# Newsletter No. 269
# October 2021

## Contents:



**To find out more about this photo - read on!**



**Copy date for the next Newsletter is Wednesday 1 December**

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| **Position vacant**<br>**Honorary Secretary,**<br><br>secretary@bcgs.info | **Andy Harrison,**<br>**Field Secretary,**<br><br>☎ 07973 330706<br><br>fieldsecretary@bcgs.info | **Julie Schroder,**<br>**Newsletter Editor,**<br>42 Billesley Lane, Moseley, Birmingham, B13 9QS.<br>☎ 0121 449 2407<br>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 more information see our website: bcgs.info, YouTube, Twitter: @BCGeoSoc and Facebook.

# Future Programme

**Indoor meetings are normally 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. The same timing applies to the current programme of online 'Zoom' meetings.**

***Visitors are welcome to attend BCGS events.***

## Covid-19 Up-date

There is no news yet on the resumption of the Geoconservation programme. The schedule below shows the current situation, with talks via Zoom until the December meeting. We will keep you notified of any changes.

**Monday 18 October *(Zoom Meeting):* 'Black Country Geopark: Progress through its first year'. Speaker: Graham Worton.**

**Monday 15 November *(Zoom Meeting):* 'Salt Industry and Brine Subsidence'. Speaker: Colin Knipe.** The talk will examine the problems of brine subsidence in Droitwich and Stafford.

**Monday 13 December *(Indoor Meeting at the Archives):* 'Deciphering the Fossil Record'. Speaker: Dr. Dan Cashmore.** A Christmas Special combining a talk plus a Christmas Buffet at the Dudley Archives.

## BCGS Committee – there is still a vacancy for Honorary Secretary!

The Committee meets about 4 times a year to discuss all matters concerning the Society, and particularly to forge together our programme of events. The Society can only thrive with the efforts put in by the Committee behind the scenes, and we are always looking for new ideas. There is **still** a vacancy for the post of Honorary Secretary, and we urgently need someone to fill this post. If you are interested, or would like more information about the work that this entails please don't be shy to put your name forward! Please use the email address secretary@bcgs.info if you are interested.

**Monday 17 January 2022 *(Indoor Meeting):* 'West Midlands National Park'. Speaker: Kathryn Moore.**

**Monday 21 February *(Zoom Meeting):* 'The Rocks That Don't Belong'. Speaker: Dr. Martha Johnson,** University of Highlands and Islands, Orkney. This talk will explore the geological basis for understanding the rock at the Ness of Brodgar, Orkney. All stone is rock but most rock is not stone. In the index or glossary of most geology texts there is no listing for stone. Conversely, in most archaeology texts, there is no listing for rock. 'The Rocks That Don't Belong' research project is investigating the non-structural, non-tool rocks recovered from the Late Neolithic site, the Ness of Brodgar, Orkney.

# Other Societies and Events

## Covid-19 arrangements

Some societies have cancelled their meetings for the foreseeable future. Many are running virtual on-line meetings. Below is a list of the societies whose events we normally promote in this Newsletter. Please check websites for further information.

## Shropshire Geological Society

**Wednesday 20 October: 'GeoMon - The Anglesey Geopark'.** Speaker: Cynthia Burek, University of Chester.

**Wednesday 10 November: 'Martley and the Teme Valley'.** Speaker: Dave Cropp, Teme Valley.

Lectures are being held using Zoom and commence at 7.15 for 7.30. Further info: http://www.shropshiregeology.org.uk/SGS/SGSEvents.htm

## Mid Wales Geology Club

**Wednesday 20 October: 'New data on the glaciations of Wales'.** Speaker: Prof Neil Glasser, Aberystwyth University.

Further information: Tony Thorp tel. 01686 624820 and 622517 tonydolfor@gmail.com
Web: http://midwalesgeology.org.uk lectures start at 7.15 via Zoom.

## Warwickshire Geological Conservation Group

**Wednesday 17 November: 'The Arden Sandstone'**. Speaker: Stuart Burley.

Venue for talks: St Francis Church Hall. There is a charge of £2.00 for non-members. For more details visit: http://www.wgcg.co.uk/ or email: WarwickshireGCG@gmail.com. Meetings start at 7.30 with tea/coffee and biscuits available beforehand from 7.00.

## Geological Society, West Midlands Regional Group

**Tuesday 12 October: 'Nitrates in Water: Sources and Processes'.** Speaker: Dr Josie McSherry (Affinity Water).

**Tuesday 9 November: 'Using Past Climates to Constrain Future Climate Projections'.** Speaker: Dr Kirsty Edgar (University of Birmingham).

Lectures are being held using Zoom and commence at 6.00 for 6.30. For further details please contact the Group Secretary at: geolsoc_wmrg@live.co.uk Click here for website.

## Manchester Geological Association

**Wednesday 13 October: 'Holiday Geology'** (by Zoom). Talks by members.

**Saturday 13 November: Broadhurst Lectures Day.** A tribute to the late Tony Adams.
The MGA is delighted to invite BCGS members to our forthcoming Broadhurst Lectures Day (Saturday 13 November) which is a Memorial Event for Dr Tony Adams who died in 2020. At Manchester University for over 30 years, he was both a well respected and liked teacher, and a researcher in the field of Carbonates. He was President of the Manchester Geological Association from 2010 - 2012 giving two interesting lectures and led various field trips for us. Registration is essential. Here's the link: https://forms.gle/RLun8vzuJJm5GKpr8

**Saturday 4 December: 'Early Hominins'.** Speakers: Prof Tom Higham and Dr Katerina Douka.

Meetings are held in the Lecture Theatre in the Williamson Building, University of Manchester, 176 Oxford Road, Manchester, M13 9QQ, unless otherwise stated. Visitors are always welcome. For more information: http://www.mangeolassoc.org.uk/ or contact lectures@mangeolassoc.org.uk

## The Geologists' Association

**Saturday 6** and **Sunday 7 November: Virtual Festival of Geology.** Free virtual geology experience for all the family! Sit in on live talks and go shopping at the virtual stalls. Explore virtual exhibitions from museums and local groups.

See the websites for further details. Festival of Geology: https://www.festivalofgeology.org.uk
Geology from your Sofa: https://geologistsassociation.org.uk/sofageology/

### Check websites for the following societies:

Teme Valley Geological Society: http://www.geo-village.eu/
East Midlands Geological Society: http://www.emgs.org.uk/
Lapworth Lectures: https://www.birmingham.ac.uk/facilities/lapworth-museum/events/lectures.aspx
Herefordshire & Worcestershire Earth Heritage Trust: https://www.earthheritagetrust.org/
North Staffordshire Group of the Geologists' Association: https://nsgga.org/
Woolhope Naturalists' Field Club - Geology Section: https://www.woolhopeclub.org.uk/meetings

# Editorial

Through the summer months there has been a cautious re-opening and re-connecting with the activities which Covid has forced off the agenda for so long. As yet, BCGS has been unable to resume geoconservation work, but field trips resumed with three evening visits to local Geopark sites in July and August, and the Birmingham Building Stones leaflet launch on 15 August. Our field meetings secretary, Andy Harrison, reported on the first two of these trips (Wren's Nest NNR and Saltwells NNR) in the last newsletter, and in this issue he covers Graham's informative and very enjoyable walk around Bumble Hole and Warren's Hall Country Park, which I think for many of us are far less well known than the previous two field trip locations. Andy also gives a detailed account of the Birmingham Building Stones leaflet launch.

Our Autumn indoor meeting programme got off to a good start with Frank Ince's talk on the minerals associated with the china clay pits of Devon and Cornwall. If you missed the talk, or would like to hear it again, it is now available on our YouTube channel, along with a number of our previous virtual talks: https://www.youtube.com/channel/UCu65xWfEmTXiczZs7x1Fasg

This issue is packed with our regular features, but perhaps particularly exciting is Alan Clewlow's account of his recent excursions to Iceland. He was able to witness the Fagradalsfjall volcanic eruption at close quarters, captured in some amazing photos.

We look forward to our next two meetings by Zoom, but perhaps most of all, our December meeting when, all being well, we'll be able to meet again in person at the Dudley Archives.

Finally, our webmaster, John Schroder has done some housekeeping on the BCGS website. Newsletters are now easier to find with a heading on the menu bar. ■

*Julie Schroder*

# Field Meeting Reports

**Wednesday 11 August *(Evening Field Meeting):* 'Rediscovering Black Country Geology and its Impacts on the Landscape: Walk 3, Bumble Hole and Warren's Hall Country Park'.** Led by Graham Worton.

Since the pandemic started, this was our third outing exploring the Black Country landscape and the interaction between local people and the underlying geology. A good turnout from both BCGS and the Geological Society West Midlands Group met Graham for a 7.00 start at Windmill End Car Park.

*Bumble Hole, original ground surface level*

**Bumble Hole** and the adjoining Warren's Hall Country Park are located approximately 2km SE of Dudley Town Centre. The sites sit on the SW facing slopes of the Rowley Hills at around 140m Above Ordnance Datum (AOD). The land rises gently at first towards the NE before ►

ascending more steeply to the hill summits at approximately 260m AOD. Historically the local landscape has been heavily sculpted and shaped to form platforms, depressions and transport networks that hint at its industrial past and geological influence.

Windmill End is so-called after a windmill which was located on a local promontory. Its purpose is unknown. Leaving the car park, we climbed steps onto the embankment that runs along the **Dudley No. 2 Canal.** The canal forms a prominent feature across the landscape and accounts for why many other features are here. Opened in 1798, it was built to link the **Dudley No. 1 Canal** in the west to the **Birmingham Navigation Canal** on the eastern side of the Rowley Hills. Around 5.5 miles long, Dudley No. 2 canal is around 2.13m (7 feet) wide and took a lot of traffic. Heading SW, the canal passes various former factories and collieries on its way to the Saltwell's clay pits and beyond to the Park Hill locks and Dudley No. 1 Canal. To the NE it passes through the Rowley Hills ridge via the Netherton Tunnel before connecting with the Birmingham Canal at Dudley Port.

Beside the Dudley No. 2 Canal, we stopped at a lake filled depression, known as **Bumble Hole Lake**, which gives the reserve its name. Historically the depression was a deep clay pit worked to provide raw materials for brick making with springs running into its base. Submersible pumps were used to drain the lake, the sound and echo from which made a 'bumbling' sound as water was transferred initially into a drainage ditch and later into the Dudley No. 2 Canal. The local clay, Etruria Marl, was used to make blue bricks which we could see lining the canal and forming associated structures such as bridge buttresses. Being strong and impervious, the bricks were resistant to leaks and cracking during colder weather making them ideal for canal building. **Warren's Hall Country Park** to the north, gets its name from a former timber framed stately home that was demolished in the 1850s. Both Bumble Hole and Warren's Hall Parks were given Local Nature Reserve status in the 1970s.

*The Netherton Tunnel*

Our route continued northwards along the canal before branching off along a wooded track and up onto an old field that formed the original land surface. Eventually our route took us up onto the lower Rowley Hills slopes with views over the Netherton Tunnel and the valley below.

Along the way Graham pointed out various features associated with the landscape. The Dudley No. 2 Canal has been cut into the original landscape, a farmer's field. As it enters the Netherton Tunnel it first passes through a large cutting carved into the toe of the Rowley Hills. Towards the tunnel entrance, Graham pointed out a change in brickwork associated with the canal side wall. Apparent on either side of the canal this feature was associated with a historical railway bridge that lined up with the woodland track we walked along. Prior to the railways, the canals had provided the main transport network for carrying goods around the region. However, with the railways being faster and able to carry heavier loads this spelt the demise of canals from the 1860s onwards.

The **Netherton Tunnel** opened in 1858 and was constructed by driving vertical shafts, later airshafts, from the surface. Whilst digging the tunnel, the navvies encountered a vast dolerite sheet, which ►

they expected to be a major obstacle. However, the sheet turned out to be eight feet thick and sub-horizontal. This is because the Rowley intrusion is shaped like an inverted top hat, known as a lopolith, between two major faults and the dolerite sheet the navvies encountered was a thinner part of this structure. Either side of the dolerite sheet were softer sandstone and shale layers associated with the coal measures strata that were easier to excavate.

Consequently, Netherton tunnel took three years to construct compared with the Dudley Canal Tunnel, on the Dudley No. 1 Canal, which took twelve years. However, whilst the Netherton Tunnel connected the Birmingham Navigation and the Black Country canals very successfully, it only operated for approximately two years before the railways arrived in the 1860s.

From the farmer's field and Netherton Tunnel, we ascended the Rowley Hills lower slopes up onto another man-made embankment that forms a long arc enclosing relatively flat ground and forming a shallow 10 acre dish. On historical Ordnance Survey maps this feature is shown as the disused **Gadd's Green Reservoir**, which was built in 1792 to collect surface water to feed the Dudley Canal network. The reservoir was abandoned around 1860 when a new water source from the mines was utilised, but it collapsed due to being undermined.

*Cobb's Engine House*
*Photo Tina Cordon at English Wikipedia*

Continuing along the embankment and the Rowley Hills slopes, we were provided with views southwards overlooking Dudley town centre, and various hills including Netherton, Knowle, Abberley, Wychbury and the Clent and Walton, all representing different geological formations and episodes ranging from Silurian to Permo-Triassic. Mining, other industry, the railways, canals and more recent developments have all sculpted and shaped the landscape before us.

Graham spoke about the collieries and how exploiting the Thick Coal created a landscape of smoking spoil heaps due to the oxygen being fed into the spoil and causing it to burn, these fires and surrounding industry providing JRR Tolkien with the inspiration for Mordor in 'Lord of the Rings'. Further along the slope, Graham showed us an eroded spoil heap where incised channels had revealed spoil layers like those seen in a sedimentary sequence.

Heading back towards Windmill End Car Park, we briefly stopped at **Cobb's Engine House,** which is all that remains from the mining legacy in Warren's Hall Country Park. It is named after the farmer who owned the land. Erected in 1831, the engine house was fitted with a Watt steam engine to pump groundwater from the mines. It closed in 1925 due to numerous miners strikes and was made a Grade II structure in 1972. After being neglected and allowed to decay for nearly fifty years, it was restored in the 1980s. From Cobb's Engine House, we headed back to the Dudley No. 2 Canal and reached the car park around 9.00. I would like to thank Graham for a very interesting evening and look forward to seeing more sites that our Geopark has to offer in the future. ►

**Sunday 15th August *(Afternoon Meeting):* Building Stones of Birmingham - Leaflet Launch.** Led by Ruth Siddall (UCL Student Mediator).

The Birmingham Building Stones Trails have been designed in three parts to tell the stories of the stones used to build the City of Birmingham. Julie and John Schroder have been driving the project since 2016 in collaboration with Ruth Siddall, to produce printed leaflets based on the trails, though work has been hampered by on-going refurbishment of Birmingham City Centre.

Trail 1 concentrates on Birmingham Town Hall to Cathedral Square and Trail 2 continues the story from Centenary Square to Brindley Place. The third trail leaflet centres around Birmingham shops between the Bullring Centre and New Street Station.

A group of 14 gathered for the launch on 15 August, meeting at 2.00 outside the Victorian (1834) Birmingham Town Hall. The weather was overcast and mild with a light breeze. To launch the leaflets, we spent the afternoon following Trail 1 under the guidance of Ruth Siddall, who provided an insight into the building stones that could be seen at each locality and where they came from.

Trail 1 follows a route starting at the **Town Hall (Locality 1)**, which although brick built is clad in a Carboniferous limestone, around 340Ma, called Penmon Marble and sourced from quarries on Anglesey. Notable within the limestone are sections through solitary, rugose, corals called Dibunophyllum. Brachiopods and some colonial corals may also be seen in the limestone. At our feet we stood on recently laid granite paving stones from China.

*Ruth talks to the group in Chamberlain Square*

Crossing Chamberlain Square to **Locality 2** and the **Memorial to Joseph Chamberlain**, the paving slabs changed to sandstone (York Stone) showing sedimentary structures and Liesegang rings. The sandstone formed in massive sandy river deltas during the late Carboniferous (320Ma). The Chamberlain Monument base is grey Aberdeenshire granite, intruded during the Caledonian Orogeny around 490Ma. Forming the main monument is Jurassic Portland Stone Basebed upon which is set a red granite dedicatory plaque from the Kalmar coast in SE Sweden.

Due to Covid restrictions, the **Museum and Art Gallery (Locality 3)** was closed, robbing from us the chance to see the impressive Devonshire marbles that decorate the interior. The marbles, really limestone, came from quarries around Torquay and date from the Devonian (390Ma).

The main museum building and adjacent **Council House (Locality 4)** are built from similar Derbyshire sandstones (Millstone Grit) that exhibit cross-bedding. Finely carved Portland Stone pediments, likely Basebed, adorn the upper exterior of the Council House. Crossing Victoria Square, we stopped to look at the Sphinx-like 'Guardian', carved from Carboniferous sandstone to match the Council house. ►

*Examining a 'Guardian' in Victoria Square*

**Waterloo House (Locality 5)** sits on the corner of Victoria Square and New Street and currently houses Nando's restaurant. The lower half of the building is clad in a dark red-brown granite called Dakota Mahogany, from South Dakota in the USA. This stone is the oldest seen on Trail 1, dating to 2,700Ma. Heading northwards we climbed the steps to Waterloo Street, stopping briefly to admire the Rapakivi granite used to form the doorstep to Waterloo House.

Continuing along Waterloo Road, the trail stops at the entrance to **New Oxford House (Locality 6)**. The door jambs are carved from pale grey limestone packed with crinoids, which give it the trade name of 'Bird's Eye Marble'. The stone dates from the Lower Carboniferous (around 330Ma) and represents the Eyam and Monsal Dale Limestone from Derbyshire. The interior door surrounds are green serpentinite breccia, known in the trade as 'Verdi Alpi'. Formed around 30Ma during the Alpine Orogeny, the stone comes from the French and Italian Alps. The stone representing slivers of ocean crust crumpled and welded onto the continental plate that was later metamorphosed and brecciated with calcite mineralisation infilling the cracks between blocks.

Leaving Victoria Square, we stopped to look briefly at the Larvikite / Portland Stone combination on the Theatrix Birmingham building before proceeding to the doorway of the **Java Lounge, 122-124 Colmore Row (Locality 7).** A Grade I listed building, the doorways are flanked with a black and white limestone called Frosterley Marble from County Durham. Formed during the Carboniferous (325Ma) this limestone contains large singular coral fingers of 'Dibunophyllum', like those seen at the Town Hall. However, this stone formed in a shallow tropical sea rich in organic material that gives the dark appearance.

Continuing along Colmore Row we passed **No. 98 (Locality 8), Nos. 79-83 (Locality 9)** and ended up at **No. 57 and The Grand Hotel (Locality 10).** No. 98 exhibits Larvikite cladding the foundations and door. This stone comes from Larvik in Norway and dates from the Permian, approximately 290Ma. Honey-coloured Jurassic Bathstone, an ooliitic limestone, formed around 168Ma clads the building at Nos. 79-83. The entrance pillars at the front of No. 57 and The Grand Hotel are constructed from Shap Granite from the Lake District, which was intruded during the Caledonian Orogeny around 397Ma. The stone contains large pink sub-rectangular feldspar crystals and black xenoliths of rock that fell into the granite mix.

*Shap granite columns at 57 Colmore Row*

The final parts of the trail centre around the **Cathedral Church of Saint Philip (Locality 11)**, which dates from around 1715 to 1725 and was originally built from Arden Sandstone. Prone to weathering, that sandstone has been replaced with buff to light-coloured sandstones from Derbyshire and the Midlands. The adjacent **Crimean War Memorial (Locality 12)** is constructed from red ►

Peterhead Granite from Stirling Hill, Aberdeenshire. This stone represents another intrusion from the Caledonian Orogeny dating to the Devonian around 406Ma. The nearby **Burnaby Obelisk (Locality 13)** commemorates a once famous soldier and has been constructed with a Bird's Eye Marble plinth and the main obelisk formed out of Portland Whitbed Stone. The roundel set into the obelisk has been carved from Carrara Marble from Tuscany, Italy. Used for sculpture since Greek and Roman times, this rock represent limestone uplifted and metamorphosed during the Alpine Orogeny, 30Ma.

*Relaxing at the Old Joint Stock after the walk*

The last stop on Trail 1, the **Monument to John Heap and William Badger (Locality 14)**, was built to remember the death of these two workers during the construction of the Town Hall. As seen at the Town Hall, the monument is a stone column formed from the same Penmon Marble.

Finishing the trail around 4.30, we headed to the Old Joint Stock for some refreshment and socialising before heading home. Julie and John hope to run the trails for the Society in due course. ■

*Andy Harrison*

***Copies of all three trail leaflets can be obtained from various outlets:*** *Library of Birmingham, Thinktank (Birmingham Millenium Point), Lapworth Museum, CBSO Centre (Berkley Street) or by contacting Julie (contact details on p.2).* ***If you know of somewhere where they can be displayed please let us know!*** *They can also be downloaded from the BCGS website at www.bcgs.info/pub/local-geology/building-stone-trails/ Ed.*

# Birmingham's Erratic Boulders: Heritage of the Ice Age

## More about the Project

In the last issue we gave full details of the new Birmingham Erratics Project in the long press release, so this will be a brief up-date to keep you in the picture.

Interviews were held towards the end of August for the posts of Project Manager and Volunteer Co-ordinator, and we are delighted to announce that Val Turner has been appointed as Project Manager and Dan Cashmore as Volunteer Co-ordinator. Val is based in Worcester and brings a wealth of experience in project management and working with volunteers. Dan was a student at the University of Birmingham, and coincidentally, will be the speaker at our December talk. Dan's Phd research was in the field of vertebrate palaeontology – rather remote from the current theme of glacial erratics!

Work has started in earnest to engage with the local community in the district of Frankley. One of the walking trails will encompass this district, but beyond that there is a plan to create a geological timeline, linking a small boulder currently embedded in the banks of the River Rea with two massive boulders lodged at the bottom of Frankley Hill beside the route of the dismantled ►

Halesowen to Northfield railway. Plans are afoot to clean up the boulders and make them more accessible. A recent visit with the project team brought back memories for me of an earlier visit in 2015 during another project to try and establish deposition dates for these and other glacial erratic boulders in the Birmingham area. (See Issue 234, December 2015 for more on this.)

The photo shows researcher Sebastian Bell, and volunteer Roland Kedge at work on the Frankley Hill boulders in 2015. Now they are badly overgrown again, and in need of major clearance work. A local team of volunteers are on board to tackle this work, and as things progress, it is likely that we will be looking for some extra help. Watch this space! ■

*Julie Schroder (BCGS rep on the Erratics Project steering group)*

# Visiting the Eruption in Iceland at Fagradalsfjall 2021

When there were the first indications of an eruption taking place in Iceland in March of this year, I felt that the fates had been conspiring against me. Having visited the country many times since first travelling there in 1993, leading groups to view the many classic outstanding volcanic and landscape features which Iceland has to offer, the one thing I had never been able to see was flowing lava. There had been a short eruption of Hekla in 2000, and the well-known Eyjafjallajökull ash-cloud eruption of 2010 (which had actually been preceded in the weeks before by a lava flow), but these took place at times when I was not able to visit, due to work commitments. Now retired, with no such work-pressures, I had to contend instead with a global pandemic and a government imposed lockdown preventing travel abroad. The 2021 eruption has (some might say fortunately) outlasted the lockdown, and this has enabled me to make two visits there in recent months; firstly as a solo visit in early June and then again in mid-July when leading a group.

The eruption currently taking place is focussed on the volcano Fagradalsfjall, lying on the Reykjanes peninsula, located around 40 km (25 miles) south-west of the capital city, Reykjavík. The mountain itself is named after Fagradalir (which translates as 'beautiful valley') lying just to its north-west.

*The scene of the active crater and lava fields around it on 8 June (access to this viewpoint was cut off by a lava flow just a few days later)*

Fagradalsfjall is a volcano which last erupted around 6000 years ago. It forms part of the Krýsuvík-Trölladyngja volcanic system on the peninsula. This lies within the zone of active rifting between the Eurasian and North American tectonic plates, where the divergent plate boundary of the Mid-Atlantic Ridge rises above sea-level and forms part of the Icelandic landmass. The Krýsuvík volcanic system has been moderately active in recent geological times, with the last lava outpourings taking place during the 'Krýsuvík Fires' of 1151 to 1188. These ended not long before another episode on the Reykjanes peninsula - the 'Reykjanes Fires' of 1210-1240, the last eruption on the peninsula before the present.

Like so many other volcanic eruptions around the world, the first indications that an eruption was a possibility came about with a series of earthquakes which began in December 2019. In the period between then and March 2021, there were many earthquakes, the strongest being a 5.7 magnitude ►

*Lava flowing down a slope into the Nátthagi Valley*

shallow-focus seismic event on 4 February 2021 which shook the entire peninsula. Following this, in the three weeks prior to lava first appearing at the surface, over 40,000 tremors were recorded, a clear indication that magma was moving closer to the surface.

Eventually, on the evening of 19 March, an effusive eruption started in the Geldingadalir valley, lying to the south of Fagradalsfjall. Reports at the time stated that a 600 to 700-metre-long fissure had opened from which lava was flowing, a situation which continued for several weeks.

In the period between 5 and 10 April three more fissures opened up, all with a general trend lying NNE-SSW. On 12 April, scientists from the University of Iceland measured the area of the lava field at 0.75km$^2$ and its volume to be 10.3 million cubic metres. The flow rate of the lava then was 4.7m$^3$/s, and sulphur dioxide, carbon dioxide and hydrogen fluoride were being emitted at 6,000, 3,000 and 8 tonnes per day - a potential matter of concern for the authorities having to deal with huge numbers of visitors and the nearby resident population. On 13 April, four new craters formed in Geldingadalir within the lava flows. The lava output which had been reducing over the previous days, increased again.

Towards the end of the month, the eruption itself had changed in character from its early effusive nature, to one which was producing lava fountains up to 50m in height, though one burst did reach a height of 250m on 28 April.

Most of the earlier fissures had closed by 2 May and by then only one remained active, but there were still occasional explosive eruptions within the active crater that sometimes reached heights of hundreds of metres. The lava at this time was flowing into the Meradalir valley (to the NE), and later the Nátthagi valley (to the south).

*The lava front in Nátthagi Valley on 8 June*

In the following days, the eruption pattern changed from a continuous eruption and lava flow to a pulsating one, where periods of eruptions alternate with periods of inactivity. The magma jets became stronger, producing lava fountains of 300m in height, visible from Reykjavík with the highest one measured at 460m (1,510ft). One suggestion is that the lava jets occur as an explosive release of ancient trapped water or magma coming into contact with groundwater. By late May the lava flow rate was much higher than in the early stages of the eruption, with an average lava flow rate of 12.4m$^3$/s from 18 May to 2 June. ►

*Glowing interior at the lava front*

The increase in lava flow is unusual, as eruption outputs typically decrease with time. Scientists from the University of Iceland have suggested that there is a large magma reservoir deep under the volcano, not the usual much smaller magma chamber associated with short-lived eruptions which empty over a short time. They also believe that there is a discrete vent under the lava feeding the main lava flow. It has been suggested that the eruption could go on to create a new shield volcano if it continues for several years.

I was fortunate that my first visit to the volcano took place on 8 June. *(See front cover photo: an eruption from the crater currently active on 8 June.)* I took footpath 'B' to a spot which gave an excellent viewpoint of the eruptions from the main crater. Just a few days later, on 13 June, this footpath was breached by lava flowing down into the Nátthagi valley. At the time, the crater was producing what I would best describe as a 'rapid flood' of lava about every 8 minutes. Each discharge lasted around a minute and sent a torrent from the southern lip, building up on its flank and spreading to the lava field beyond, sometimes accompanied by lava fountains within the crater. My June visit also included the opportunity to walk down to the front of the lava flow in the Nátthagi valley, from where it was possible to see the incandescent red glow within the flow, and feel the intense heat being given off.

By the time I returned on my second visit on 21 July, the volcano had settled into a pattern of having regular episodes lasting around 12-18 hours where there was little surface activity, followed by a similar period with regular eruptions and lava fountains from the crater. Unfortunately, our group's arrival coincided with the start of one of the 'quiet' periods. Weather and visibility were excellent on the day, but there was no sign of anything being erupted or any flowing lava. There had been activity earlier that morning, and it resumed again by the evening, but by that time, our group had left the area!

*View into the Nátthagi Valley in Mid-July, showing proximity to coastline and main road*

My visit on that day also included a walk down into the Nátthagi valley. The lava by then was much further advanced to the south (nearer the road) than on my earlier visit, but was no longer too hot to the touch (it was barely warm), with no sign of any red glow from within. Its upper surface showed many classic 'pahoehoe' coiled rope patterns. Broken fragments of the rock revealed a black glassy outer skin with a dark grey finely crystalline texture typical of basalt within. The rock was vesicular in nature and contained occasional pale green porphyritic crystals of olivine.

Since my returning from Iceland in July, the eruption has continued and shows no sign of any reduction in lava production, with the same regular pulses of fairly intense activity followed by a few hours of relative quiescence. Scientists have come up with different predictions of how long this period of activity will last - from weeks to years. I am just hoping that I get the chance to view it again before the eruption finally ends! ■

*Alan Clewlow Sept 2021*

# Matt's Maps No. 4

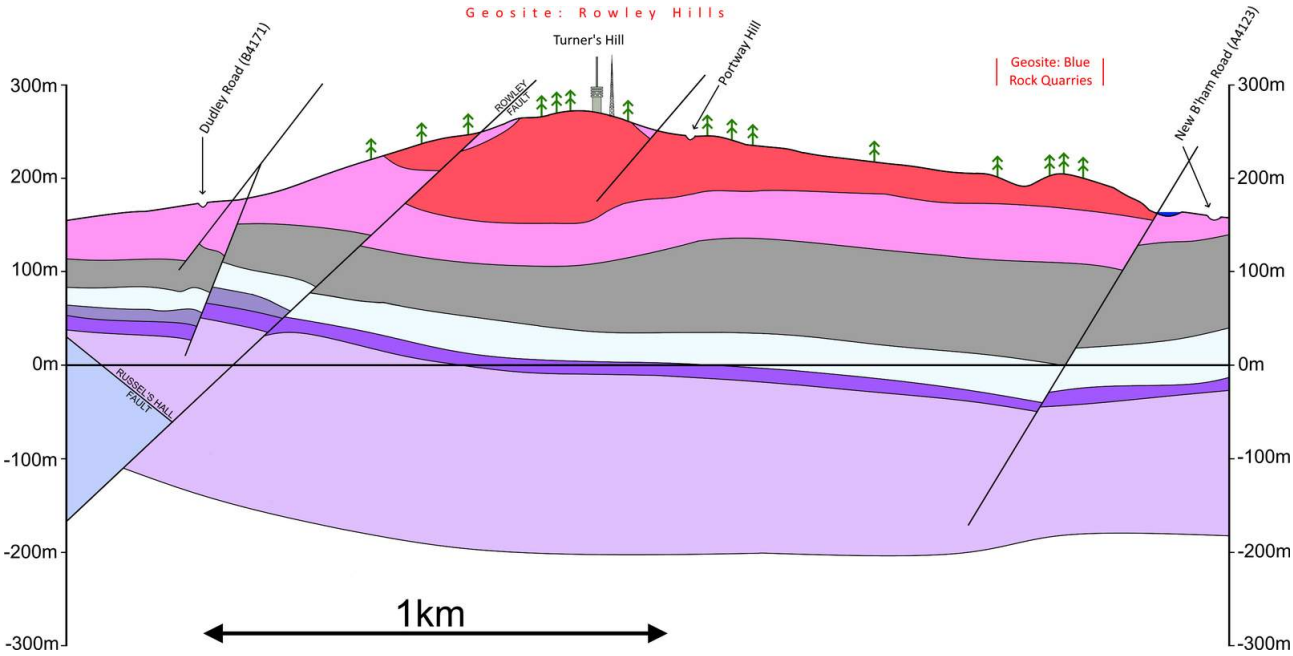
## The Rowley Hills & Blue Rock Quarry

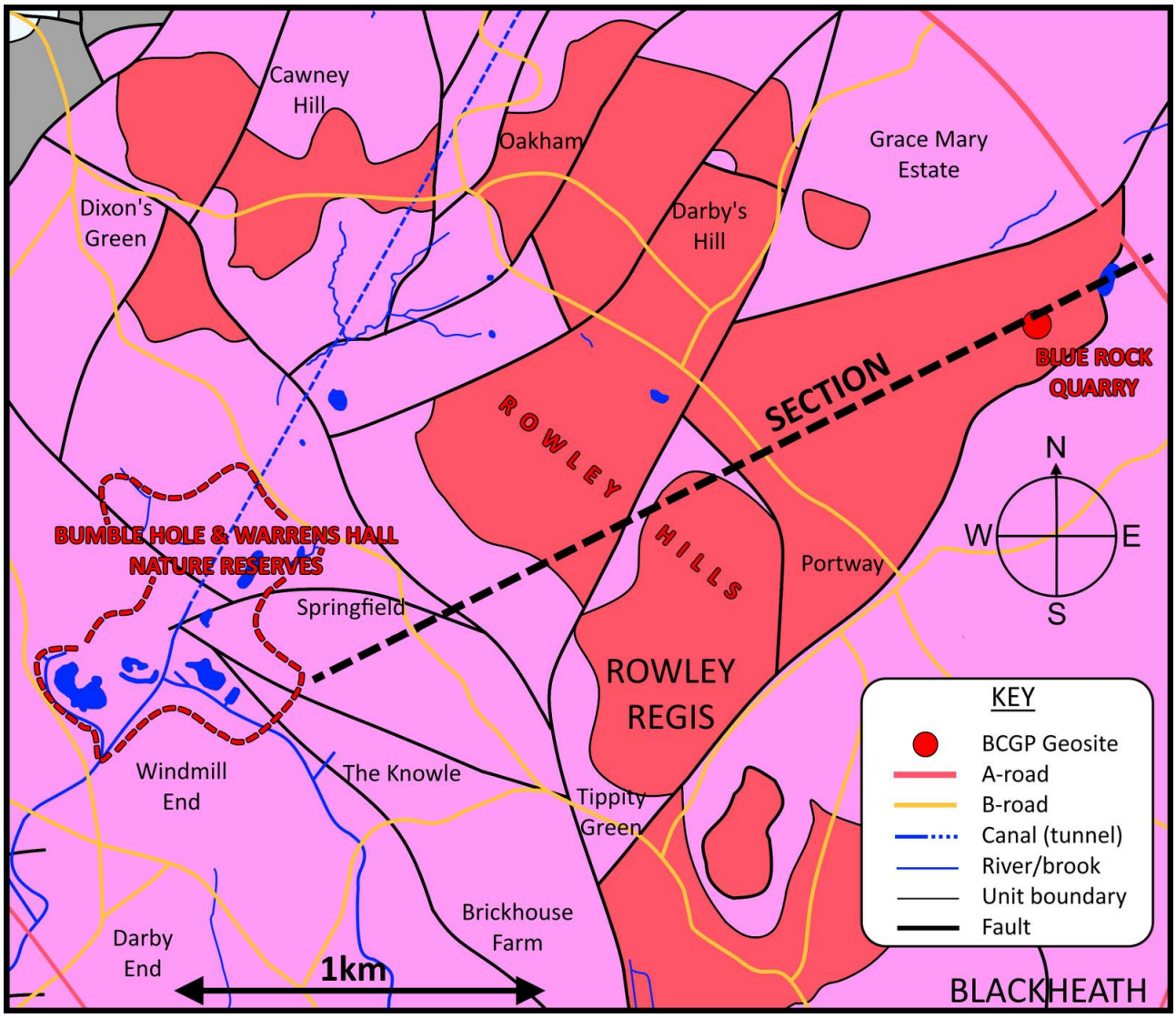
*A western view from the golf course near the summit of Turner's Hill. At the base of the hill are Netherton and Dudley, whilst the horizon extends as far as the Wrekin and Clee Hills in Shropshire. On a clear day you can comfortably see into Wales from this vantage point.*

Some parts of the world are defined and divided by their mountains. North America has the Rockies, Italy has the Apennines, and the Black Country has the Rowley Hills. Perhaps Rowley doesn't quite share the same grandeur as the others, and certainly it has slightly fewer ski resorts. Nonetheless, the significance of those hills in defining the Black Country's landscape, as well as the uniqueness of their geological origins, endears them with a magnificence all of their own.

The nomenclature is loosely defined, but the Rowley Hills could be said to extend from Penn Common in the far north-west, along a ridge that encompasses Sedgley's Beacon Hill, Wren's Nest, Dudley Castle Hill and Turner's Hill near Rowley. This high ground persists into Quinton in SW Birmingham before merging into a similar but offset ridge formed by the Clent and Lickey Hills to the south.

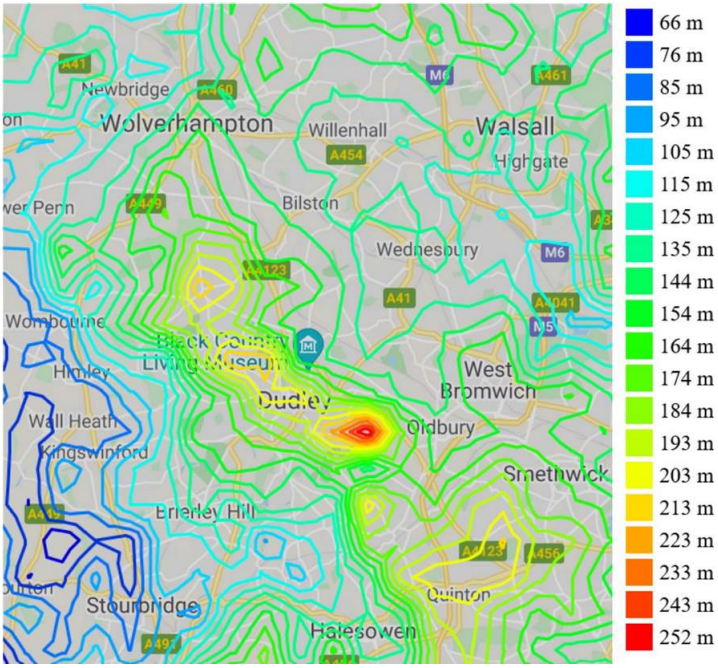
The Rowley Hills bisect not just the Black Country, but also England. Rain falling on Coseley, Tipton or Oldbury - to east of the ridge - will drain into the River Tame and ultimately enter the North Sea at the Humber estuary. Should that rain fall just a few hundreds metres to the west, in Gornal, Netherton or Halesowen, it will instead flow into the River Stour, merge with the Severn and greet the sea far to the south-west at the Bristol Channel. ►



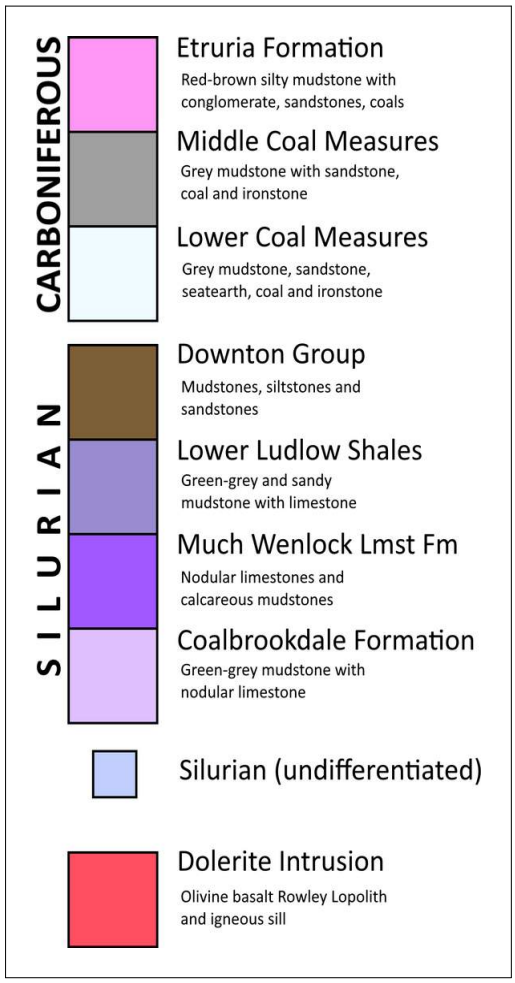



Although the broad definition outlined above is a helpful way of defining Black Country topography, the Rowley Hills can also be thought of as the slopes surrounding Turner's Hill, just north of Rowley Regis. This area encompasses not one, but three geosites: the titular 'Rowley Hills'; Bumble Hole & Warren's Hall Local Nature Reserves (the subject of a future section and article); and Blue Rock Quarry on Portway Hill.

Turner's Hill, home to two distinct radio masts, is the loftiest of the Rowleys' peaks at 271m above sea level. One of our region's most endemic pub facts is that if you were to travel due eastwards in a straight line from the top of Turner's Hill, you wouldn't reach a higher point before the Ural Mountains in Russia. Armed with Google Earth and a spare 10 minutes, I did what any self-respecting scientist would do and put this story to the test. Regretfully I must exclusively reveal here that it is sadly not true, however the reality is still impressive. Travelling eastwards on the same latitude, no higher point exists in England, the Netherlands, Germany, Poland or Belarus. In fact, it is only after 3000km of travel (but still 800km shy of the Urals), that we reach Penza Oblast in Russia and a wooded hill that rises marginally higher than Rowley's greatest peak. ►




*Map of the Black Country from Google Maps with topography overlay courtesy of the 'Contour Map Creator' web tool. Note that elevation data is imperfect, but the NW-SE ridge of the Rowley Hills is clearly visible. Turner's Hill is the area with red contours SE of Dudley.*




So what lies beneath all of these hills? Under a thin cap of ice age sediment is a rock known as Rowley Rag. Rowley Rag is the local name for dolerite, or olivine microgabbro. It's an igneous rock - the crystallised remnants of magma that originally infiltrated into cracks and between the bedding planes of local sedimentary rocks at great depth in the Earth's crust. Small exposures of this rock crop up in different parts of the Black Country, including at Saltwells and London Fields. Barrow Hill's volcanic rocks are also directly associated with this interval of igneous activity, although at Rowley there is no evidence that surface volcanism ever took place. The size of the Rowley intrusion is an order of magnitude greater than that found anywhere else on the local coalfield. The commonest types of igneous intrusions - sills and dykes - are typically only a few metres thick at their widest. These hills host a lopolith - a vast bowl-shaped body of rock with a maximum thickness of at least 100m. It most likely represents a magma chamber that was injected during crustal thinning associated with the formation of the supercontinent Pangaea, approximately 310 million years ago.

Flashing forward to the ice age cycles of the last 2 million years, repeated episodes of extreme cold, glacial activity and major erosion scoured the entirety of the region. The rock type most able to withstand the destructive effects of the ice ages was the dolerite at Rowley - hence enabling this area to become the highest point in the county. Cycles of freezing and thawing continue into the present day and give a beautiful and unique texture to the dolerite in certain exposures. Spheroidal (also known as 'onion skin') weathering creates remarkable balls of layered dolerite as the rock expands and contracts in response to external temperature. The best place to see this is in one of the few remaining large exposures of dolerite in the Rowley Hills - Blue Rock Quarry. ►

Blue Rock Quarry is nestled in the pock-marked rolling green landscape between the Portway Hill Road and Wolverhampton Road at Oldbury. Despite being in the very core of the still-industrial Black Country, this is a broad and tranquil area that I cannot recommend highly enough. On my recent visit I encountered a pair of buzzards soaring only a few metres overhead, countless bees and butterflies, and caught a glimpse of a green woodpecker plucking ants from the footpath. The character of this landscape comes from the former abundance of small-scale quarrying operations that were present here from the 18th century onwards.

*Spheroidal weathering of dolerite, Blue Rock Quarry*

The shear vastness and volume of the Rowley lopolith has created significant economic opportunities in this area for centuries. Rowley Rag was extensively used as a roadstone, perhaps as far back as Roman times. It saw early use as a cobblestone and, in more modern times, as an aggregate layer. Although most quarrying activity ceased in the late 19th and early 20th centuries, the largest quarry in the Rowley Hills only stopped operating in 2008. Edwin Richards Quarry sits immediately to the south of Turners Hill and must surely stake a good claim for being the deepest hole in the Black Country (excluding mineshafts of course).

*Edwin Richards dolerite quarry in 2008. The masts atop Turner's Hill are in the top right.*
*Courtesy of a 2013 FCC Environmental report.*

Edwin Richards Quarry is one of the few remaining parts of the Black Country where the immense impact of 250 years of industrial activity on the natural landscape is self-evident. As it is slowly backfilled over the coming decades, those dolerite exposures will once again become hidden beneath soil and cement. But even when it is no longer facing you in the landscape itself, our connection to both our industrial and geological past remains - never too far away for those who would seek it out. ■

*Matthew Sutton*

**References/Further reading**

Contour Map Creator: https://contourmapcreator.urgr8.ch/

I gathered much information from the 2010 BCGS leaflet on the Rowley Hills 'From the depths of the Earth', which is available here: https://bcgs.info/pub/local-geology/geological-leaflets-and-guides/rowley-hills-leaflet/

A 2013 report by FCC Environmental details a brief history of the Edwin Richards Quarry as well as future plans for its infill: https://www.fccenvironment.co.uk/waste-processing/landfill/edwin-richards-quarry/

Geological map was made with reference to OS Explorer Map 219 Wolverhampton & Dudley and British Geological Survey 1:50 000 Maps E167 (Dudley) and E168 (Birmingham).

# BCGS Poet in Residence - R.M.Francis

Our Poet, Rob Francis has nothing specific for us this time, but sent this note about a film project: "I'm currently working on a film with the director Paul Stringer, which will be a cinematic exploration of my ideas. We were on location in The Wren's Nest, Rowley Hills and Bumble Hole a few weeks ago, filming poems in location and taking shots of all the cool geological wonders. Paul is currently editing the film and we hope to send it to some festivals and do some events around it in the new year".

The discussion which Rob took part in on 1 October was for the launch of a new book entitled: 'Earth Lines: Geopoetry and Geopoetics'. The event introduction stated: "Earth Lines grew out of a Geopoetry event hosted by the Geological Society of London on 1 October 2020, and is a compilation of poetry and essays on the broadest theme of geoscience". It is being promoted by the Edinburgh Geological Society. There is a promotional review here: https://www.edinburghgeolsoc.org/earth-lines/ and the discussion is now on YouTube here: https://youtu.be/VjllkHIU5dM

Rob produced a series of 12 blogs under the heading 'Chain Coral Chorus' providing lots of food for thought. Here is a link to the final one, on Sedgley Beacon, written by guest blogger, Roy McFarlane. https://rmfrancis.weebly.com/chain-coral-chorus Keep scrolling down for more happy reading! ■ *Ed.*

# Mike's Musings No. 34 - A surfeit of 'ologies

The last two 'musings' have dwelt on the oblique subject of 'otomies'. It seems to me that a natural follow-on would be to consider the more familiar **'ologies' ('ographies and 'onomies)**, while considering the place of **Geology** within the wider spectrum of the sciences. (The three Greek suffixes relate to differences in the nature of a subject: an 'ology is something studied, an 'ography is something drawn, written or listed and an 'onomy is something named or regulated, although the choice of suffix is sometimes less than clear.)

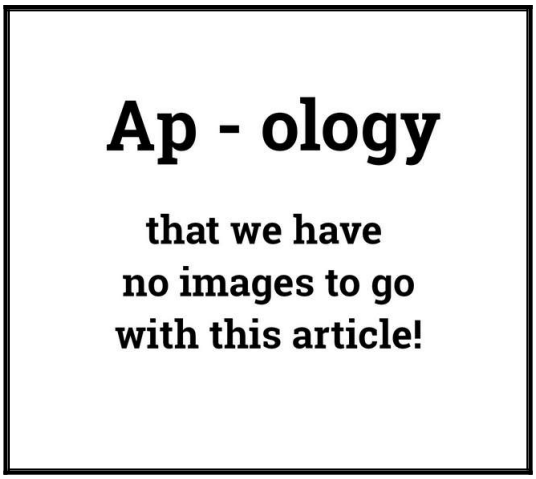
There was a time when much scientific speculation resided within the poorly defined classification of *'Natural Philosophy'* which covered a multitude of disciplines (a time when it was possible for an individual to be a genuine polymath, with expertise across several fields of enquiry). When I went to university, 'way back in the 70's', geology was usually still just called geology (the study of the Earth). Nowadays the terms *'Earth Science'* or *'Geoscience'* are commonly preferred. Nothing wrong with that – indeed, it probably just reflects a distancing of terminology from the Classics, which have themselves gone largely out of fashion. More people probably understand what Earth Science is all about better than they understand what geology is (and, in my experience, mixing it up with **genealogy**!).

Research for this article led me to a proliferation, and indeed confusion, of ways of looking at the whole question of how the sciences are classified. It reminded me a little of that bogus scheme for classifying things, 'The Celestial Emporium of Benevolent Knowledge' that I recounted in my 'Musing' on Taxonomy (Newsletter 250, August 2018). Consequently, what follows is very much a personal and no doubt simplistic take on the subject!

If one were to try and construct a family tree of the sciences, I think most people would begin with the main branches of *Physics, Chemistry* and **Biology** (and perhaps *Mathematics*, if they regard it as a science). As scientific understanding matured, or progressed, the boundaries between individual disciplines became increasingly blurred and a whole new raft of sub-disciplines evolved. Further, as the professional status of all practitioners of science established themselves, each strand sought to ►

position themselves as separate and individual from each other, partly for clarity and, dare I say it, partly for self-esteem. Consequently, we now live in an age of highly defined disciplinary boundaries, albeit with a healthy emphasis on collaboration (look through the leading scientific literature and see how many papers you can find today with just a single author, as used to be quite normal 'back in my day'!).

Returning to a consideration of the place of **Geology** (being old-fashioned, I'll stick to this name), it isn't difficult to appreciate that it wouldn't be on my list of the 'main branches' of science. Clearly it has connections to all three (or four), but must rank as subordinate, or derivative, to them all - the second tier of the scientific family tree, to which I am inclined to add **Archaeology**, **Geography** and **Astronomy**.




Delving deeper into the family tree, we may begin to explore where further branching has 'evolved' to create a host of more precisely defined areas of study. We can begin this investigation by seeing the obvious associations of geology with the three (or four), first rank sciences.

The combination of geology and physics most obviously leads us to *Geophysics*, but less obviously to *Plate Tectonics,* a relative newcomer to the field of geology, but one that has revolutionised the subject (much as establishing the Periodic Table did for Chemistry or the understanding of DNA did for the biological sciences). Closely related is the area of *Tectonophysics*; neither would have got very far without the study of **Seismology** (earthquakes), or an understanding of **Rheology** (flow and deformation of solids) which feeds into the broader area of **Structural Geology** and leads, via an association with *Rock Mechanics*, to some aspects of engineering such as *Metallurgy* and even **Metallography**. Within this family of associations we might include the specific studies of **Orology** (mountain building) and **Volcanology** (volcanoes!).

Similarly, the combination of geology and chemistry gives us, most obviously, *Geochemistry*. This leads on to the various branches of geology concerned essentially with the chemical composition of our world and hence **Mineralogy** (minerals) and its derivative **Petrology** (rocks). The more specific areas of **Optical Mineralogy** (minerals in thin section) and its 'rocky' equivalent of **Petrography** (rather than **Optical Petrology** for some reason!) might be considered as derivatives of *Microscopy* and this seems to be the most appropriate place to make mention of other more specific areas of study such as **Crystallography** and **Gemmology**, both of which often involve looking at things under magnification.

Geology may combine with the biological sciences; **Zoology** (animals), **Phytology** (plants), more familiar as *Botany;* **Mycology** (fungi), **Malacology** (shells), most obviously in the study of fossils of one sort or another under the umbrella term of **Palaeontology**, but deconstructed into a number of discrete specialisations such as **Micropalaeontology**, **Vertebrate Palaeontology, Invertebrate Palaeontology** (though for some reason this is seldom referred to so specifically, except in the subtitles of textbooks); **Palynology** (spores and pollen), **Ichnology** (trace fossils) and **Ichthyology** (fish). This might also be the best place to add **Evolutionary Biology**, a defined branch of the subject which all began with Darwin's great idea, but wasn't so named until much more recently. **Taxology** might also be mentioned here, although this is better known as **Taxonomy**, and can be applied to all areas of classification. ►

Mathematics is less likely to be coupled in people's minds with geology. Although it is often desirable to try and quantify things, geology is generally a less precise, or numerical, science. Nevertheless, *Geodesy* is a branch of mathematics dealing with the geometry of our planet and transgresses into the geological domain. There could also be an argument for introducing the fourth dimension here, with **Geochronology**, but the techniques mostly employed have more to do with physics and might be better included under the multi-pronged subject of **Isotope Geology**, whilst the separate branch of **Dendrochronology** clearly involves a bit of botany; so this is where categorisation becomes rather less straightforward.

Many further aspects of geology might best be considered as derivatives of **Physical Geography**. **Geomorphology**, the study of landforms, also relates to underlying geological structure so has connections with that area of the subject already mentioned. In considering matters I had some difficulty in where to include the important study of **Lithology** (the study of the overall physical characteristics of a rock unit), but here seems not inappropriate, leading as it does to further key disciplines of **Sedimentology, Pedology** (soils) and **Stratigraphy**, the last of which has obvious associations to the fourth dimension, but in a relative rather than numerical sense (the order in which things happened, without assigning actual dates).

Another series of 'ologies' can be related through an association with water, at the centre of which **Hydrology** takes pride of place, dealing with the movement, distribution and management of that most vital of natural resources. More specifically, **Hydrogeology** deals with the movement of water below ground, having obvious associations with **Speleology** (caves and karst), which feeds back into landform studies. Since water may also be solid, this is clearly the time to mention **Glaciology**, and there is even a fairly new 'kid on the block' which I have come across quite recently that is even more specific: **Speleoglaciology**! Meanwhile, returning to water in liquid form, we arrive at **Oceanography** (which I'm surprised to learn is also referred to in some quarters, arguably more correctly, as **Oceanology**). Water in its third state (gas or vapour) feeds into all forms of *Atmospheric Science*, so this is where I finally get to give that topical favourite, **Climatology**, a mention. This might also be the best place to mention *Geoengineering*, which involves large-scale attempts to control or improve our environment (Lord help us!) by manipulating the Earth's natural systems.

We're almost done now, but I still haven't found a suitable place for such an important aspect of our subject as **Economic Geology**, even though the fundamental contribution this has made to our modern lifestyle seems little understood or appreciated by many. Nor have I yet mentioned the relatively young specialist field of **Forensic Geology**.

I have deliberately avoided leaving the planet to include subjects like **Astronomy**, *Astrophysics*, **Lunar Geology** (which seems a contradiction in terms) or **Cosmology**, although there is no doubting that the field of *Meteoritics* cannot be ignored for a full understanding of our own 'rock in space' - and perhaps our own insignificance in 'the grand scheme of things'?

No doubt there are other areas I have overlooked, but I think by now you will have got the general thrust of my argument: geology lies firmly central stage amongst all the 'ologies, 'ographies and 'onomies science has to offer, and this is no doubt a large part of its appeal. Geology has come a long way since it emerged as a distinct area of study, having a difficult gestation period at a time when it was arguably uppermost in challenging **Theology**, then perhaps the most influential 'ology' of the day. ■

*Mike Allen*