham Christmas Market.

For further details and to register your interest in attending, please contact the Group Secretary at: geolsoc_wmrg@live.co.uk

North Staffordshire Group of the Geologists' Association

Wednesday 7 November, 7.30: 'Quaternary Geological Ground Models for the reduction of Engineering Risk'. Speaker: Dr David Giles (University of Portsmouth).

Lecture meetings are held at 7.30 in room WSO.06 in the William Smith Building, Keele University. 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/

Shropshire Geological Society

Wednesday 10 October: 'Escaping Snowball Earth'. Speaker: Prof Ian Fairchild, (University of Birmingham).

Wednesday 14 November: 'Education at the Lapworth Museum'. Speaker: Anna Chrystal, (Lapworth Museum).

Lecture meetings are held at 7.30 in room 019 University Centre, Guildhall, Frankwell Quay, Shrewsbury SY3 8HQ. A nominal charge is levied for attendance by non-Members. Further info: www.shropshiregeology.org.uk/

Woolhope Naturalists' Field Club - Geology Section

Friday 26 October: 'Professor Fred Shotton'. Speaker: Prof Peter Worsley (Reading Geological Society).

Friday 23 November: 'Tale of Five Magmas: A Review of Planetary volcanism'. Speaker: Dr. Paul Olver.

Talks will now be held from 5.30, in the Councillors' Meeting Room, Committee Room 1 at the Shire Hall, Hereford. Non-members of the Club pay £2. Contact Sue Olver on 01432 761693. Email: susanolver@hotmail.com or visit: http://www.woolhopeclub.org.uk/Programme.html

East Midlands Geological Society

Saturday 13 October: 'In search of a giant meteorite impact in Scotland'. Speaker: Dr Michael Simms, National Museums, Northern Ireland.

Saturday 10 November: 'Terra Infirma: What has salt ever done for us?' Speaker: Professor Christopher Jackson, Imperial College, London.

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

Mid Wales Geology Club

Wednesday 17 October: 'North Sea Oil Fields and Debris Flows'. Speaker: Kit Moorhouse.

Further information: Tony Thorp tel. 01686 624820 and 622517 tonydolfor@gmail.com
Web: http://midwalesgeology.org.uk Talks at 7.30 at Plas Dolerw, Milford Road, Newtown.

Teme Valley Geological Society

Monday 15 October: 'How did climate change contribute to the end-Triassic mass extinction?' Speaker: Dr Sarah Greene, University of Birmingham. Includes a brand new record of ocean temperature and the first record of ocean pH, both from well-known UK localities.

Monday 19 November: 'Tanzania'. Speaker: Jim Marshall.

Talks are held at 7.30 in the Martley Memorial Hall, on the B4197 by the Sports Ground, Martley. Contact John Nicklin on 01886 888318 or visit: http://www.geo-village.eu/ Non-members £3.

Editorial

With those hot days of summer but a distant memory, we now have our autumn and winter programme of indoor and geoconservation meetings to look forward to.

One major event this month is the GA's 'Geology of Mordor' conference at the University of Birmingham and the Lapworth Museum, from 19 – 21 October. For fans of Tolkien's 'Lord of the Rings', rest assured that you will not come face-to-face with the evil Lord Sauron, nor the menacing volcano 'Mount Doom' dominating his dark domain of Mordor. Instead you will receive a warm welcome to a celebration of the geology and industrial heritage of the Black Country, and we hope that you will come along to share in the weekend's activities. There will be displays from geological societies, including BCGS. There is a wide-ranging programme of talks on Saturday and field trips on Sunday. See the box on p.5 for registration details and further information. ■

Julie Schroder

Field Meeting Reports

Saturday 21 July: Severn Valley Country Park, Alveley, Shropshire. Joint field visit for BCGS and OUGS West Midlands Group. Led by Andy Harrison.

Members of both societies met at 10.30 in the car park of the Severn Valley Country Park (SVCP). The weather was generally cloudy, but dry and humid. The aim of the day was to explore the Country Park's geology and industrial heritage. A toposcope located about 500m uphill from the car park, provided a good vantage point from which to introduce the Country Park, the surrounding landscape, its geological setting and history.

View from the SVCP Toposcope

Situated approximately halfway between Bridgnorth and Kidderminster, the SVCP straddles the Severn Valley with the villages of Alveley to the east and Highley to the west. At the bottom of the valley and flowing north-south is the River Severn, parallel and to the west of which runs the Severn Valley Railway. Covering approximately 126 acres, the Country Park sits on the steep terraced slopes of the Severn Valley that provide numerous habitats, including woodland, meadows, pools, streams and river banks. The Alveley Industrial Estate situated immediately adjacent to the Park's north-east corner was, until the late 1960s, the location of the Alveley Colliery.

Geology

The undulating local landscape, the Severn Valley, its terraces and the river's present course result from retreating Devensian ice sheets. During the last Ice Age, local topography and ice combined to switch the northerly flowing River Severn into a southward feeding drainage channel, via the Ironbridge Gorge. Meltwater, silt, sand and gravel carved and constructed the River Severn's present course and defining river terraces. Today, the valley's flat bottom and yellow-brown silty alluvial soils reflect annual high water and flooding during the autumn and winter months.

Sandstone bedrock belonging to the Upper Carboniferous Alveley Member (formerly Keele Beds) and Halesowen Formation (formerly the Highley Beds) underlies the Country Park and immediate surrounding area. Unconformably below these strata lie rocks of the productive Middle Carboniferous Pennine Coal Measures. Together, these strata make up the northern end of the Wyre Forest Coalfield.

Alveley Sandstone

The youngest Alveley Member stratum, or Alveley Sandstone, comprises fine to medium-grained, red-brown, channel cross-bedded sandstone. It also contains mudstone and occasional thin 'Spirorbis' gastropod limestone layers. Generally present on the Alveley (eastern) side of the river and partially on the west bank, these rocks are poorly exposed. They are best represented in local buildings, occasional boulders, heavily overgrown quarries and red-brown soils underfoot. A slab of Alveley Sandstone containing small tetrapod footprints, on display in the Lapworth Museum, was taken from a quarry along the river south of the Country Park. ►

Occurring on the western (Highley) side of the river, the older Halesowen Formation generally consists of channel cross-bedded greenish-grey micaceous sandstone. The overlying Alveley Sandstone transitionally grades into the Halesowen Formation stratum, which also contains thin interbedded mudstone, 'Spirorbis' limestone and coal layers. These rocks are well represented in local buildings and exposures in Stanley Quarry adjacent to Highley Station.

River Severn, looking north

Both sandstone strata indicate fluvial deposition over low-lying flood plains during the late Carboniferous. However, given the colour difference, it is likely that the Alveley Sandstone was deposited under more exposed and arid conditions than the Highley Sandstone.

The Middle Pennine Coal Measures comprise alternating layers of grey and black mudstone, shale, coal, buff sandstone and orange-red ironstone. Although not visible as outcrops, these rocks are represented in bare patches on former colliery waste tips seen in the Country Park. Limestone, quartz and dolerite gravel, used to construct drains and paths, can also be spotted.

Numerous small streams flow through the Country Park, emerging where mudstone and limestone bands within the Alveley Sandstone meet the surface. Historically, the streams made the steep colliery spoil slopes unstable before gravel drains were constructed and vegetation took hold. One stream issuing from a limestone band has caused freshwater carbonate, or tufa, to be deposited as a yellow brown crust over gravel and plant remains downstream.

Tectonic earth movements have tilted the bedrock west to east, by approximately 8° - 12°, and vertically displaced the strata along numerous north-south and east-west trending faults.

Economic Geology

Alveley and Highley Sandstone quarrying for use as building stone and grind stones dates from medieval times. The River Severn and later the Severn Valley Railway provided useful transport links north to Bridgnorth and south to Worcester where these rocks can be seen in many structures.

Stanley Colliery, adjacent to Highley station, was the first to open in the area around 1804, but along with the quarries, the early mine became exhausted around mid-Victorian times. When the Severn Valley Railway arrived in 1862, mining saw a new lease of life and the Stanley shaft was re-sunk to around 279m in 1878. However, the mid-1930s saw the workings become inefficient and they were gradually moved over to the Alveley site where production started in 1938. Highley Colliery finally closed in 1940, the Severn Valley Railway ceased operation in 1963 and Alveley Colliery closed in 1969 as the coal became too uneconomic to work.

Highley Sandstone near Stanley Quarry

Due to the dipping bedrock, the Alveley shaft was sunk to around 350m depth. The main coal horizon worked at both sites was the Brooch Coal, which, it was rumoured, if worked far enough eastwards would meet up with the workings at Baggeridge (near Sedgley). However, the north-south trending Romsley Fault east of Alveley prevented this. ►

Conservation

The closed mines and disused Severn Valley Railway left behind a legacy and landscape of industrial desolation. In 1965, a group of 50 local train enthusiasts set up the Severn Valley Railway Society, who for the next 19 years restored the line between Kidderminster and Bridgnorth. The former Highley and Alveley Colliery sites remained derelict until 1986 when Shropshire and Bridgnorth Councils commenced reclamation works. The former spoil heaps were regraded and installed with drainage ditches. Trees and shrubs were planted and the completed Severn Valley Country Park opened in 1992.

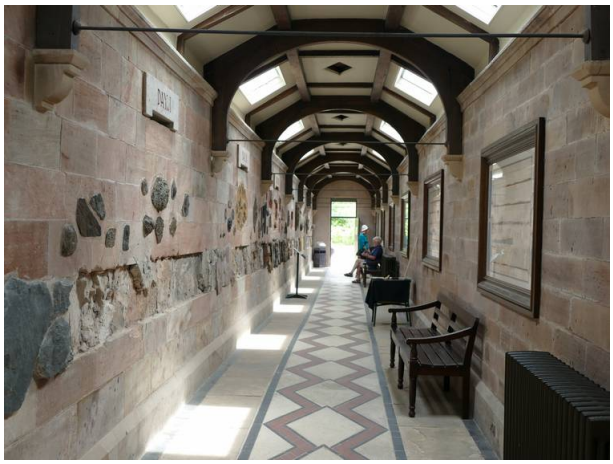
Today, council wardens and an army of volunteers maintain the Country Park, running numerous public events and providing a great place to see wildlife.

I would like to thank members of both societies for their attendance and look forward to our next outing with the OUGS West Midlands branch. ■

Andy Harrison

The Geological Gallery at Biddulph Grange Garden

Tucked away in the northern reaches of Staffordshire lies a man-made geological curiosity with a long and chequered history almost as fascinating as its original purpose. This is the Geological Gallery at Biddulph Grange Garden, created by James Bateman in the mid-nineteenth century, and now owned by the National Trust. After many years of neglect, work is currently underway in a project to restore the Gallery and include its story as an integral part of the history and interpretation of this remarkable Garden.



The Geological Gallery, June 2018

I first learned about the Gallery several years ago from Eric Robinson (former lecturer in geology at UCL, editor of 'Geology Today', and a tireless champion for the use of building stones in the teaching and promotion of geology). Eric has connections with the BCGS and is an honorary recipient of our Newsletter. Soon after the National Trust acquired the Geological Gallery, Eric was consulted about a proposed restoration plan for the Geological Gallery. Although he has had no direct involvement in the current project, he has kept in touch with its progress and has kept me informed of developments over the years. This fuelled my interest and a recent visit inspired me to do some further research...

Background and History

James Bateman was born in 1811 into a family whose fortune had been made in the iron and coal industries, and he was brought up at Knypersley Hall near Biddulph in Staffordshire. He read classics at Oxford University, but his main interest proved to be in botany and horticulture, and he became well known as an authority on orchids. Having inherited considerable wealth from his industrialist father, he built Biddulph Grange and moved there with his wife Maria in 1842. With the help of his friend, the marine artist Edward W Cooke, he set about the task of creating his extraordinary garden. ►

Bateman was a deeply religious man, and wanted his garden to reflect his belief in the biblical creation story and demonstrate his perception that God's handiwork could be discerned in all the wonders of the natural world. He did this by creating a network of garden 'rooms' or compartments, representing different aspects of the natural world, or significant characteristics of specific countries. But Bateman was a thinking man of his time, and was aware of the discrepancy between the literal biblical story of creation taking just 6 days, and the facts emerging from the new science of geology which pushed the age of the earth vastly further back in time than the biblical world view. There was also the knotty problem of extinction. The fossil record was revealing the former existence of flora and fauna unknown in the modern world. This put a spanner in the works of the biblical creation story, in which all living things were created by the end of day 6.

Lepidodendron fossil and accompanying rock strata

It was to reconcile the two opposing philosophies - one religious and the other scientific - that Bateman created his Geological Gallery. Biblical apologists were working feverishly at this time to find ways of defending their faith against the unequivocal facts of scientific discovery which were shaking religious dogma to the core. William Buckland and Hugh Miller both favoured a more relaxed interpretation of the 6 days of creation as 6 long epochs with successive creations and extinctions of flora and fauna to account for the fossil record. This thinking clearly struck a chord with Bateman. The gallery was first opened to the public in 1862, and a contemporary report by Edward Kemp describes it as a narrow corridor about 100 feet long with bays on one side and "*at about three feet from the ground, a series of specimens, showing the earth's formation, and exhibiting all the various strata in their natural succession, are let into the wall, in a layer about eighteen inches wide; and above this are arranged the animal and vegetable fossils that the respective strata yield... The whole is distributed into 'days' supposed to correspond with the six (so called) 'days' of the Mosaic cosmogony, beginning with the granites, and passing into the slates, the limestones, the old red sandstones, the coal formations, etc, with such animal and vegetable remains as occur in each*". On the other side of the corridor there were geological maps and sections, and specimens for visitors to study. The Gallery reflected Bateman's strong commitment to the value of visual education. It is also known that the Gallery was designed to be a grand entrance to the gardens. Visitors would walk through the stages of creation and out into the fantastic world of his garden. Fancifully one might surmise that Bateman had the Garden of Eden in mind (though there is no historical record of this).

In 1869 Bateman moved to London, leaving Biddulph Grange in the hands of his son. It is not known why he left after so few years to enjoy the fruits of his labours, but London was the centre for his links with the Royal Horticultural Society and his work on orchids, both of which were becoming increasingly important to him.

The estate was sold to iron and coal master Robert Heath. Most of the house was destroyed in a fire in 1896, and the rebuild bears no resemblance to Bateman's house. In the 1920's the building became an orthopaedic hospital (first for the North Staffordshire Cripples Aid Society, then a children's free orthopaedic hospital under Lancashire County Council, and finally an NHS general orthopaedic hospital). Some parts of the house were demolished to make room for new wards, and amongst these was the end section of the Geological Gallery. The rest of the gallery was used as a workshop. ►

Although a conservation order was granted to the estate in the mid-1970's, neglect and vandalism took its toll until the National Trust acquired the gardens in 1988. The monumental task of restoring the Garden began. The hospital was officially closed in 1991, and the magnificently restored Biddulph Grange Garden opened to the public in 1991. The house was bought by a developer and converted into flats.

A research challenge – and a new lease of life for the Gallery

But what of the Geological Gallery? It came to the notice of Dr John Stanley (adult education lecturer at Keele University) in the early 1970's. He found it in a dilapidated state with many of the fossils and rock specimens missing, and the few remaining ones in poor shape. These were removed to Keele University to be used as teaching specimens for the geology adult education course.

In 2002, the National Trust acquired the Gallery. After several years of fund-raising, the task of restoration began in earnest in 2012/13. The first task was to restore the fabric of the building itself, and then to piece together its history, and find suitable replacement specimens to restore it to its former glory. With virtually no records left by Bateman, and just a few snippets of information, the project team started by approaching Dr Stanley, Professor Hugh Torrens and Dr Ian Stimpson from Keele University. With identification work completed by the Keele academics, palaeontologist Nigel Larkin was commissioned to conserve the original fossils that Keele had gifted back to Biddulph Grange, and then source and create replicas for the walls. Daniel Atherton (Historical Research Consultant) was commissioned to lead a research project to better understand the Gallery and Bateman's purpose in creating it.

At first the Trust's project team were confronted with an empty space with 7 bays on one side, the first with no heading and the others headed by Roman numerals I to VI. The bays represented the biblical 'days' of creation each expanded into an epoch. Below were numerous holes in the walls where fossils had been, and below this were some sections of rock cemented into the walls but with many obviously missing. There were many more questions than answers. Where, why, and how did Bateman develop such an interest in geology? Who designed the gallery? Where had he sourced his specimens?

'Day VI' with gaps still to fill, June 2018

With funding in place (thanks largely to private donations, plus a recent grant from the GA's Curry Fund to pay for the conservation of the adult ichthyosaur skull), work began in earnest to restore the Gallery. A breakthrough came in 2015 thanks to painstaking research, and answers began to emerge to some of those questions.

It was clear that Bateman's interest in all aspects of the natural world went hand in hand with his religion, and direct evidence for his interest in geology came to light in the discovery of a newspaper report of a public lecture he delivered in December 1857 in Hanley Town Hall. It was entitled 'Genesis and Geology Compared' and revealed that Bateman's main source of inspiration was Hugh Miller. Miller was a renowned geologist famous for his work on the Old Red Sandstone, and for his vast collection of specimens. His painstaking attempts to reconcile geology and religion were best expressed in his book: 'The Testimony of the Rocks; or, Geology in its Bearings on the two theologies Natural and Revealed'. This takes the form of a collection of lectures, and was published posthumously in 1857, following Miller's suicide by shooting himself in 1856. ►

Another clue from the report of Bateman's 1857 lecture was the connection with Benjamin Waterhouse Hawkins, who had provided drawings to illustrate the lecture (though sadly these have not been found). In 1852, Hawkins had produced the world's first life-size dinosaur and extinct mammal sculptures for the Crystal Palace Gardens after the Great Exhibition of 1851. These were done under the supervision of Sir Richard Owen, and although this was still in the pre-'Origin of Species' era, evolutionary ideas were in the air, and both Hawkins and Owen were firmly in the anti-evolutionary camp.

Frog sculpture by Benjamin Waterhouse Hawkins in the Chinese Garden

Bateman already had connections with Hawkins. Following the Great Exhibition, Hawkins was commissioned to do some sculptures to enhance Bateman's garden, and at least four of them are still there; the guardian sphinxes in the Egyptian garden, the fantastical 'Ape of Thoth', and in the Chinese garden, a gilded water buffalo and a magnificent stone frog. This begged the question: did Hawkins have any part in the design and creation of the Geological Gallery? As yet it seems there is no direct evidence for this, but it seems likely that Bateman's association with Hawkins would have given him a link to Sir Richard Owen, and Bateman may already have known Owen via membership of the Atheneum Club and as both were Fellows of the Royal Society. In 1856 Owen was put in charge of the natural history collection at the British Museum, and was the driving force in establishing the Natural History Museum, where he remained in charge until 1883. Owen would have been a very useful ally to have in the sourcing of rock and fossil specimens, and would have been sympathetic to Bateman's viewpoint.

Following these leads, the National Trust project team were able to re-construct the time divisions as intended by Bateman. The first bay, with no number, was to represent the period of chaos before creation (described by Hugh Miller as the 'Azoic' period). Day 1 corresponds (in today's terminology) with the Cambrian, Ordovician and Silurian periods, day 2 with the Devonian and early Carboniferous, day 3 solely with the coal measures strata of the Carboniferous, day 4 with the uppermost Carboniferous, Permian and Triassic periods, day 5 with the Jurassic and Cretaceous (described by Hugh Miller as "the period of great sea monsters and creeping things") and day 6 the Cenozoic, or the age of mammals, crowned and completed (in Bateman's view) by the appearance of the human species.

Day 5 contained most of the surviving fossils, notably a complete young ichthyosaur, and a large ichthyosaur skull. These are in the process of conservation, and to prevent further deterioration, most of the specimens on display will be replicas. The team has the on-going task of working out which fossils came out of which holes, and then sourcing replacements from places which would have been 'on the map' in Bateman's time, and which fit into the vacant spaces! Fantastic progress has already been made, and it is intended to complete the restoration by the end of 2018. I hope to follow this article with a sequel when the work is complete, with more geological detail and up-to-date photos - and to remind you that Biddulph Grange is well worth a visit - for all its varied treasures. ►

'Day V' partially restored, June 2018

Helen Wilshaw (Biddulph Grange Geological Gallery project manager) adds that completion of the fossil installation is scheduled for the end of October, leaving only the rock strata installation to complete. She offers her thanks to Nigel Larkin (the palaeontologist working on the fossils side of the project) and to the Lapworth Museum, the Manchester Museum and Amgueddfa Cymru - National Museum Wales for their support.

Postscript

Darwin's 'Origin of Species' was published in 1859, just 3 years before the known opening of the Geological Gallery. Those who favoured a strictly biblical interpretation of the natural world were in an ever dwindling minority. The evidence-based theory of evolution by natural selection gradually took hold in the mainstream scientific world, and for the most part, the religious community managed to find ways of reconstructing the tenets of their faith without denying scientific evidence. The Gallery seems to have quickly fallen into obscurity along with the ideas it represented.

The Geological Gallery is a snapshot of a bygone world, literally cast in stone at the height of a debate which rocked the very foundations of society at the time. It provides a uniquely graphic insight into the turbulent history of geology and those who both championed and hindered its progress into the modern world.

Acknowledgements and thanks

I would like to express my thanks to Helen Wilshaw (Biddulph Grange Geological Gallery project manager) and Barbara Kleiser (lead Geological Gallery volunteer) for reading the draft text and suggesting corrections, and for offering many helpful suggestions and additional material. ■

Julie Schroder

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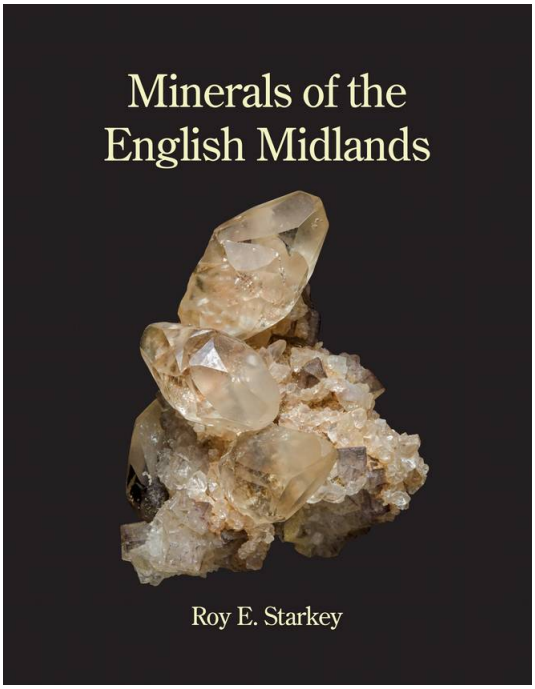
Minerals of the English Midlands

BCGS member Roy Starkey has been working for some time on his book on the Minerals of the English Midlands. It has now been published, and below he outlines the scope of this welcome new publication. Ed. ►

The English Midlands, as defined for the purposes of this book, extend from the Welsh border in the west, northwards to the boundary of Derbyshire and Yorkshire, across to the eastern margin of Northamptonshire and southwards, roughly to the line of the M4 motorway. Included, are the counties of Cheshire, Derbyshire, Gloucestershire, Herefordshire, Leicestershire, Northamptonshire, Nottinghamshire, Oxfordshire, Rutland, Shropshire, Staffordshire, Warwickshire, West Midlands and Worcestershire, a total area of some 30,000 square kilometres (11,600 square miles). It is an area of diverse geology, varied landscape and steeped in industrial history.



Mining and quarrying have been of pivotal importance to the economy of the English Midlands. As a consequence of this, the area has produced a wide range of interesting mineral specimens. Examples of these are to be found in local and regional museum collections, and especially at the Natural History Museum in London. However, such was the importance of Britain in the development of mineralogy as a science that specimens from the English Midlands are to be seen in collections all over the world.

The Derbyshire lead mining industry will, of course, be well-known to BCGS readers, and more recently, baryte and fluorite, minerals formerly considered as waste products, became economically important, in the production of drilling mud, and as a flux for steelmaking, respectively. Many small-scale opencast operations enjoyed a brief resurgence during the latter years of the twentieth century, but today only Milldam Mine, under Hucklow Edge remains in production. Elsewhere, the gypsum mines in Staffordshire and Leicestershire and Winsford Rock Salt Mine in Cheshire continue to keep the mining tradition alive in the Midlands.

There are many excellent publications which document the industrial heritage and mining history of the Midlands, but few of these include any significant mention of the wealth of fine mineral specimens which have resulted from centuries of extraction. We are fortunate indeed that thanks to the efforts of miners, mineral dealers and collectors over the past few hundred years, many interesting and beautiful specimens have been preserved for us to enjoy today.

Quartz, Kenslow Knoll Sand Pit, Derbyshire
Copyright Roy Starkey

The book has been professionally typeset and is a high quality production on 150 gsm silk paper. Running to 432 pages (276 x 218 mm) and with more than 900 images, almost all of which are in full colour, it is a substantial volume. The softback version is £35 plus p&p, and the limited edition hardback is £50 plus p&p. You can find out more about the book, and order a copy at https://britishmineralogy.com/wordpress/ If you are attending the Bakewell Rock Exchange on 13th and 14th October you will be able to pick up a copy and save the postage. ■

Roy Starkey, roy@britishmineralogy.com

Mike's Musings No. 17, Hardstoft Oil Bore – 100 years on

Long before anyone had heard of, or even thought about, 'North Sea Oil', activities had been afoot to search for the 'black stuff' within our own shores. The late 1930s and 1940s, in particular, had seen a surge of exploration across what was to become the 'East Midlands Oil Province', largely in response to the outbreak of hostilities in 1939.

Indeed, it was the earlier such outbreak in 1914 that had prompted interest in home oil resources in order to improve the efficiency of our naval fleet by employing oil rather than coal as their principal source of fuel. This also led to Government investment in the Anglo-Persian Oil Company, but that is quite another story.

Wartime constraints encouraged the commissioning of a survey, in 1915, of potential British oil resources by the Pearson Company (owned by Lord Cowdray, of Cowdray Park in Sussex), who determined that the three best prospects were the Lothians of Scotland (already having a long history in the oil shale industry), the Staffordshire Potteries and the Derbyshire Coalfield. The last of these areas had a familiarity with oil seeps in various mines around Langwith and Shirebrook, as well as historical experiences with hydrocarbons at Windy Knoll near Castleton, Eyam and Riddings.

In due course seven favoured drill sites were identified in Derbyshire (as well as two in Scotland and two in Staffordshire), all aligned NNW to SSE between Sheffield and Nottingham and broadly associated with a series of anticlinal structures in the Carboniferous rocks of the region. All seven wells began drilling in late 1918 – early 1919; all too late for the war effort due to delays caused largely by legal considerations over the ownership of the oil, and the failure of legislation to overcome these obstacles. Contracts also had to be drawn up with wealthy landowners, who knew how to look after their own interests! The main oil well of this account lay on land owned by the Duke of Devonshire, and his rights needed to be respected.

It was also necessary to engage the more expensive services of an American drilling company as the required technical expertise was pretty much lacking this side of the pond. Whilst the global oil industry was no longer in its infancy, it was a very different business from what we see these days. The method employed on this well was percussion (also known as cable) drilling whereby a chisel-shaped cutting tool (or 'bit') suspended on a cable is repeatedly raised and dropped in the hole, clearing away loose chippings with a self-closing container. More sophisticated rotary drilling was not so widely used at this time, and involved greater expense.

Six of these wells, at Ridgeway, Renishaw, Brimington, Heath and two at Ironville, all failed to identify any worthwhile oil or gas but it was a different story at Hardstoft by Tibshelf (the closest village), which likes to associate itself with this successful venture! Here the No.1 borehole was 'spudded in' (to use the oilmen's language) just about 100 years ago as you read this – on 15 October 1918, to be precise. The geology of the site was much less well established at this time, but was favoured for being situated within the area of a small, local periclinal structure (an elongated dome produced by an anticline plunging at both ends) in the Coal Measures and close to a sizeable fault that would hopefully intersect the well close to the suspected horizon at which to expect an oil trap (see cross section). ►

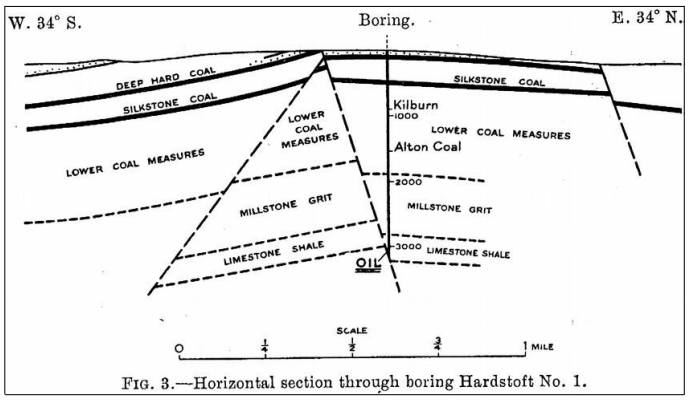


FIG. 3.—Horizontal section through boring Hardstoft No. 1.

See references below

The long and the short of it is that their judgement (inspired, educated guesswork?) came off, and on the night of 27 May 1919, after just over seven months of drilling, oil was struck at a depth of 3,070 feet, more or less at the top of the Carboniferous Limestone (see cross section). The well had cost £15,435 to reach this stage, quite a sum for the time but small beer in proportion to the million pounds that the government had set aside for the whole exploration project (of which only some £564,000 was ever spent). This in turn should be viewed against the £62 million pounds being spent annually on oil imports at the time.

The oil continued to flow, albeit at varying rates, and eventually required pumping, until it was finally decided to shut the hole down in 1945, although it continues to 'leak' a little oil to this day. During its life it yielded around 30-35,000 barrels of oil. Production figures were not kept from 1928 to 1937, but this was relatively minor, and was used on the Chatsworth estate, ownership having passed to the Duke in 1923. At its height the well was producing some 14 barrels a day on average – a laughable amount by today's standards. Partial records show that 500 tons (around 4,000 barrels) sold at £22 10s per ton in 1920, and a similar quantity was sold for £4 6s per ton in 1922, netting the government a return of at least £13,400, so I expect it paid for itself overall, with a bit to spare.

This, however, is not the end of the story. Encouraged by this success, two further boreholes were drilled in the vicinity, but neither fared any better than the other project boreholes in the county. What geologists have learned, or realised, since, is that Hardstoft No.1 was a rather fortunate strike that succeeded because it was located at the very crest of the periclinal structure, probably aided by a fault that helped to enlarge a local reservoir of increased permeability. It also appears that both the cap rock and the source rock lie within the basal shales of the Namurian succession, currently the focus of much interest with respect to the controversial 'fracking' prospects for shale gas.

On the broader front, only the D'Arcy well in Scotland had any other success at all, yielding some gas and around 7 tons (55 barrels) of oil for a few months of 'production'. Greater success was had during later exploration in the late 1930's, but still only of a very minor nature.

There are a good number of small onshore oilfields that have been proved from the 1950's on. As far as the East Midlands are concerned there is little to see except for the odd ‘nodding donkey’ on currently productive sites around Lincolnshire and Nottinghamshire as well as within a nature reserve at Duke's Wood, near Eakring east of Mansfield. This also used to house a small museum recording a later chapter in the history of oil exploration in the area, but this has now been moved to a far grander setting in Kelham Hall near Newark (various links on line).

The Hardstoft No.1 well head can still be seen weeping oil at Oilwell Nursery on the B6039 north of Tibshelf (see front cover photo). I was made to feel welcome to inspect the site without being expected to spend in the nursery itself, though they do sell small souvenir jars of 'Texas Tea' when available, and reprints of articles on the subject, from which much of my information has been gleaned. ■

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Mike Allen