Newsletter No. 281
October 2023

Contents:

To find out more about this photo - read on!

Copy date for the next Newsletter is Friday 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 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.

Visitors are welcome to attend BCGS events but there will be a charge of £1.00.

Monday 16 October *(Indoor Meeting):* 'Erratic Tales'. Speaker: Prof. Ian Fairchild (University of Birmingham and Chair, Herefordshire & Worcestershire Earth Heritage Trust, H&WEHT).

I will start the lecture by giving some examples of erratic boulders in the UK, Iceland and the Alps which provide us with interest and instruction about geological processes. Over the past two years, the Black Country Geological Society has partnered with the H&WEHT, the Birmingham Open Spaces Forum and the Lapworth Museum of Geology to deliver the Heritage Lottery Funded project 'Birmingham's Erratic Boulders: Heritage of the Ice Age'. The legacy of this project includes much better documentation and visibility of these boulders in SW Birmingham and NE Worcestershire, the creation of eight walking and cycling trails, a programme of public engagement events, and a website, erraticsproject.org which includes two essays on the historical study of the erratics by Julie Schroder. The nature of these stones, through their exotic nature and sometimes impressively large size makes them attractive to the public and a means to foster pride in the local area. There is scope for further projects in other geographic areas to build on this interest. The original enthusiasm for documenting boulders and mapping glacial flowlines barely survived WWI. The Birmingham geological memoir barely mentions them, yet they are the most widespread evidence for deep time processes visible to the public and remain of considerable scientific significance. *(See the BCGS website programme for a fuller version of Ian's abstract. Ed.)*

Saturday 11 November *(Geoconservation Day):* Portway Hill, Rowley. In collaboration with the Friends of Rowley Hills and the B&BC Wildlife Trust. Meet at St Brades Close just off Tower Road at 10.00 (Grid ref: SO 974 893, nearest PC: B69 1NH). Directions: from Birmingham New Road (A4123) turn left onto Tower Road if coming from Birmingham, right if coming from Wolverhampton. Just after Bury Hill park, turn left onto St Brades Close. Wear old clothes, waterproofs and stout footwear. Please bring gloves. Tools will be provided but do feel free to bring your own. Also bring a packed lunch. Hot drinks will be provided. Finish around 1.30.

Monday 20 November *(Indoor Meeting):* 'Origins of Starfish and their relatives'. Speaker: Aaron Hunter.

Asterozoans, including starfish and their close relatives, the brittle stars, are amongst the most instantly recognisable and iconic marine animals. They are a dominant and successful group of living echinoderms based on their diversity, abundance and global distribution. Despite their ecological success and a fossil record spanning more than 480 million years, the early evolution of asterozoans remains a mystery. New discoveries from France and Morocco have begun to resolve this mystery. We look at the earliest common ancestors of the 'Bat Star' somasteroids and their Cambrian descendants, including a new fossil from the exceptionally preserved Fezouata biota in Morocco, which is the earliest starfish-like animal so far recorded in the fossil record. We then follow these exceptional fossils through the Ordovician, as true starfish and brittle stars appear and show how they rapidly diversified during the biotic revolution we call the Great Ordovician Biodiversification Event.

Saturday 9 December *(Geoconservation Day):* Saltwells National Nature Reserve. Directed by the Reserve Wardens and the Friends of Saltwells NNR. Meet at the Wardens Hut adjacent to the Nature Reserve car park (Grid ref: SJ 934 868) on Saltwells Lane at 09.45 for a 10.00 start. Wear old clothes, waterproofs and stout footwear or wellies. Please bring gloves. Tools are provided. Either bring packed lunch or hot food can be acquired from the Saltwells Inn adjacent to the car park. Finish at 2.30.

Monday 11 December *(Indoor Meeting, 7.00 for 7.30 start):* Members' Evening and Christmas Social. This is our annual chance for members to share their geological experiences in a sociable atmosphere with a Christmas buffet provided by the Society.

Contributions needed from you!

We need a few of you to volunteer to do a short presentation - on any topic with geological connections; or perhaps bring some of your specimens for admiration, discussion and identification. Please contact Mark Jeffs if you can contribute to this event: honsec@bcgs.info

Saturday 13 January 2024 *(Geoconservation Day):* Portway Hill, Rowley. Details TBC.

Monday 15 January *(Indoor Meeting):* 'A Recipe for Disaster'. Speaker: Dr. Ekbal Hussein (Remote Sensing Geoscientist at the British Geological Survey).

Globally, two thirds of deaths arising from natural hazards in recent decades were caused by geological hazards. But how and why do natural hazards turn into disasters? In this talk Ekbal will explore this question through the lens of one particularly troublesome hazard: earthquakes. The death toll for a given earthquake magnitude (and mechanism) will depend not only on geographic location, but also the social vulnerability of communities and the quality of the building stock. But these are dynamic features of evolving societies, which means earthquake risk varies in time and space. This talk will compare and contrast global trends in earthquake fatalities and aim to extract common themes that exacerbate the impact of natural hazards, and consider where and why these turn into disasters. Ekbal's research focuses on the use of satellite imagery to understand earth processes, particularly those related to natural hazards such as earthquakes, landslides and subsidence. Ekbal is an advocate for holistic multi-hazard approaches to understanding and managing the impact of disasters to society.

Saturday 10 February *(Geoconservation Day):* Wren's Nest. Details TBC.

Monday 19 February *(Indoor Meeting):* 'A very British summer in the late Triassic: the Arden Sandstone Formation of the English West Midlands and the dawn of the dinosaurs'. Speaker Prof. Stuart Burley.

The Arden Sandstone Formation of central and western England is a thin but conspicuous arenaceous unit within the Late Triassic Mercia Mudstone Group. Sedimentological and palaeontological data point to lacustrine depositional conditions, in contrast to the red desert mudstones above and below which were deposited as continental dryland desert floodplains. The Arden Sandstone records deposits of the lake margins and may be the high stand lateral equivalent of the halite and gypsum deposits which formed in the lake centre. The Carnian age of the Arden Sandstone potentially links it to the Carnian Pluvial Episode, marking the coalescence, spread and freshening of the formerly saline desert lakes, and deposition of sandy, fluvial and lacustrine deposits during the wetter climate that prevailed for at least a million years.

Saturday 9 March 2024 *(Geoconservation Day):* Saltwell's NNR. Details TBC.

Monday 18 March *(Indoor Meeting):* AGM and talk TBC.

Monday 15 April *(Indoor Meeting):* 'Geology of the Chiltern Hills; new data & new interpretations'. Speaker: Dr. Haydon Bailey (Geological Adviser, The Chiltern Society). The Chiltern Hills are underlain by Chalk, predominantly lithostratigraphic units traditionally called the Lower and Middle Chalk (the latter now the lower part of the White Chalk Group) capped by the Top Rock - Chalk Rock complex. It is this series of chalk hardgrounds which effectively forms the spine of the Chiltern Escarpment. The Chalk dips gently into the London Basin, and the overlying basal Tertiary succession provides minor outliers around this northern rim of the basin. The other major geological event we have to recognise in this area is the re-routing of the Proto-Thames River during and following the Anglian glaciation, some 450,000 years ago. This created the landscape we currently see in much of the southern parts of the Chilterns. Geological mapping of the region by the BGS over the last ten years and ground investigations resulting from the ongoing construction of the HS2 High Speed rail link have greatly added to our knowledge of the regional geology. Add to this the recognition that subsurface movement of water through the chalk is far more prevalent than previously identified, then this means that we're still learning a whole load more about the geological development of the hills which form the northern margin of the London Basin.

Other Societies and Events

The Geologists' Association

Saturday 4 November: Festival of Geology 2023 at University College London. Exhibitors from around the world - including fossil & mineral displays from local groups and affiliated societies, books, maps, photo-competition, Mary Anning maquette and much more!
Special Exhibit: 'The Maps: Smith & Greenough - in the same room once again!'.
Special Lecture: 'Geology of Hogwarts' - Dr Leanne Hughes (BGS).

See the website for further details. Conference: https://geologistsassociation.org.uk/conferences/
Free admission. No pre-registration necessary, just turn up on the day.

Teme Valley Geological Society

Monday 23 October: 'The Moreton glaciation across the West Midlands and its implications for the Quaternary stratigraphy in the Teme Valley.' Speaker: Dr Sebastian M. Gibson, University of Cambridge**. Abstract:** For the last few decades, past glacial activity across the West Midlands has been overlooked at best or incorrectly described by geographers in East Anglia. With new evidence, it is clear that the British Isles' most significant glaciation occurred during the Moreton Stadial in the late Middle Pleistocene. We shall review the last 100 years of Quaternary research, present new findings and consider its implication for the Teme Valley region.

Monday 27 November: 'Geological perspectives on climate change: from our local rocks to the IPCC'. Speaker: Prof. Stuart Robinson, University of Oxford. **Abstract:** It has long been recognised by geologists that Earth's climate has changed over timescales of thousands to millions of years. Understanding the record and drivers of these past changes informs our knowledge of the environmental history and biotic evolution of our planet but also provides insights into ongoing, and future, anthropogenically-forced, climate change. Critically, the range of past climate states represented in the geological record allow us to probe the major controls and mechanisms that affect climate over a range of atmospheric CO_2 levels. This allows us to offer perspectives on Earth system variables that are critical to predicting future climate change, such as climate sensitivity to CO_2 (the amount of global warming that will occur in response to a doubling of atmospheric CO_2). This talk will explore some of the ways that geologists reconstruct past climates and discuss examples of how the geological past can contribute to predictions of the future.

Talks take place in Martley Memorial Hall at 7.30. Non-members £3. For further information email: martleypfo@gmail.com or visit: https://geo-village.eu/

Open University Geological Society, West Midlands

Saturday 11 November 10.30 - 3.45: Mineralogy Practical Laboratory Day School led by Alan Richardson. A practical tutorial to introduce members to the systematic investigation and identification of minerals by means of observations and physical tests. Venue: Lickey Hills Country Park Visitor Centre School Room.

For more details and booking please contact: Alan Richardson: alanrichardson.geo@gmail.com

Manchester Geological Association

Saturday 14 October - The Broadhurst Memorial Lectures – Volcanology.

'Relating magma intrusion to volcano deformation and eruption potential'.
Speaker: Dr Craig Magee (Leeds University).

'What's going on in Iceland'. Speaker: Prof. Hazel Rymer (Open University).

For more information: http://www.mangeolassoc.org.uk/ or contact outdoors@mangeolassoc.org.uk

Warwickshire Geological Conservation Group

Friday 13 October, 10.30 - 12.30: Urban Geology of Warwick. Walk led by Jon Radley. The walk is open to all but will be limited to 15 participants. To register for this walk please contact Julie Harrald WGCG@JEGH.me.uk

Thursday 16 November, 7.30 - 9.00: 'Northern Chalks and their associated flints'. Speaker: Paul Hildreth.

There is a charge of £2.00 for non-members. Indoor meetings are both live at St Francis, Kenilworth and by Zoom. For more information visit: http://www.wgcg.co.uk/ or email: WarwickshireGCG@gmail.com.

North Staffordshire Group of the Geologists' Association

Thursday 12 October: '55 years of scientific ocean drilling and the IODP expedition 398 to the Hellenic arc volcanic field'. Speaker: Dr Ralf Gertisser (Keele University).

Thursday 9 November: 23rd Wolverson Cope Lecture. 'From cradle to grave: delivering responsible extraction of construction raw materials and sustainable long term legacy through quarry design'. Speaker: Ruth Allington (Allington Collaborative Problem Solving Ltd).

Meetings are normally held at 7.30 in Room WS0.06, William Smith Building, Keele University.
For more information: https://nsgga.org/

Geological Society, West Midlands Regional Group

Tuesday 10 October: 'An Update on the Geology of the Black Country'. Speaker: Graham Worton (Keeper of Geology, Dudley Museum & Black Country UNESCO Global Geopark Lead Officer).

Tuesday 14 November: 'Jurassic Railway - Engineering Geology of HS2 in the South Midlands'. Speaker: Simon Butler (Chief Engineering Geologist, Atkins & Senior Project Engineer, HS2).

Lectures are being held at Mott MacDonald, 10 Livery St, Birmingham, B3 3NU & by Zoom Video Conference. They 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.

Mid Wales Geology Club

Wednesday 18 October: 'Quartz and Other Forms of Silica'. Speaker: Bill Bagley.

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

Shropshire Geological Society

Wednesday 11 October: 'Scotland's Greatest Ice Age'. Speaker: Ian Fairchild.

Wednesday 8 November: 'The Lie of the Land'. Speaker: Martin Whiteley (Beds. Geology Group).

Meetings commence at 7.15 for 7.30. Lectures are now being held in hybrid form, in person at the University Centre, Shrewsbury, as well as by Zoom. If you wish to attend please contact Albert Benghiat: 07710 421 581, email: SGS.chair@hotmail.com
Further information: http://www.shropshiregeology.org.uk/SGS/SGSEvents.htm

East Midlands Geological Society

Saturday 14 October: 'Mineral solutions to global problems – how minerals can feed the world and remove atmospheric CO_2'. Speaker: David Manning, Professor of Soil Science, Newcastle University

Saturday 11 November: 'Extent, style and timing of former glaciation in the Gaick, Scotland'. Speaker: Dr Benjamin Chandler, Assistant Professor in Geomorphology, University of Nottingham.

Non-members are welcome and should register with the secretary. Meetings will be held at 6.00 in the Geography Department of Nottingham University, which is in the Sir Clive Granger Building. Further info: www.emgs.org.uk or email: secretary@emgs.org.uk

Editorial

It was good to see so many members at our first meeting of the autumn season, where we were treated to an excellent talk by Roy Starkey on the life and mineral collection of Sir Arthur Russell. This followed the recent publication of Roy's detailed and fabulously illustrated book: 'Making it Mine: Sir Arthur Russell and his Mineral Collection'. Our next meeting on 16 October features, 'Erratic Tales', a timely talk from Ian Fairchild at the conclusion of the two-year long Birmingham Erratics project, in which BCGS has been proud to be an active partner. Ian has been the team leader guiding the team and volunteers to the conclusion of a truly inspiring and successful project. In this talk he will set this small project in its wider context and look forward to further 'erratic' possibilities in the future...

We hope to see most of you at our indoor meetings and geoconservation sessions through the coming months. If you haven't yet attended a geoconservation session, don't be shy! Come along and join in! There is no pressure. All participants just do what they can, and enjoy the camaraderie. Getting up close to the rock faces is by far the best way to learn more about the geology, while helping to keep our precious sites open for all to see – surely a win win situation, and a chance to make new friends.

Please note that we need contributions from you for the Members Evening on 11 December *(details on p.3),* and we are still short of committee members, especially someone to take over the role of meetings secretary. Please contact our secretary, Mark Jeffs if you can help.

Finally I'd like to thank Matt Sutton for finding time to give us a new instalment of his splendid series of 'Matt's Maps'. Previous instalments are in earlier newsletters, and can be found on our website here ■

Julie Schroder

Field Meeting Report

Saturday 16 June: (Field Visit): North Malverns - Tank and North Quarries.
Led by Peter Bridges (H&WEHT Champion for Malvern quarries)

The weather was fine and overcast during our visit to the northern tip of the Malvern Hills and Tank and North Quarries. We met Peter Bridges, from the Herefordshire and Worcestershire Earth Heritage Trust (H&WEHT), in the Tank Quarry car park, which is situated on the north-east flanks of North Hill. We spent the day walking between Tank and North Quarries with a brief detour up onto North Hill via Rocky Valley. We spent the day looking at the northern most exposures of the Malverns Complex and how these relate to the East Malvern Fault (EMF).

Head of Rocky Valley on North Hill

The Malverns Complex

The Malverns Complex forms the full, approximately 7 mile (12.5km), length of the Malvern Hills. It is roughly 20m wide at the narrowest point and 500 - 750m across at the widest. The Complex generally comprises sheared and altered acid and intermediate igneous rocks (diorite, granite, pegmatites and basalt dykes), which were intruded deep in the earth's crust. Pegmatites are very coarse granites. Subsequent tectonic movements have intensely sheared and faulted these rocks giving them, in places, a gneiss or schist-like appearance.

Rocks forming the Malverns Complex date to the Late Neoproterozoic (Precambrian), around 677 Ma, when England, Wales and Southern Ireland were part of the Avalonian subcontinent. Palaeogeographically, Avalonia sat to the north of Gondwana and both were situated close to the South Pole. A subduction zone lay to the north of Avalonia, which dipped southwards beneath Gondwana. To the north and west of Avalonia was the Iapetus Ocean beyond which was Siberia to the north-east and Baltica to the north-west and Laurentia (including Scotland), to the west.

Ongoing subduction to the north caused magma to intrude into the Avalonian landmass. As the magma cooled, fractional crystallisation favoured magnesium and iron rich minerals, such as plagioclase feldspar, biotite, hornblende and pyroxene, with the highest melting points to crystallise out first and settle to the base of the intrusion. The result was dense, medium to coarse grained intermediate diorite rocks occurring at the intrusion base. As the fractional crystallisation process continued, the melt became progressively magnesium and iron depleted resulting in more acidic (high silica) rocks, such as granite and granodiorites, forming and defining the upper parts of the intrusion. ►

Granites and granodiorites, Tank Quarry

As seen at the surface today, extensive faulting has displaced the earlier dioritic rocks up against later acidic rocks, which has made mapping the Malverns Complex very complicated. Reverse (thrust) and normal faulting during the Precambrian, and later tectonic events have created a network of north-west to south-east, north to south and east to west trending discontinuities that carve the Malverns Complex up into numerous fault-bounded blocks. This has helped with mapping the Malverns Complex. Each fault trend is associated with thrusting during the Precambrian, the Caledonian and Variscan orogenies and intervening episodes of crustal rifting.

A significant regional structural feature associated with the Complex is the East Malvern Fault (EMF), the origins of which are associated with the Caledonian orogeny. The EMF forms part of a general north-south trend known as the Malvern Lineament, or Axis, which runs from the Bristol Channel up to Cheshire. To the east lies the Worcester Graben through which flows the River Severn. The EMF forms an eastern boundary separating the Malverns Complex from younger Triassic rocks that fill the Worcester Graben to the east.

In the North Malvern area, British Geological Survey (BGS) sources show the EMF with a significant kink towards the east. However, Peter argues that this may not be the case. Given the extensively faulted nature of the Malverns Complex, the kink to the east could easily be a totally separate fracture.

Malvern Hills Quarries

Along their length, the Malvern Hills are peppered with historically worked quarries that include Gullet Quarry, Hollybush Quarry and Dingle Quarry, to name a few. Each quarry has revealed the various rock types, faulting and associated features that make up the Malverns Complex. Between quarries, linear depressions form shallow valleys that help trace fault alignments at ground surface today.

Dating back to prehistoric times, the quarries were originally worked for building stone and later for roadstone and railway ballast up until the 1970s. Our excursion focussed on Tank and North Quarries located on the northern flanks of North Hill towards the northern end of the Malverns Complex. The exposures within are likely to belong to the same intrusion but display markedly different lithologies.

From Tank Quarry car park, we walked south to North Quarry, which was worked up until the early/mid 20th Century when it became disused following a substantial collapse. Here, Peter first explained the fractional crystallisation process that the melt within the intrusion had undergone as it cooled. The North Quarry rocks contain the earliest and densest minerals to form, and these settled to the intrusion base. The melt being silica-poor meant that no olivine is to be found in these diorite rocks. At this location, the diorite is very dense and mainly comprises hornblende, so giving it the name 'Hornblendite'. Later fracturing and hydrothermal deposition has resulted in lighter coloured quartz and feldspar-rich veins running through the rock. ►

North Quarry, hornblende-rich diorite and feldspar veining

North Quarry Faulting and Breccia

Towards the quarry entrance, breccia-filled crevasses and slickensided surfaces on the dolerite exposures are evidence for subvertical reverse faulting, which is common in all quarries. The fault trends north-west to south-east, potentially representing the EMF or a separate fault altogether that cuts off the EMF to the north.

Small and overgrown exposures visible in Tank Quarry typically comprise more acidic granite and granodiorite, representative of the upper parts of the intrusion. Today these rocks sit at the same topographic elevation as those found in North Quarry, indicating that the older diorites have been thrust up against younger acidic ones. Whilst north-west to south-east trending Precambrian thrusts are common throughout the Malvern Complex, at Tank Quarry much younger faulting has impacted the more acidic layers.

Rocky Valley and North Hill

Between Tank and North quarries lies a fault-controlled linear scour, called Rocky Valley, which continues southwards over North Hill before being cut off by an east to west trending fault. The valley has been dammed at its lower end to form an underground reservoir that helped prevent the quarries being flooded when they were operational. The dam collapsed once during construction and after completion has served to prevent flooding further down-slope and also provides a water source for North Malvern residents.

Reverse faulting, Rocky Valley Reservoir

Towards the rear of the reservoir, we saw a sub-vertical outcrop that shows breccia and slickensided surfaces associated with the same north-west to south-east thrust fault we had seen at North Quarry. The fault clearly shows the earlier hornblende-rich diorite having been thrust up against the later, more acidic granite and granodiorite rocks.

From the reservoir, Rocky Valley ascends steeply southwards following the fault line that water has exploited over time whilst being funnelled as it drains off North Hill. On the valley sides, we saw patches of scree formed from variably sized, angular blocks. These represent broken fragments formed from freeze-thaw activity during the last Ice Age when a periglacial environment dominated the local landscape. ►

Continuing southwards up North Hill, we eventually reached the head of Rocky Valley, a bow-shaped depression where water and debris accumulate before being funnelled down the V-shaped valley towards the location of the reservoir. From the highest point on our route, we caught views northwards towards the Clee, Clent and Lickey Hills and Birmingham and the Black Country where the glaciers from the last Ice Age were stopped in their tracks, and hence the more periglacial conditions further south around Malvern. To the east is the Worcester Graben, with Bredon Hill and the Cotswolds forming the eastern edge. Another major fault-line trending roughly north to south separates these Jurassic hills from the Triassic sediments that lie within the lower-lying graben. When the last Ice Age ended, a vast braided watercourse flowed southwards through the Worcester Graben to the Bristol Channel, and the graben would eventually accommodate the River Severn once retreating glaciers forced it south.

Leaving North Hill, we headed down the slope back to Tank Quarry. Along the way, we saw further examples of the faulting, in-filled extensional fractures and intruded dykes that define the Malverns Complex.

The visit illustrated well, just how complicated the Malvern Hills geology is and I would like to thank Peter for a very interesting day. Further information about Tank and North Quarry and the Malverns Complex can be found on the EHT and the Abberley and Malvern Hills Geopark websites: https://earthheritagetrust.org/ and http://geopark.org.uk/pub/ ■

Andy Harrison

A Visit to see The Old Man of Hoy

Earlier this year on a visit to Orkney I was able to photograph this iconic sea stack from the seaward side *(see front cover photo).* With a height of 137m (450ft) the stack comprises alternating layers of soft red and yellow sandstone interleaved with harder flagstones. These members of the Hoy Sandstone series (Old Red Sandstone) have given rise to the distinctive vertical cliffs and sea stacks of Western Hoy.

The west-facing sandstone cliffs of Hoy, Orkney

The Old Man was formed some time after 1750 and originally had two feet sitting on a platform of the Hoy Lava (olivine basalt with porphyritic crystals of olivine and feldspar). However by the mid 1850s the landward side had eroded to leave the stack much as we see it today until it too collapses into the North Atlantic. ►

The Old Man of Hoy

The stack was first climbed in 1966 by Chris Bonnington, Rusty Baillie and Tom Patey, a feat taking three days. This encouraged the BBC to return the next year for a live outside broadcast of a second climb led by Joe Brown, Chris Bonnington and Ian McNaught-Davis. It was viewed by an estimated 23 million people. I can still recall Joe Brown's rather matter of fact commentary as he ascended the Old Man by a completely new climbing route, a feat he repeated in 1984 with his daughter Zoe for a television documentary. ■

Mike Williams

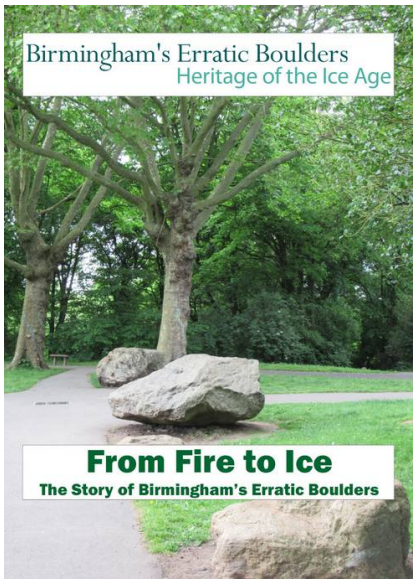
Birmingham's Erratic Boulders: Heritage of the Ice Age

The end of the project – what next?

After more than two years of intensive work by the project team and numerous volunteers, the final Erratic Boulder Trail launch took place on 12 August at Woodgate Valley Country Park, the starting point for Trails 4 and 8. Activities and a project display were housed in two gazebos beside the Visitor Centre, and a guided walk on Trail 8 was blessed with rather better weather than the constant rain which beset the BCGS field visit in July. The project booklet 'From Fire to Ice' was published just in time for the launch event. It is an attractive and informative summary of the Erratic Boulder story and some of the activities undertaken during this project.

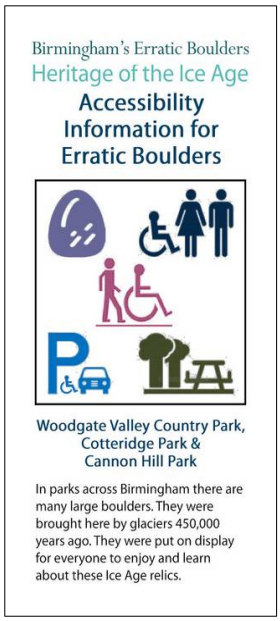
The Launch event for Trails 4 and 8 at Woodgate Valley Country Park

One of the objectives of the Erratics Project has been to promote accessibility and inclusiveness as far as possible in our activities, events and trails. This has been limited in the series of 8 trails, but following dedicated Accessibility training sessions, one additional leaflet has been produced highlighting some of the fully accessible boulders in three Birmingham parks: Woodgate Valley, Cotteridge and Cannon Hill. This is available as a printed leaflet or can be downloaded from the project website's Accessibility pages: https://erraticsproject.org/accessibility/ ►



The Project Booklet

The concluding project conference was held at Rowheath Pavilion on 16 September with impressive displays and four short talks summarising the work of the last two years. The venue, as it happened, is close to the site of the 'Missing Boulder' campaign which hit the headlines at about this time last year *(see Newsletter 276, December 2022, p.13).* Sadly, in spite of the national publicity which the missing Rowheath boulder received, it remains elusively missing. On the positive side, the publicity inspired some new 'rockhounds' and a few more erratic boulders to add to the list.



Accessibility Leaflet

BCGS played an active supporting role in the execution of this project, which has highlighted the significance of the Midlands area as a focal point for research in the early days of glaciology. The legacy of different periods of glaciation is still evident for those who seek, and especially visible in the glacial boulders which were left behind. The project has raised the profile of those which were saved during the late 19th and early 20th century in and around Birmingham and Bromsgrove, and has highlighted the vulnerability of those that remain in obscurity.

As one who has been deeply involved in this project as a volunteer, I would dearly like to see a similar revival of interest and enthusiasm for the vast wealth of glacial boulders which lie within the Black Country - perhaps with our Society taking a leading rôle. We have had a tantalising glimpse of Anglian Ice Age boulders from the Arenig mountains which lie within Dudley MBC (Trail 8), and there is one huge monolithic specimen in Wolverhampton West Park, but what about all those Devensian age boulders from Scotland and the Lake District which have been found in the Black Country? The Crosskey collection in the Lapworth Museum houses at least as many erratic boulder samples from the Black Country and beyond as those from the Birmingham area. This could make a good starting point for anyone wishing to research more about our local Black Country Ice Age heritage. ■

Julie Schroder (BCGS rep. Erratics Project steering group)

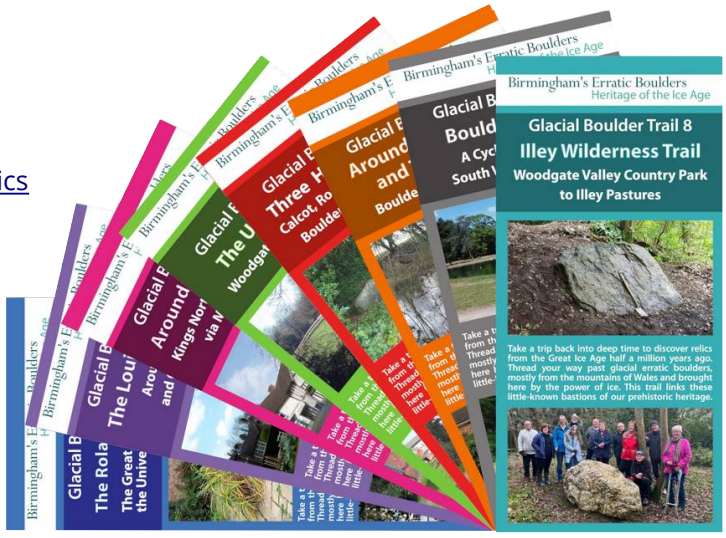
For more information:

https://erraticsproject.org/

https://www.facebook.com/birminghamerratics

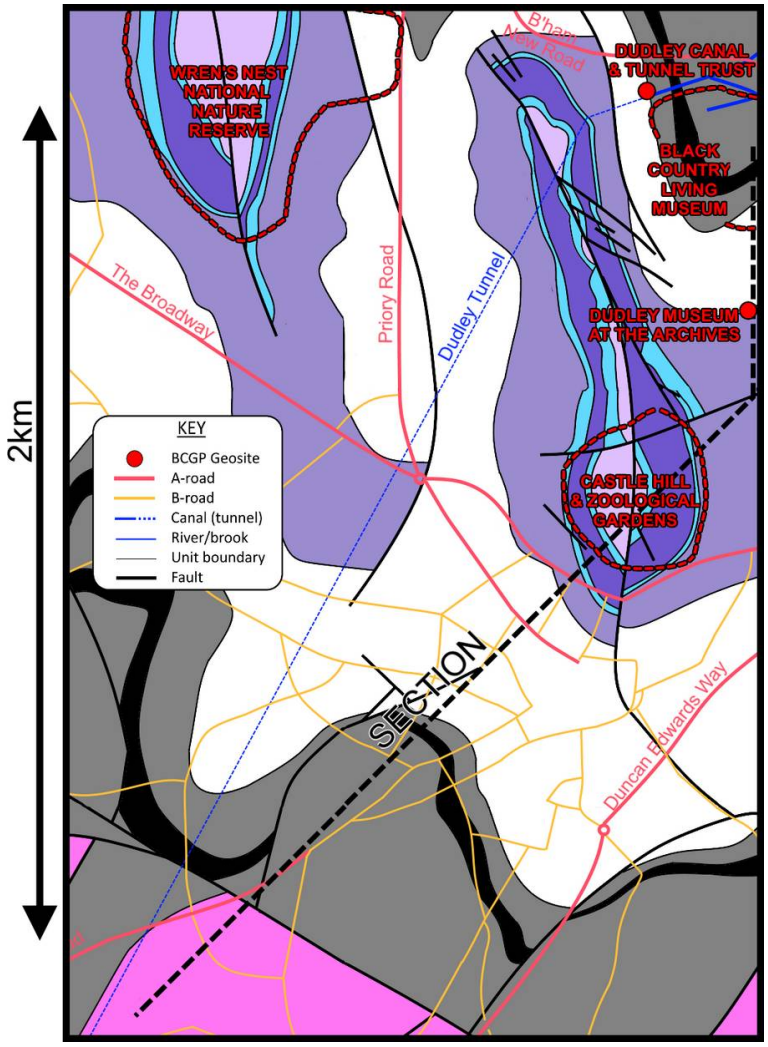
https://www.instagram.com/erraticsproject

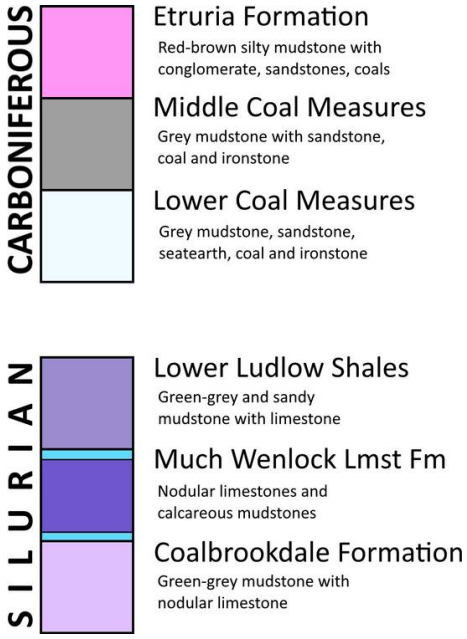
https://www.twitter.com/erraticsproject

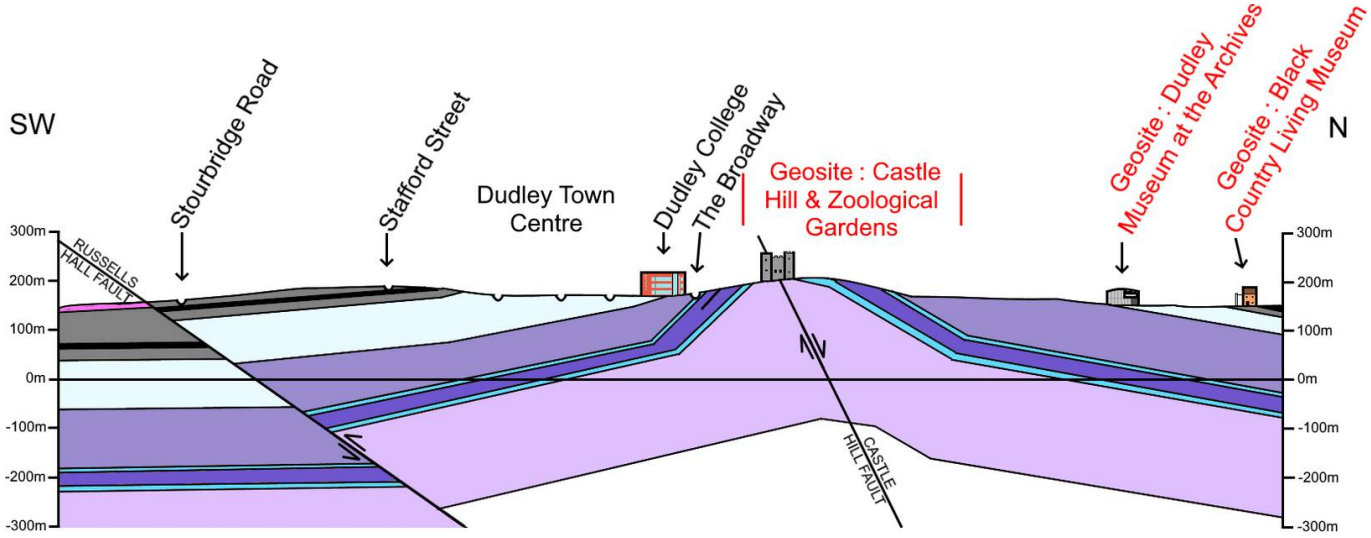


Matt's Maps No. 11

Castle Hill

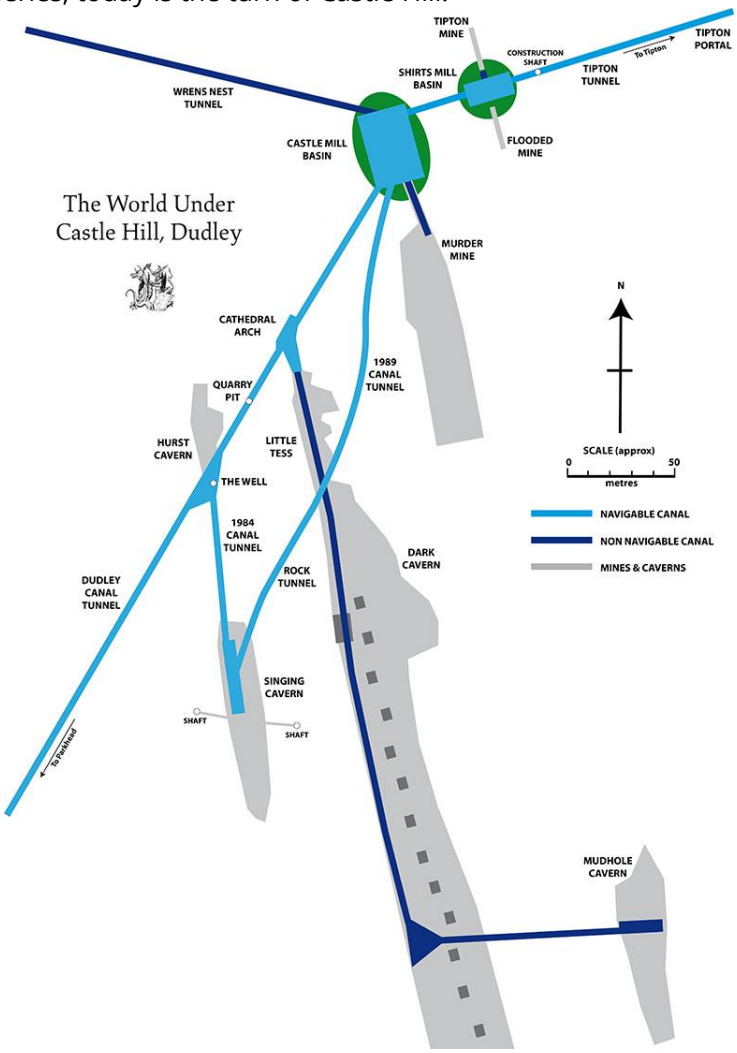






A Palaeozoic ridge bisects the Black Country, dividing its watershed. This ridge comprises Sedgley Beacon in the north-west, Wren's Nest and Castle Hill in Dudley, and the Rowley Hills to the south-east. Having now discussed the other hills in this series, today is the turn of Castle Hill.

Castle Hill is a faulted anticlinal limestone ridge, sitting south-east of the more geologically renowned hill of near-identical composition at Wren's Nest. Its slopes dominate the skyline north of Dudley town centre and have been occupied by Dudley Zoological Gardens since 1937. Dudley Castle itself proudly occupies its summit. Most of the extant castle dates from the thirteenth century and it played a notable part in two civil wars – Stephen and Matilda's Anarchy; and the English Civil War. It was largely destroyed in the latter conflict, leaving the ruins we see today. Whilst a millennium of human history is impressive, the castle's Silurian foundations are approximately 430,000 times older than the structure on top!

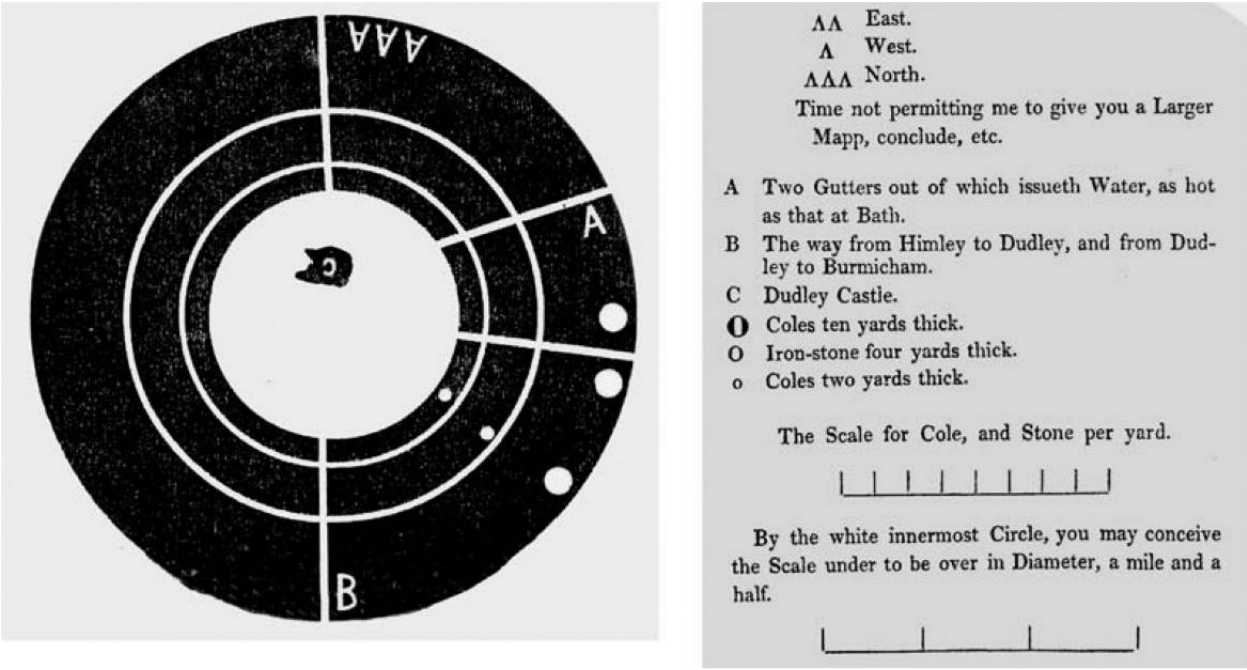


The surviving and backfilled tunnels beneath Castle Hill, which were used to extract limestone at depth. Map created by Dudley Canal Trust.

Much like Wren's Nest, the resilient Silurian limestones that define Castle Hill were mined and quarried extensively. Quarrying of the fossiliferous Much Wenlock Limestone at Castle Hill dates back at least a thousand years and blocks packed with corals, crinoids and trilobites (to name just three) are the primary building stone used in both Dudley Castle and the 12th century St James Priory. The quarrying industry accelerated enormously at the onset of the industrial revolution due to the value of limestone-derived products in processes such as iron smelting and glass manufacture. Starting in the late 1700s a web of underground canal branches, many emerging from the surviving Dudley Tunnel, was built to access and extract limestone from caverns deep beneath Castle Hill. When the profitability of limestone quarrying declined in the mid-19th century, the Earl of Dudley had gas lighting fitted in one of the larger caverns so that lectures, balls and concerts could be hosted there. Many of these tunnels have since collapsed or have been backfilled due to their instability, though the Dudley Canal and Tunnel Trust does an admirable job of maintaining the main tunnel, several caverns and two sections of additional tunnel that were built in the 1980s (the youngest tunnels in Britain's canal network). Today most of Castle Hill is a scheduled monument, in recognition of the historical legacy of the lime industry in defining the Black Country.

Perhaps the most intriguing historical legacy related to Castle Hill is that the oldest 'modern' geological map was produced here. Dud Dudley, the illegitimate son of the then-Baron of Dudley, Edward ►

Sutton (of no known relation to the author), was a fascinating figure in the early industrial history of the Black Country. From 1618 to the 1630s, Dudley experimented with the use of coal-derived coke for smelting iron. Ironstone was being mined from the Coal Measures by this time, but the many thousands of smiths working in the Black Country relied on charcoal, which was challenging to acquire due to local deforestation and import difficulties due to poor infrastructure in the pre-canal age. Dudley was one of the first to make use of the abundant coal instead, notably doing so at furnaces in Cradley and Gornal. Dud's questionable relationship with honesty in his writings have long obfuscated his true importance to local history whilst his inventions and legacy have undoubtedly been eclipsed by those of his sister's descendant, Abraham Darby.



Dud Dudley's geological map of Castle Hill and seams of coal and ironstone to the east, from 'Metallum Martis'

Nonetheless, Dud's pioneering geological knowledge is indisputable. In his 1665 magnum opus, 'Metallum Martis', he describes the outcropping of coal and iron seams around Castle Hill and depicts these in what has been argued to be the first true geological map. Stratigraphic horizons are depicted by circles, mimicking the exposure of the lithological units created by the anticlinal dome which is readily visible on modern geological maps. His 'coles ten yards thick' refers to the Thick Coal, also known as the 'Thirty Foot' coal, whilst the other ironstone and coal seams mentioned are likely part of the Lower Coal Measures (perhaps the Bottom and/or Fireclay coal) being mined on Kate's Hill. Basic though it is, this map deserves much greater renown than it has achieved. It demonstrates an understanding of structural and economic geology that predates William Smith's work by 150 years.

The other Geosites depicted in this month's section are apt for the theme of preserving and celebrating history. Firstly, Dudley Museum at the Archives does an exceptional job of enthusiastically communicating the Black Country's geological heritage. As most readers will be more than aware, it is the beating heart of the Black Country Geopark. The building is a neighbour of the Black Country Living Museum, the most tangible and exciting means of directly encountering our region's past. The museum has earned its popularity and is surely the attraction that plays the greatest role in immersing people in their social and industrial heritage - not to mention that the chips are bostin'! ■

Matthew Sutton

References and additional reading for 'Matt's Maps – Castle Hill'

Dudley Canal Trust page on the network of tunnels beneath Castle Hill used to quarry limestone.

'A historical perspective on local communities and geological conservation' by Graham Worton, in which he briefly discusses Dud Dudley's 1665 map and its significance.

Historic England listing for the surface and underground lime workings near Castle Hill, including a discussion of their history.

Mike's Musings No. 47

'Water Water Everywhere?'

For most of human history, water has been obtained directly from natural sources: rivers, lakes and more importantly groundwaters emerging as springs or tapped by wells specifically dug for the purpose. Settlements developed on sites with a suitable water resource to draw upon. One example, that has never been known to fail in the Cotswold village of Compton Abdale is the quirky 'Crocodile Spring' *(Fig.1)*. This was constructed during the mid 19th century, with water emerging from the jaws of the named reptile, rather overgrown these days by vegetation.

Fig. 1: The jaws of the Crocodile Spring, Compton Abdale

There is the remarkable case of the 'Belle Tout shaft', perhaps a well, some 43 metres deep and up to 1.7 metres in diameter, that emerged in the face of the chalk cliff near Birling Gap (Sussex) in 1976. It is believed to have been dug perhaps as long ago as 2000 BC when the site, within a Bronze Age enclosure since partly lost to coastal retreat, was some two kilometres inland, and may indicate the lengths to which people would go to find a reliable water supply. For copyright reasons, all I can offer you is figure 2, a view of the base of this well, since discovered beyond the cliff edge: it was just deep enough for the bottom 30cm or so to penetrate the present day wave-cut platform, and still visible to all who care to search for it! Better images are available on a dedicated website (see: 'Belle Tout well shaft').

Fig. 2: The base of the Belle Tout Shaft preserved in the Chalk of the wave cut platform (in 2018)

Coincidentally, the record for the deepest known hand-dug well in the world is claimed not far away just outside the Nuffield Hospital at Woodingdean (Brighton). This was a much more recent undertaking to supply a local workhouse, requiring four years to reach a final depth of 392 metres in March 1862.

We are inclined to believe that Britain is awash with water from the heavens (especially if you live in Manchester or 'north of the border'), but in terms of rainfall per person I have it ►

on the authority of a radio programme on the subject from 1999 that our water resource is not much different from South Africa, or that East Anglia compares well with Jordan, both nations generally thought of as rather dry and desert-like in the popular imagination, whilst the USA and Norway enjoy a resource some 70 times greater per head. A brief look at the bewildering array of statistics provided on line doesn't exactly confirm these figures, but they do appear to show that the UK is not as wet as we would suppose: our 'total renewable water resource per capita' is reported to be barely 10% of the global average, at 2,200 litres per person per year as opposed to just under 25,000 litres globally (source: ChartsBin.com/view/1470). So perhaps we should think more carefully about the way we use and manage our water!

Fig. 3: One of the two Observation Posts above the Knighton tunnel

Historically, water wells have been dug since Neolithic times, but in more recent 'modern' times there has been a need to construct sophisticated water-supply networks based on man-made reservoirs and associated infrastructure to serve our large urban populations. Only in the early decades of the 20th century did a safe domestic water supply network begin to be widely available and trusted across the country, especially once the connection between poor water supplies, hygiene and epidemics (like the 1854 Broad Street cholera outbreak in London) became better understood.

It is well known that the West Midlands conurbation is served by a series of reservoirs in Mid Wales whose construction began in the Elan Valley in 1893. Indeed, Charles Lapworth was involved as an expert consultant on the geological aspects of the project. Water is delivered by gravity via the 73 mile long Elan aqueduct, at a rate of less than 2 mph, down a gradient of 1:2300 (average), and takes around 40 hours to arrive. Several features associated with its construction survive along its route which now make you wonder what their purpose was. One example on Black Hill, above the hamlet of Monaughty (in the middle of nowhere, Mid-Wales!) are a pair of observation towers built along the line of the Knighton tunnel *(Fig. 3).* This scheme was enhanced after WW2 as the population grew, with further reservoirs at Claerwen, and it supplies drinking water which is noticeably 'softer' than that from more local sources which are, by contrast, noted for their 'hardness'.

Similar major reservoir engineering projects serve other English cities: Liverpool and Manchester from the Lake District (Thirlmere and Haweswater), Nottingham and Derby from the Peak District (Howden and Ladybower) and Kielder Water serving Tyneside, are perhaps the best known. Along with the establishment of such schemes, administered by a host of different water companies, came wider controls over standards of water supply, especially with respect to drinking water. These vary worldwide, but in Britain the benchmarks set for a wide array of constituents and contaminants are amongst the highest, and compliance closely observed.

However, the purity of our domestic water supplies have a legacy of popular suspicion, fuelled by incidents such as the notorious Camelford contamination event in 1988. Despite controls over the quality of our 'natural' water resources (springs, fountains etc.) being far less stringent, it is perhaps no coincidence that the 1980s saw a marked increase in the consumption of bottled water, which seems to have become a way of life for many over the last generation or two, even if some of us can recall an age when tap water was deemed perfectly acceptable to most. News items about spillages and sewage dumping probably do little to allay such fears and suspicions that water supplies are in safe hands, so the bottled water industry is likely to continue to prosper for the foreseeable future. ►

The practice of commercial bottling of water in the United Kingdom actually goes back as far as 1622, with the Holy Well in Malvern *(Fig. 4)*. This was at a time when tap water, if it existed at all, was certainly not very reliable; nor was water drawn from wells or other outlets always very safe. Indeed, poor hygiene, particularly in growing towns and cities once the industrial revolution took hold, often led to serious outbreaks of disease such as cholera, the reasons for which were little understood until the late 1800s.

This situation persisted throughout the 17th to early 20th centuries, when ale or beverages prepared from boiled water were the favoured choices for a safe option with which to quench one's thirst on a daily basis. Indeed, so-called 'small beer', with a much lower alcohol content, had been around since medieval times, being produced within households for consumption by children and servants.

Also prepared with boiling water, the 17th century saw the arrival of coffee in Europe, the beverage that fuelled the rise of the intelligentsia during the western Enlightenment, with the growth of the coffee house culture (supplanted in modern times by a more egalitarian clientele gracing Starbucks or Costa cafés!). Simultaneously, tea arose as the beverage that 'drove the British Empire', initially available only to an elite aristocracy but eventually becoming available to all, though it had been widely imbibed in Eastern cultures for millennia beforehand.

Fig. 4: The Holy Well, Great Malvern

Meanwhile, the earliest spas of the 14th century (the Belgian town of Spa was one of the first) were places associated with a healing spring, possibly derived from the Roman epithet *'Sanitas per Aquas'* (health through water). Harrogate was one of England's earliest spa resorts with the discovery in 1571 of the chalybeate and sulphurous waters of the 'Tewit Spring', supposedly having similar properties to those on the continent including Spa itself. Sulphurous waters have been posited as beneficial for those suffering from eczema, bronchial ailments, gastritis, heartburn, gout or rheumatism.

The notion of health-giving mineral content in certain spring waters gathered apace during the 17th century and saw the rise of a long list of fashionable spa towns in Britain: Malvern (1612), Matlock (1698), Cheltenham (1716), Tunbridge Wells (c.1750) and Leamington (1784) to highlight but a few. Some had their origins in Roman times, Bath being the best known for its geothermal waters. Others became better known for the salt industries associated with their saline waters, Droitwich in the 19th century being the stand out example, with the success of its hot brine bathing during a cholera outbreak. Yet others, being somewhat 'off the beaten track' like Llandrindod Wells (1736), benefited in particular from the advent of cheap rail travel which brought it into the reach of many more people for its heyday in the late 19th century.

Specific treatments brought in from the continent became something of a rage during the 1800s. One such, the Preissnitz cold water cure, became the speciality at Malvern in 1842: the tortures people put themselves through sometimes boggle the mind, but then humans have long had the facility for imagining strange ways to achieve all kinds of salvation! ►

Fig. 5: The Radium Palace Spa Hotel, Jáchymov, Czechia

At one time even the radioactive waters at some resorts, again especially on the continent, were seen as having wonderful curative properties. The 'Radium Palace' in Jachymov (Czechia) *(Fig.5),* 'the historic birthplace of radiobalneology', became a fashionable destination, with radiotherapeutic treatments being seriously offered, and accepted, by the public! Indeed, radon baths are still being advertised today as a cure for various ailments such as arthritis, despite its known carcinogenic properties.

A separate branch of spas arose during the Georgian period with the promotion of seaside bathing, first promoted by William Russell of Brighton in 1750. One suspects that the commercial benefits were a stronger motive, but it certainly led to the creation of many seaside resorts. Folk flocked to these destinations especially as the population became more affluent, leisure time became available to more people and travel improved with the advent of the railways and, later still, the internal combustion engine. Some resorts attracted royal patronage, such as Weymouth, a favourite with George III. One legend has it that they managed to offend his royal highness by fashioning his image astride a white horse on the Osmington Downs nearby *(Fig.6),* but much to his chagrin he was depicted as riding *away from town*, which he never visited again. In fact, his well known illness probably took hold before the figure was sculpted in 1808, so he never actually saw it for himself, his last recorded visit being in 1805.

Fig. 6: George III depicted in Chalk on the Osmington Downs near Weymouth

Newer trends in the perceived benefits from natural waters include various concepts of wellness. Convalescence for soldiers returning from the trenches in WW1 saw spas being used again for the purpose of healing and general recovery, but lack of investment gradually saw many spas go into decline as better understood and reliable medical practices independent of water arose. However, hydrotherapeutic practices such as those mimicking weightlessness are coming back into favour. Even the benefits of cold water immersion in boosting the immune system and improving brain circulation and kidney function are now recognised. Perhaps Herr Preissnitz was ahead of his time after all!

In addition to many Wikipedia sites, I should like to acknowledge an information board at the Holy Well in Malvern for some of the above material. ■

Mike Allen