Newsletter No. 252
December 2018

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Copy date for the next Newsletter is Friday 1 February

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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 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.

Sunday 20 January *(Geoconservation Day):* Lickey Hills, Barnt Green Road Quarry. Clearance session in conjunction with the Lickey Hills Geo-Champions, directed by Lickey Hills Ranger team, Lickey Hills CP. Meet at 10.30 at the Lickey Hills Visitor Centre, Warren Lane, B45 8ER. Bring hard hats if you have them, gloves and a packed lunch. (Some hard hats available at the VC if required.) Wear old clothes and strong footwear. Tools provided. Finish at 2.00. Significant progress has been made recently at this quarry by the Geo-Champions group and other researchers, with new finds and new interpretation. The site is also included in a geology App *(see Newsletter 249, June 2018 p.13 for more on this).* Download the App 'Voyager BrooksDesigns', come along to help with the endless task of keeping the rock-face clear, then perhaps have a go at the 'Lickey Ridge' voyage.

Monday 21 January 2019 ***(Indoor Meeting):*** **'The Piltdown Man hoax – a skeleton in the cupboard'. Speaker: Dr Colin Prosser, Head Geologist, Natural England.** The Piltdown hoax is perhaps the best known case of scientific forgery in the world and has been the subject of hundreds of papers, books, articles, press reports and web-pages. This talk describes the fascinating story of the hoax but also reveals the amazing, and until recently 'forgotten', story of the site of the Piltdown 'finds' - an embarrassing skeleton in the science and conservation cupboard.

Saturday 16 February 2019 ***(Geoconservation Day):*** **Wren's Nest.** Directed by the reserve wardens. Meet at the Wardens' office on the former Mons Hill College site 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.

Monday 18 February ***(Indoor Meeting):*** **'Turning Soil into Stone'. Speaker: Dr Steve Wilkinson, Senior Lecturer in Engineering Geology, University of Wolverhampton.** Applied geo-microbial technologies are developing fast. We know from historical observation that micro-organisms have affected the properties and behaviours of the ground. In this talk we explore whether we can direct the actions of micro-organisms for engineering/design purposes.

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. Finish around 2.30.

Monday 18 March ***(Indoor Meeting, 7.00 for 7.30 start):*** **AGM** followed by **'Rock along the Cut'. Speaker: Andrew Jenkinson.** The canal system in Birmingham and the Black Country was included in William Smith's first geological map of England & Wales in 1815, because at the time, canals had been developed to a greater extent than the road and rail networks. Canals in B&BC were developed better to exploit products from the earth such as iron ore, coal and limestone, based on geological knowledge. Canals enabled these products to be moved more easily from one place to another.

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.

Saturday 6 April *(Field Meeting):* Quaternary of the Severn Valley in Shropshire, led by David Pannett (Shropshire Geological Society). Meet at 10.30 at Lyth Hill car park, GR: SJ476072 (off A5 onto A49 south, after half a mile right fork into Bayston Hill, then straight ahead to the top of Lyth Hill). Introduction to Shropshire Plain, then back to A5 and on to Bicton (David's house) for refreshment and use of facilities. Further briefing at Merton SY3 8BT. Tour of glacial landscape via Bicton, Preston Montford, Shrawardine, and Melverley pub stop (if wanted) and tea at Melverley church, time permitting.

Monday 15 April *(Indoor Meeting):* 'Europe's Lost World: The Rediscovery of Doggerland'. Speaker: Professor Vince Gaffney MBE FSA, Anniversary Chair in Landscape Archaeology, University of Bradford. 8,500 years ago the area that now forms the southern North Sea was dry land. By 5,500 BC the entire area had disappeared beneath the sea as a consequence of rising sea levels. The 'North Sea Palaeolandscape Project' has mapped 23,000 km^2 of this 'lost world' using seismic data collected for mineral exploration. In mapping this exceptional landscape the project has begun to provide an insight into the historic impact of the last great phase of global warming experienced by modern man and to assess the significance of the massive loss of European land that occurred as a consequence of climate change.

Saturday 11 May *(Field Meeting):* Martley Geo-Village, led by John Nicklin (Teme Valley Geological Society). Meet at 10.30 at Martley Memorial Hall for light refreshments and a pop-up display. Recognised as a Geo-Village, Martley has distinctive geology within its bounds spanning the Palaeozoic and lower Mesozoic. Includes rocks belonging to the Precambrian Malverns Complex, Martley Quartzite, Silurian and Carboniferous mudstones, siltstones and sandstones, Triassic sandstones, and Quaternary sand deposits. By car and/or on foot we will explore local geological sites, finishing around 4.00. Please bring a packed lunch.

Saturday 15 June *(Field Meeting):* Lydney Cliffs, Gloucestershire: Led by John Moseley (Gloucestershire Geoconservation Trust). Meet 10.30 at Lydney Docks. Good parking at east end of Harbour Road, GR647013. Views of River Severn and south to Aust Cliffs, walk along low cliff to access Lydney Cliff section (caution required!), to examine Pridolian sequences. Lunch in Lydney, or at Parkend, 2 miles north of Lydney. Afternoon: possible underground visit to Hopewell Colliery or Clearwell iron ore caves, or a Carboniferous limestone locality. Finish around 4.00. Bring a packed lunch or there may be an opportunity to buy lunch in Lydney or at the Forest of Dean VC.

BCGS trip to Dorset 2019

The Dorset Geologists' Association Group has kindly agreed to host a weekend visit for BCGS to the Dorset South Coast. Either: **16 - 18 August or 23 - 25 August 2019.** A suggested itinerary would be to arrive on Friday using Weymouth as a base (2 overnight stays), then 2 full days to explore features from the West Dorset Heritage Coast to the Purbeck Heritage Coast, i.e. Chesil Beach, Isle of Portland, Durdle Door, Lulworth Cove, Kimmeridge and possibly Studland Bay and Old Harry Rocks.

This trip can only happen with sufficient interest and support from BCGS members!

Please contact Andy Harrison (andrewcfharrison@yahoo.com, mobile 07973 330706, tel: 01746 781 033) to express an interest in attending this field event. Please indicate which weekend you would prefer, any ideas to add to or amend the suggested itinerary and places to stay.

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.

East Midlands Geological Society

Saturday 12 January 2019: Mediterranean tsunami at 80ka. Speaker Prof Jim Rose.

Saturday 9 February: The Long and Moving Story of the Great Glen Fault. Presidential Address: Dr Mike Allen.

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

Warwickshire Geological Conservation Group

Wednesday 16 January 2019 at 7.00: The Wren's Nest – Geology of this celebrated nature reserve in Dudley, and the application for Unesco Geopark status. Speaker: Graham Worton (Curator at Dudley Archive).

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 8 December at 1.30: Some Aspects of the Quaternary. Speakers: Prof Jamie Woodward, University of Manchester, Prof Jeff Peakall, University of Leeds, Prof David Bridgland, University of Durham.

Thursday 17 January 2019 at 6.30: Prof Robert Ward, British Geological Survey. Joint Meeting with Geological Society, North West Region.

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.

Geological Society, West Midlands Regional Group

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

Thursday 24 January 2019 at 7.30: The geomorphological and geological impacts of glaciers: recent insights from glacial land systems. Speaker Dr Richard Waller (Keele University).

Thursday 7 February at 7.30: BGS collections: over 200 years in the making. Speaker Dr Michael Howe (Head of the National Geological Repository, British Geological Survey).

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/

Teme Valley Geological Society

Monday 21 January 2019: The Ice Age in Worcestershire and prospective TVGS research on the origin of the Teme Valley. Speaker Prof. Ian Fairchild.

Monday 11 February: Palaeolithic Worcestershire. Speaker Nick Daffern.

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.

Mid Wales Geology Club

Wednesday 16 January 2019: AGM & 'The Geology of Anglesey' a short talk by David Warren.

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.

Woolhope Naturalists' Field Club - Geology Section

Friday 25 January: 'From Martley to Mozambique, a tale of two coals'. Speaker: Dr Bill Barclay.

Non-members of the Club pay £1 extra. Meetings to be held in the "Woolhope Room" of the Library in Broad Street, Hereford at 6.00 for 6.30 until 8.00. Contact Sue Olver on 01432 761693. Email: susanolver@hotmail.com or visit: http://www.woolhopeclub.org.uk/Programme.html

Editorial

In October, BCGS had a stand alongside the Black Country Geopark display at the GA's 'Geology of Mordor' weekend conference at the University of Birmingham and the Lapworth Museum. Here we proudly displayed our new pull-up banner, and members of the committee were kept busy talking to delegates between a dazzling array of talks from experts in many fields of interest, but all with some connection to the Black Country and its industrial heritage. There were posters and displays from a wide variety of groups - and individuals - and a choice of field trips on the Sunday. Altogether this was a very stimulating weekend. ►

This month we bring you news of a possible weekend away in Dorset, at the kind invitation of the Dorset Geologists' Association Group. This follows their visit (led by our Chairman Graham Worton), to the Wren's Nest and Saltwells Nature Reserve in May. This is a great opportunity for our Society to have an 'away' weekend where we can enjoy each other's company and some amazing geology. Please do let Andy know as soon as possible which weekend would be best for you, so that we can start making the necessary arrangements. It's a very long time since BCGS had enough support for any suggested 'away' trips. Let's make this one work!

BCGS display at the GA's 'Geology of Mordor' conference

Finally, we send our seasonal greetings to you all and draw your attention to our action packed programme of events for next year. Please get these dates firmly in your diaries! ■

Julie Schroder

Field Meeting Reports

Saturday 18 August: New Dudley Museum and Art Gallery at Dudley Archives, and the Wren's Nest. Led by Graham Worton.

Dudley Museum and Art gallery


The Fossil Gallery

Our August field visit was in two parts. First we met Graham Worton at the Dudley Archive at 10.30, to visit the recently opened Dudley Museum and Art Gallery. Afterwards we went on to Wren's Nest to catch up on the latest discoveries there.

At the Archives, Graham introduced the day, describing the new museum and the process of getting it established. Shortly after hearing about the closure of the former Dudley Museum and Art Gallery, BCGS moved to the Archives for its meetings in late 2014. Dudley Council closed the old museum in December 2016 in an attempt to save money, and planned to move its contents to fill unoccupied space at the Archives. The space had previously being used as a 'dumping ground', by Sandwell Council. With limited budget, loss of staff and limited time, Graham was given the unenviable task of packing up the contents of the old museum and moving into a much smaller space. This brought to an end over one hundred years of displaying geology exhibits in the old museum.

The move has been very political. The old museum was a dynamic space filled with geology, human history and art work that changed around every corner and over time, whereas with the new museum, the emphasis is very much on what's special about Dudley. So within the limited space Graham has tried to set up a timeline in order tell the story of Dudley from the ancient past to modern times. Integral to the timeline is the story of how and where people fit in, to bring home just how special the Black Country area is to its people. ►

Upon entering the museum, visitors can watch a video of approximately two minutes duration that describes the Geopark and what there is to see around the Black Country. With the emphasis on people, the first exhibits are all about digging into the past and the people involved, such as Sir Roderick Murchison and the miners. The artefacts on display are being used to illustrate the lives, work and discoveries of the people involved.

The next gallery is all about fossils. Greeting the visitor on entering, there are cases presenting what fossils are, and varieties of preservation using local specimens – although a rogue ammonite has slipped in! Proceeding through the gallery are cases showing the passage of Silurian marine faunas (corals, trilobites, crinoids, gastropods, bivalves and brachiopods) to aquatic and terrestrial Carboniferous ones (fish, plants and arthropods). One display contains a rather out-of-place crocodilian that is more akin to the archosaurs than the amphibians of the time.

Stan the T-Rex

The archosaurs' descendants are presented in the next (Mesozoic) gallery. Here anatomical and animatronic dinosaur replicas rule to thrill younger visitors. Cases containing bones and skulls line the walls, but could do with being arranged into identical periods. The display also includes the cast of a T-Rex skull called Stan from Utah, on which the scars and injuries of life are clearly visible.

The connection with people continues in the next gallery, which is dedicated to the evolution of man and the Ice Age. Unfortunately, 'Fluffy' the mammoth from the old museum had to find a new home because he was too big for the new gallery. The contentious subjects of evolution and climate change, both strongly connected to people, form this gallery's underlying theme.

The following galleries continue the human timeline with the influence of the Romans, Anglo-Saxons and Normans before moving to the medieval period with finds from Dudley Castle. The human story is finally brought up to date with the Industrial Revolution and the important role of the Black Country as a centre for iron, steel and glass manufacture. The exhibits also show a change of social behaviour from one of scientific exploration to more artistic and creative activities as people accumulated more wealth and leisure time. The last corridor of galleries provides temporary exhibition space for art exhibits and includes social history dedicated to local heroes.

The Ascent of Man

Finally, on the way out of the museum is the Geopark room where visitors can take leaflets about places to go and explore in the Black Country. Whilst exploring, they can learn about how the local geology influences the landscape and where to visit local attractions and hospitality.

Although the museum is coming together, there is still a lot of work to do. Labels, interpretation panels and graphics explaining what the exhibits are about and guiding the visitor through the museum were noticeably lacking. Graham mentioned that this was a major complaint from visitors and that plans were in operation to have the situation sorted out sometime in September. ►

The Wren's Nest

From the museum, we headed to Wren's Nest. From the Wardens' centre we walked a route that took in the Snake Pit, NCC cutting, top of the reserve to the Seven Sisters Caverns and finally the Ripple Beds. Along the way Graham reiterated the important role people and the landscape have played in shaping each other and local history. At the NCC cutting and a location known as Stop 6, Graham described some recent discoveries made at Wren's nest.

The Seven Sisters Cavern, photo taken by founder member Peter Oliver in 1966. Recently added to our online archive.

Over the past ten years, Carbon-12 to Carbon-13 ratio variations between different carbonate-rich rock layers through the Wenlock Series have been used to correlate changing marine conditions through time. When plotted graphically the results produce a double peak, or kick, that has been used nationally and globally to age carbonate-rich rocks from a similar period, like those at Wren's Nest. However, the Carbon-12 to Carbon-13 ratios recorded at Wren's Nest appear to cast some doubt as to this method's accuracy for correlating dates between different geographic locations. Attempts have also been made to correlate the results with fluctuating environmental conditions and extinction events, to tell of possible stresses in the marine environment at the time.

Other research has finally identified conodonts (the teeth of ancient chordates resembling eels), within some mudstone rocks at Wren's Nest. Conodonts can be found through geological time over wide areas and they evolve very rapidly making them ideal for dating purposes. However, until recently none had been found at Wren's Nest. Significantly, the rock layer containing conodonts has also been dated using Carbon-12 to Carbon-13 isotope ratios to give this layer a particular age stamp, plus or minus a thousand years, within the geological timeline.

I would like to thank Graham for another very interesting trip and wish him the best of luck with getting the new museum organised.

Andy Harrison

Saturday 1 September: Titterstone Clee Hill. Joint trip organised by the Open University Geological Society, West Midlands branch. Led by Andrew Jenkinson, Shropshire Geological Society.

Unfortunately, our leader, Andrew Jenkinson, became incapacitated at short notice. With no time to warn members planning to join the trip, we still met at the starting point at Clee Hill Village car park at 10.00. Fortunately, some attendees had maps and the geological guide leaflet for the area written by the Shropshire Geological Society. So as not to waste the day, we followed part of the guided trail taking in the quarrying and mining heritage of the area, the dolerite sill intruding the Coal Measures strata and the local landscape.

I would like to thank the OUGS West Midlands group for organising this event. ►

Andy Harrison

Tuesday 12 November: Birmingham Building Stones - Trail 3. Joint trip with the Geol Soc WM. Led by Julie Schroder.

On a dark Tuesday evening 16 geologists met up by the Bull sculpture in the centre of Birmingham at 6.00 to participate in a guided tour of the building stones used in this area of the city.

This trip followed the final part of Ruth Siddall's Birmingham Building Stones Trail No. 3, and was a sequel to the joint trip held in May, based on Trail No. 1. The focus of this evening's walk was on the old centre of Birmingham, around the church of St Martin in the Bull Ring and the surrounding shopping malls. The area demonstrates continuity as a centre for trade and retail but the building materials used here have changed beyond those that would have been familiar to local lord of the manor, Peter de Bermingham, in the 12th century. The area has been transformed over the last two decades, and though the oldest part of the city of Birmingham, it is now the symbol of a new vibrant centre, with the covered markets replaced by glamorous shopping malls. Malls are modern cathedrals in terms of delivering the double whammy of decorative stones and public access. They are built to impress and the polished surfaces provide excellent opportunities for observing fossils, minerals and textures. This walk will take in the new shopping precincts of the Bullring and Grand Central.

Rotunda's Carrara Marble

The walk commenced examining the entrance to the Rotunda, clad in Carrara Marble from the early Jurassic Apulian Tectonic window in northern Italy. Diagonally opposite the Bullring entrance is the Nationwide Building Society. The façade is clad in panels of a greenish-grey gneiss.

Nationwide's gneiss

From here we walked down St Martin's walk to St Martin's Square, crossing the obscured Birmingham fault, and stopping at the monument to Nelson. The plinth is made from Whitbed Portland Stone of late Jurassic age, showing distinctive fossil death-bed assemblages.

The plinth of Nelson's monument

Our last outdoor stop was the Church of St Martin's built with Grinshill Stone of Triassic age. The spire is thought to be built of a different stone. The slabs outside the church are of Hauteville Limestone, a Lower Cretaceous limestone from the French Jura mountains. *(See front cover photo - the group by the Christmas tree in St. Martin's Square. Ed.)*

The street lighting was not good enough to appreciate the colour variations and sedimentary features in the stones of the church. Planning such a trip for a dark winter's evening was always going to be a challenge; however, most of the walk was indoors and the few localities visited outdoors were quite well lit with the street lights. Torch light augmented street lights for looking at details within the building stones.

Cinza Rajado

From St Martin's we entered the Bullring Shopping Centre at the lower level. The flooring immediately inside is made from Cinza Rajado, a yellow and black tiger striped gneiss from Brazil, almost certainly Archaean in age (around 2.5 Ga). ►

Yana Limestone

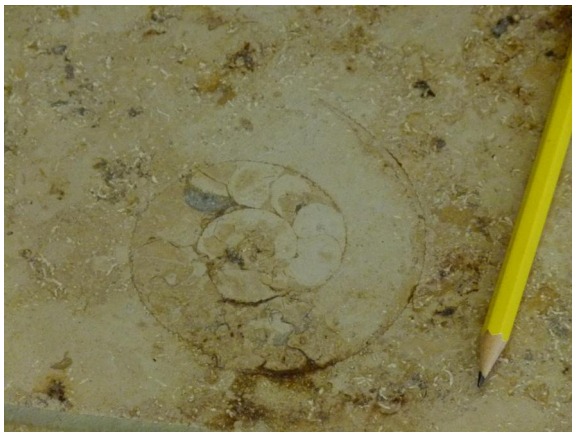
On the main concourse of the mall, the dominant paving stone is Yana Limestone of mid-Cretaceous age from N.E. Spain. It is variably fossiliferous, with fossils (dominantly the oyster *Toucasia* sp.) concentrated in shell lags. Gastropods and ammonites are also present. Some slabs are entirely devoid of fossils, others are packed full with them.

Rosso Tigrato and Vånga Granite

Rosso Tigrato is another decorative paving stone notably used in the roundels at each end of the concourse. It is a pink and black banded gneiss from N.E. Brazil of ancient cratonic origin, around 2.5 - 2 Ga. It forms the outer roundel in the photo. The inner roundel is of Vånga Granite, a rich wine-red granite from Skåne in southern Sweden from the Vånga pluton around 1.4 Ga.

Vizag Blue and Orissa Blue

The lozenge-shaped decorative features on the top concourse are made of two contrasting stones from the Eastern Ghats Mobile Belt of N.E. India around 1.5 - 2 Ga. The darker Vizag Blue and the lighter Orissa Blue have the same mineralogy: garnet-bearing migmatic gneiss. The latter contains distinctive porphyroblasts of plagioclase aligned in the gneissose matrix. Both rocks are rich in red garnets.



Jura Marble ammonite, tiny white flecks are tubiphyte worms.

Crossing the linkway on the third floor to Grand Central shopping mall, the walls near Caffè Nero are clad in Jura Marble. This is a fossiliferous limestone from Central Bavaria. It belongs to the Late Jurassic Treuchtlingen Formation.

Nero Marquina

A black Spanish limestone, Nero Marquina, is mid-Cretaceous in age and comes from Marquina, in the Basque country of N.E. Spain. It is a bituminous limestone with a micritic matrix. This rock has been weakly deformed, evidenced by the excellent conjugate sets of en echelon tension gashes, infilled with white calcite.

Royal White granite

The station concourse and the paved area outside the Southside entrance are comprised of 2 types of intrusives; Kobra (dark diorite) and Royal White granite. Both come from the eastern coastal area of China and are of Cretaceous age.

Trail 3 continues outside and on to the Pagoda at Holloway Circus, but this marked the end of our evening stroll. ■

Ray Pratt (quoting from the text of Birmingham Building Stones Trail 3, by Ruth Siddall)

Reference

http://bcgs.info/pub/local-geology/building-stone-trails/birmingham-trail-31/

Mike's Musings No. 18, Footsteps Through Time

“That's one small step for man, a giant leap for mankind”.

It seems almost unbelievable now that this iconic utterance was articulated almost 50 years ago as Neil Armstrong placed the first human footfall upon the moon's surface, leaving its imprint in the basalt dust of the 'Sea of Tranquility'.

Anticipating more than a few flashbacks to that famous moment in human history in the months to come, it seems an appropriate time to ponder a less well documented, yet arguably even more momentous point, in geological time, when the first footsteps ever were committed to a soft-sediment substrate in Earth's long, and largely unrecorded, history of life on this planet.

The ‘trails’ in the Lake District

Of course we cannot expect to identify the actual 'what', 'when' and 'where' of this event, but we can perhaps at least speculate on the 'why' and 'how' it ever came about. This is just one of those many important links in the chain between the earliest advent of any kind of life on Earth and that ability to plant a footstep on another world in 1969. And, who knows, perhaps such things do already exist on worlds as yet unknown to us mere earthlings...

But to return to earthly footsteps, we can perhaps divide the argument into two separate events: the first being an imprint on a seabed; the second taking place most likely on a seashore (just out of the water) somewhere on the fringe of a landmass. We might also enquire after a third iconic footstep - that of a land-dwelling creature making its mark in the context of a fully terrestrial lifestyle.

What really prompted me to this subject was a recent report from China of 'the oldest footprints in the world'. It is a subject that has interested me for some while, ever since visiting a location on the southern fringe of the English Lake District that has also claimed such an accolade. The 'footprints' described from southern China are dated to around 550 million years ago, and belong to a creature with a bilateral pair of appendages which produced a series of poorly organised, parallel rows of 'dot-like' marks in the mud 'on the sea-bed'. What the nature of this creature was isn't entirely clear, but 'pairs of appendages' sounds very much like an arthropod (?) of sorts. The pattern should more accurately be described as a trackway (rather than footprints; feet are a more specific kind of appendage that came along later), but this report is of particular significance because of the age of these imprints - pre-dating the currently accepted beginning of the Cambrian period (543 Ma). This appears to prove that articulated, and 'armoured', organisms had already evolved before the so-called 'Cambrian Explosion', when animal life first appeared in great abundance and variety in the fossil record. ►

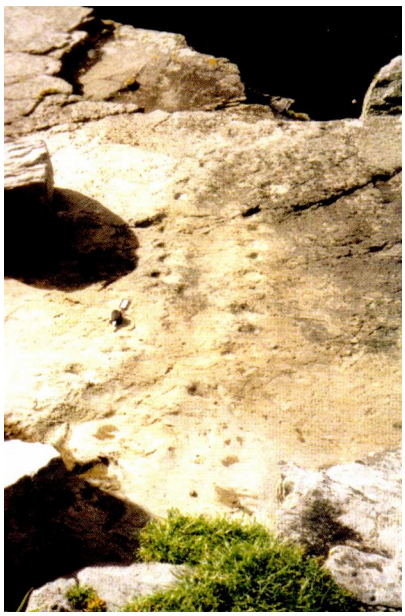
The ‘trails’ in the Lake District

Candidates for the first 'footfall' on land are considerably younger in age. They include a series of extensive traces preserved on a single sedimentary bedding surface within the extensive Borrowdale Volcanic sequence in the Lake District, of late Ordovician age (some 450 Ma) and interpreted as representing volcanic outfall in a sub-aerial environment. Most of the markings appear as closely spaced, parallel grooves, sinuous in places, including elliptical loops intersecting each other. These are better described as trails, but closer examination of some trails reveals paired grooves in which discrete imprints ('footmarks') can be discerned, and hence described as tracks. Both forms appear to grade into one another and it is suggested that they were both made by the same organisms, the difference in appearance being due to the different degree of firmness of the substrate. This distinction has been replicated by living arthropods (woodlice) in experiments conducted under laboratory conditions. The traces are thought to have been made by a millipede-like animal and their age is significant in that they appear to precede any record of higher terrestrial plant life (vascular plants). So, perhaps they fed on simpler plants or seaweeds, or each other!

An even older candidate dated at around 490 Ma, (late Cambrian or early Ordovician), comes from a report of trackways preserved in aeolian sediments and also attributed to some kind of arthropod. More specifically they seem to have been quite large beasts with at least eight well-developed pairs of appendages having simple pointed terminations, of the kind seen in fossil euthycarcinoids. These are a kind of arthropod (probably amphibious in nature) most like crustaceans or certain insects. Some of these trackways also appear to show evidence of a tail-drag mark.

In terms of terrestrial body fossils, which are extremely rare from this early on, there is a record of a euthycarcinoid from a non-marine sandstone deposit in Australia thought to be late Ordovician in age (say about 450 Ma). Otherwise such body-fossils (scorpions and centipedes) only appear in the late Silurian, although they are sufficiently sophisticated (with sensory and respiratory organs seemingly well adapted for life on land) to suggest a reasonably extended earlier pedigree.

For true 'footprints' however, we cannot really consider anything earlier, or simpler, than traces left by animals with recognisable tetrapod limbs. Whilst not directly relevant to the present argument, it is a remarkable fact that the earliest tetrapods (in a broad sense) are known to have had not the 'five-toed hands and feet' we associate with ourselves and all other such living animals, but limbs bearing six, seven or even eight digits. Tetrapods are thought to have evolved from fish of some kind, in particular a group of lobe-fins known as 'elpistostegids'. These are known from body fossils of mid to late Devonian age, so it is fair to presume that the earliest possible 'footprints' on land are likely to date from around this time.



The trackway on Valentia Island

There are quite a number of candidates, apparently, of which the most celebrated in our part of the world would seem to be a trackway found on Valentia Island, south-west Eire. This is believed to belong to the earliest (?) amphibian and consists of a paired row of shallow imprints that reveal the presence of separate digits on each of four limbs, together with a suggestion of a median tail drag mark. The latter may be of importance in that some interpretations regard this as proving the animal was walking on all fours out of water. The presence of an overlying ash bed has enabled a fairly accurate date of 385 Ma for this trackway (mid/late Devonian), and so right on cue! An earlier record from the Holy Cross Mountains of Poland dated at c.397 Ma (early to mid-Devonian) has also been described, whilst other challengers seem to be end-Devonian or younger. ►

Footprints with clear 'toe' impressions become widespread in the geological record thereafter – especially with the enthusiasm there is for such traces of the iconic 'dinosaurs'. One can also speculate on the timing of the first 'human' footfall on earth: the trackway at Laetoli in Tanzania, associated with 'Lucy' and dated just (!) 3.2 Ma is well known.

No doubt the search for 'the oldest footsteps', by whatever definition, will go on and probably be pushed back still further into the murky depths of geological time. ■

Mike Allen

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