Newsletter No. 289
February 2025

Contents:

Copy date for the next Newsletter is Tuesday 1 April

To find out more about this photo - read on!

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For enquiries about field and geoconservation meetings please contact the Field Secretary.
Please notify Andy Harrison in advance if you will be attending these events.
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, and Facebook.

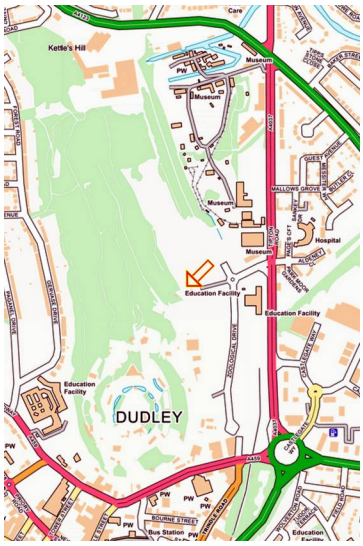
Future Programme

Indoor meetings are now held in the Lamp Tavern, 116 High St, Dudley, DY1 1QT
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 17 February *(Indoor Meeting):* 'The Wuda flora: an earliest Permian tropical forest ecosystem preserved under volcanic ash'. Speaker: Professor Jason Hilton (University of Birmingham). This talk will showcase an exceptional fossil flora preserved in exquisite detail under a blanket of volcanic ash at Wuda in Inner Mongolia (north China). Think of it as Pompeii without the Romans, but rather than stepping back in time a few thousand years in Mediterranean Italy, jump back 299 million years to the earliest Permian and a tropical forest ecosystem. The visually stunning fossils are preserved complete, in their life positions, and with exceptional preservation that records their morphology and, in some cases, cellular anatomy. *(More details are on our website.)*

Saturday 8 March *(Geoconservation Day):* Castle Hill Woods, Dudley. Park and meet at the Dudley Visitor Hub car park, at the Visitor Hub building, adjacent to the Dudley Archive for a 10.00 start. Take Discovery Way from the A4037 to a roundabout and head straight on passing the zoo overflow car park on the left and the Living Museum car park on the right. Go straight on *(see the arrow on adjacent map, grid ref: SO949911)*. The barrier should be lifted on the day. The day will be arranged through the Birmingham and Black Country Wildlife Trust. Bring appropriate footwear and outdoor gear and a packed lunch. The WT staff will provide tools and tea/coffee. We will aim to finish between 2.00 and 3.00.



Dudley Visitor Hub

Monday 17 March *(Indoor Meeting, 7.00 for 7.30 start):* AGM followed by **'The Cascades Volcanoes of NW North America'. Speaker: Alan Clewlow** (BCGS Treasurer and acting Meetings Secretary, leader of 'Volcanic Experiences' geological tours. *More biographical details on our website*). This talk will look at the plate tectonic situation in that region of the planet and how it has developed over time to create the currently active High Cascades range of volcanoes, as well as earlier manifestations of volcanism. There will be an examination of the more recent geological history of the area, including the creation of the Columbia plateau basalts. The latter part of the talk will focus on the eruptive history of specific volcanoes in Washington and Oregon, including Mount St Helens, and the hazards they present.

Saturday 5 April *(Field Meeting):* 'The Arden Sandstone in the context of Warwickshire Culture and History'. Led by Prof Stuart Burley (Keele University & Chair of WCGC). Meet at 10.00 for a 10.15 start at the car park for St Laurence Church, Rowington (Grid ref: SP203693). It lies off the Old Warwick Road (B4439), opposite and a little to the NW of the church. This trip in the former Forest of Arden will explore geological details of the Arden Sandstone, including on-going geoconservation work by WGCG and the historical fossil finds of the Rev. P. Brodie, along with associated culture-history in west-central Warwickshire. There will be short drives between localities with short walks at each location. We start with the BGS reference section of the Arden Sandstone on the Grand Union Canal. The churchwarden will provide tea and coffee in St Laurence Church. We will examine exposures of the Arden Sandstone at both ends of Shrewley Tunnel on the Grand Union Canal (a geological SSSI). We visit Henley-in-Arden to climb the 'Mount' for the distant views, take in the Norman church of St Nicholas and its building stones, plus walk to recently cleared exposure on Blackford Hill. Lunch will be at the canal-side Fleur-de-Lys pub, Lowsonford. You can sit in their grounds to eat a packed lunch or purchase a light lunch from the pub. Some difficult terrain. Bring walking boots or strong walking shoes and clothing appropriate for the time of year and weather conditions. Finish around 4.30.

Monday 14 April *(Indoor Meeting):* 'Diamonds'. Speaker: Chris Duffin (Teacher, author, currently Scientific Associate at the NHM London, also part of the Palaeobiology Research Group with Prof. Mike Benton at the University of Bristol. *More biographical details on our website*.) In addition to being a girl's best friend, diamonds possess great cultural significance. This lecture explores the geological occurrence of this celebrated gemstone, its properties, variety and use as a jewel, including an overview of the different cuts produced by jewelers through history. Some celebrated diamond gemstones and classic diamond sites, together with the stories behind their discovery, are considered, together with the position of the diamond in folklore and legend.

Saturday 10 May *(Geoconservation Day):* Portway Hill, Rowley. With the Friends of Rowley Hills and the B&BC Wildlife Trust. Meet at St Brades Close off Tower Road for 10.00 (Grid ref: SO 974 893, nearest PC: B69 1NH). Directions: from Birmingham New Road (A4123) turn left on to Tower Road if coming from Birmingham, right if coming from Wolverhampton. Turn left into St Brades Close. Wear old work clothes, waterproofs and strong footwear. Please bring gloves. Tools provided but do feel free to bring your own. Also bring a packed lunch, hot drinks provided. Aim to finish around 2.30.

Saturday 7 to Sunday 8 June *(Field Weekend)* Yorkshire Museum of Natural History & Biddulph Grange Geological Gallery and Gardens. *See box below.*

Saturday 5 to Sunday 6 July *(Field Meetings):* BCGS 50th Anniversary Celebrations.

BCGS Field Weekend - Sat 7 to Sun 8 June

Yorkshire Museum of Natural History & Biddulph Grange Geological Gallery and Gardens

This is intended as a weekend visit to Sheffield to visit the Yorkshire Natural History Museum and stay over in Sheffield on the Saturday night with a visit to the National Trust's Biddulph Grange Geological Gallery and Gardens on the way home on the Sunday. Please organise your own accommodation and transport. Let Andy Harrison know if you need assistance with a lift. **Please let Andy know as soon as possible whether you intend to join this trip:** fieldsecretary@bcgs.info**.** He needs to provide numbers to the Museum and National Trust. Here are the preliminary details:

Saturday 7 June: Yorkshire Natural History Museum: 149 Holme Lane, Sheffield, S6 4JR (Grid Ref: SK329894). Approx. 1 hour guided tour of museum exhibits and an optional 2 hour laboratory fossil preparation session (*charge may apply)* with emphasis on marine reptiles. Possible alternative option of visiting Weston Park Museum. *More here: https://ynhm.org/* Details TBC.

Sunday 8th June: Biddulph Grange Geological Gallery and Gardens: Grange Road, Biddulph, Stoke on Trent, Staffordshire ST8 7SD (Grid ref: SJ892591). Visit to this National Trust property's Geological Gallery and Gardens designed by Victorian businessman and horticulturalist, James Bateman. He was heavily influenced by Hugh Miller's vision to reconcile the Biblical creation story with geological time. The gallery is a unique physical relic from that period, with a long subsequent story of neglect, destruction and restoration. This is a chance to see some of the original fossils, the restored gallery and take a walk around the beautiful gardens. Entry fee for non-National Trust members, £11.70 each. Details TBC. *More on this history in Earth Heritage Magazine 47 and BCGS Newsletter 251.*

Other Societies Events

North Staffordshire Group of the Geologists' Association

Thursday 13 February: 'What Does the Etruria Marl Mean?'. Speaker: Dr Bernard Besly.

William Smith Building, Keele University at 7.30. For more information: https://nsgga.org/

Teme Valley Geological Society

Monday 24 February: 'Mass extinctions'. Speaker: Prof. Mike Benton.

Monday 24 March: 'Carbon Capture and Storage'. Speaker: Dr Andy Sims.

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

Mid Wales Geology Club

Wednesday 19 February: 'Welsh Dinosaurs'. Speaker: Cindy Howells.

Wednesday 19 March: 'Geoforensic Case Study: Otzi Ice Man'. Speaker: Professor Cynthia Burek.

Further information: Tony Thorp tel. 01686 624820 and 622517 tonydolfor@gmail.com
Web: http://midwalesgeology.org.uk lectures start at 7.15 and are a hybrid of in person meetings at Plas Dolerw, Newtown, SY16 2EH and via Zoom. Those wishing to join a meeting remotely should contact the secretary, Chris Simpson, at christopher_s@btinternet.com

Shropshire Geological Society

Wednesday 12 February: 'The 1831 Darwin-Sedgwick tour of North Wales', Darwin Week Public Lecture. Speaker: Michael Roberts. Because this will be a public lecture as our contribution to Darwin Week, admission will be by ticket only to ensure that we don't exceed room capacity. If attending in person please register for a free ticket using this Eventbrite link. For those unable to attend in person, the talk will be live streamed as usual and here is the zoom registration link.

Wednesday 12 March: 'The role of the Ediacaran strata of the Long Mynd in determining the severity of Earth's first mass extinction'. Speaker: Dr Alex Liu (University of Cambridge).

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

Open University Geological Society, West Midlands

Saturday 15 February: Practical Metamorphic Petrology Day School.

Saturday 15 March: Thin Section Microscopy Day School.

Alan Richardson leads the sessions at the Lickey Hills Country Park Visitors' Centre (B45 8ER). Non-members are welcome. A charge of £10 is made for each event. This covers workbooks, published course guides and the use of all the necessary testing equipment. For full details of these Day Schools, please visit the West Midlands page of the Open University Geological Society: https://ougs.org/westmidlands/

Geological Society, West Midlands Regional Group

Tuesday 11 March: 'Calculating uplift rates using geological sea-level indicators on the south coast of England'. Speaker: Becky Briant, Associate Director of Geomorphology, Jacobs/ Birkbeck University.

Lectures are being held at Mott MacDonald, 10 Livery St, Birmingham, B3 3NU and by Zoom. 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.

Woolhope Naturalists' Field Club - Geology Section

Friday 21 February: 'The geology, hydrology and ecology of our rivers'. Speaker: Stuart Cuming (Geomorphologist, Environment Agency).

Friday 21 March: 'George Piper and the Ledbury passage beds'. Speaker: Rose Watkins.

Meetings are in Hereford Town Hall, from 6.00 to 8.00. Non-members are welcome and pay £2. More info. at: https://www.woolhopeclub.org.uk/meetings

Warwickshire Geological Conservation Group

Thursday 20 February: 'Footprints from the past: the nature and value of the UK's dinosaur track record'. Speaker: Kirsty Edgar.

Thursday 20 March: 'Alpine peaks and salt intrusions – geological windows into deep Earth's mantle'. Speaker: Jonathan Turner.

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

Subscriptions 2025

Subscriptions were due on **1 January 2025.** If you haven't already paid then please send your cheque to: **Alan Clewlow, 19 Manor Court Road, Bromsgrove, Worcestershire, B60 3NW.** Cheques should be made payable to **'The Black Country Geological Society'**. Payment may also be made by bank transfer. Our bank account details with Lloyds Bank are as follows: Name of account: Black Country Geological Society

Sort Code: 30-90-89 Account Number: 43898960

Editorial

In this issue we are pleased to announce the field weekend on **7/8 June to the Yorkshire Museum of Natural History in Sheffield, and Biddulph Grange in Staffordshire.** Please have a close look at the field weekend information on p.4. Andy needs to know **as soon as possible** if you will be joining this trip. It will also be opened to other societies, and Andy needs to know numbers.

Also, make sure you have the **50th Anniversary weekend** in your diaries! We will send out more details about this in due course.

Whether or not you took part in the field visit to Barrow Hill, have a look at Andy's detailed and informative report (p.7). Then we travel to the far-away Caribbean in an article by long-term BCGS member Graham Hickman (also ex-President of the GA). We learn of his adventures on a holiday visit to La Soufrière volcano on St. Vincent Island while he was working in Trinidad several years ago. Next we have two geological snippets from Mike Williams' holiday in Canada, then Mike Allen's fascinating Musing – a 'heavenly body' story rooted firmly in a Yorkshire village! Finally, our webmaster gives some helpful hints about making the most of the 'events' entries on the website. Have a look! There's all this, and a full programme of talks and events to look forward to during this special 50th Anniversary year. ■

Julie Schroder

Field Meeting Report

Saturday 14 September 2024: BCGS Field Event – Barrow Hill, the 'Dudley Volcano'. Leader Andy Harrison (BCGS).

Introduction

September usually marks the beginning of the BCGS autumn/winter conservation programme. However, due to current local authority constraints, this has been disrupted as the reserve wardens cannot perform overtime and supervise working parties during the weekends. In light of this issue, this Barrow Hill visit was the first of many events planned to visit all 40 plus sites within the Black Country Geopark. The aim is to explore what geological features and conservation work these sites have to offer and to collect memories from anyone local attending the visit.

Cool and overcast, calm conditions greeted our group, as we met on Vicarage Lane outside St Mark's Church at 10.15. Here, the group was provided with some background to the day and the Barrow Hill nature reserve. During the visit, we followed two published paths outlined on the white Wildspace Project leaflet (2001) and The Dudley Volcano leaflet (2005). Finer and sunnier conditions developed throughout the day. ►

View from Barrow Hill south towards the Clent Hills

Background

The 2001 Wildspace Project was a £125 million 'Big Lottery' funded programme for green spaces and sustainable communities. This programme aimed to help urban and rural communities to understand, improve and care for their natural and living environment. Working in partnership with Natural England, Dudley MBC won a £5 million grant to help local nature reserves, including Barrow Hill, Cotwall End Valley and Bumble Hole, to benefit from the grant with an appointed overseeing officer. The Project ran until 2004 and established fourteen nature walks around the Dudley area.

In July 2005, the 'Barrow Hill, Dudley Volcano' leaflet was published. This looked into the geological features around the nature reserve. The Wildspace and Barrow Hill routes cross over in part and combining them gives an interesting perspective on the reserve's geology, heritage and biodiversity.

Barrow Hill, East Quarry

As its name suggests, the reserve generally comprises a main hill, rising to 178m Above Ordnance Datum (AOD), on the Ordnance Survey map with ground elevations falling to roughly between 120m AOD and 140m AOD in the north, east and south and 110m AOD in the west. The leaflets claim that the height of Barrow Hill is over 152m AOD. Vicarage Lane and St Mark's Church sit immediately south of the reserve and are reached via the High Street, (A4101) off Pensnett Road. Cooper's Bank meadows and Farm, leading to Gornalwood, bound the reserve to the north, whilst Russell's Hall housing estate and hospital bound the reserve to the east and south-east. To the west, the former Pensnett railway, today a public footpath, delineates the site with the former Tansey Green Clay pits - now meadows, beyond.

Patchy woodland and open meadows cover and surround Barrow Hill itself. On its north-west flanks are two deep gouges - the East and West Quarries, which in the 1800s were worked for the underlying dolerite that forms the hill. It is the East Quarry where the Society has undertaken conservation works previously. The reserve is named after two Bronze Age burial chambers, dated to around roughly 2,000BC to 700BC. These were discovered on the north side of the hill. However, they were destroyed when quarrying activities commenced.

Barrow Hiil sits adjacent to the northern outskirts of Pensnett village, which is believed to be named from Pen - Celtic for 'Hill Side' and Sneath - Anglo Saxon for 'Small Fenced Area'. Historically, dense ancient woodland belonging to Pensnett Chase covered the area and extended west to Enville and Bobbington. Barrow Hill represents one remaining patch of the original woodland, which was probably fenced off for keeping deer. Called 'New Park' in the 13th Century, the area formed a fenced hunting ground for the Dudley family who quickly realised the wealth they had underlying the local area. The earliest industry, charcoal burning, lasted until the 19th Century and during the 17th and 18th centuries Pensnett Chase was pock-marked with quarries and coal mines. The first Pensnett railway section was completed around 1829 and eventually formed 40 miles of railway linking all the Earl of Dudley's enterprises. Mineral extraction reached a highpoint in the 1800s, but depleting raw materials saw collieries and factories close during the 20th century. ►

The Field Visit

From St Mark's Church, we walked up the Barrow Hill incline to the hill summit. Thick vegetation partly hid the once great panoramic view to the north, east and west. To the south, Russell's Hall Hospital, Clent and Wychbury Hills were visible, with the Malvern and Abberley Hills beyond. A large metal cross commissioned by the Church, stands on the hill summit. According to the Wildspaces leaflet, during the 'Cold War', a private listening centre was constructed somewhere beneath Barrow Hill.

View north over Coopers Bank

Like the Rowley Hills and other Black Country dolerite bodies, that which underlies Barrow Hill was intruded during the late Carboniferous, around 315 Ma *(Dudley Volcano leaflet)*. During the Variscan Orogeny, as the Rheic Ocean was closed, localised tectonic uplift and extension allowed molten basic magma to intrude the Coal Measures strata and to propagate along coal seams. The main bedrock surrounding Barrow Hill is the Upper Carboniferous, Etruria Marl Formation, which was deposited within deltaic swamps that occasionally flooded. Continued uplift led to low-lying floodplains with braided rivers that deposited, unconformably, the overlying Halesowen and Alveley Formations, which have since been eroded away. On the reserve's eastern edge, a large north-south trending fault separates the Etruria Formation from older Coal Measures strata to the east.

Despite Barrow Hill being called the 'Dudley Volcano', it was no more than a small magma chamber and vent situated on the larger volcano's flanks. The original volcano would have stood at roughly 1km above the existing landscape and spewed lava and ash out over a wide area. Faulting has subsequently split the original Barrow Hill intrusion into smaller bodies with ash deposits bounding them to the north.

Tansey Green Clay Pit

Descending the Barrow Hill Incline, we continued through Barrow Hill Copse, the local remnants of Pensnett Chase, to East Quarry. In spring the copse is carpeted in bluebells and rings to the song of chiffchaffs and willow warblers. Unfortunately, since no clearance works have been conducted in East Quarry for some time, it has become very overgrown with hawthorn, hazel and brambles that hide the important geological exposures. These include columnar jointing in the dolerite, contacts with the surrounding Etruria Marl and brecciated features where hot dolerite has contacted cold, wet sediment. Calcite mineral veins also occur where carbonate rich hydrothermal fluids percolated through the fractured rock during diagenesis. ►

Leaving East Quarry and heading a short distance west, we encountered some large concrete blocks. These are all that remains of an aerial ropeway used to transport dolerite from the quarry, initially up towards Coopers Bank and eventually, to the Pensnett Railway. Trees lining the ropeway route hid spoil heaps and various features that hint at the site's industrial past, including the deep and overgrown West Quarry with water in its base.

Former Pensnett Railway

Retracing our steps, we followed the Wildspace route east with views north over untouched meadows and hedgerows, now very overgrown, towards Cooper's Bank Farm. The underlying nutrient-poor Etruria Formation makes perfect growing conditions for quaking grasses, betony, field scabious, ladies bedstraw and greater knapweed in the spring and summer. Trees along the path hid an old pump-house chimney that served a former colliery, beyond which were the Cooper's Bank Farm barns. Continuing to the reserve's eastern edge, and crossing the main fault line on to the earlier Coal Measures strata, we came across several overgrown ponds filled with pumped mine water. Today these ponds provide a home for many amphibians (frogs, toads and newts) and plants (rushes, rosebay willowherb and various grasses).

The route continued northwards and intersected another path heading west. This was a disused railway line, part of the former Gibbons Branch line, which formed part of the Earl of Dudley's mineral railway network. Continuing west, we passed the old pump-house chimney (seen earlier) and eventually came across the former Hunts Mill site, hidden in the trees. Dating to 1780, the mill produced flour for bread production and was demolished in 1986 after falling into disrepair. Adjacent buildings included the barns to Cooper's Bank Farm, formerly a dairy farm which closed following the 1972 foot and mouth outbreak when the cattle had to be destroyed. It subsequently turned to beef production until the 1980s. Amongst the hawthorn, oak and sycamore lining the former railway were a local variety of pear trees, called Tettenhall Dick. Planted by local businesses, the pears were used to make perry cider for their workers. The former Hunts Mill building sits on another small dolerite intrusion, the extents of which were hidden in the trees.

Continuing west, we reached a large pool which sits on impermeable Etruria Marl and is rimmed with marsh grass and reddish soils where dragonflies flitted about. Stopping for lunch, the clouds began to clear and the sun appeared to give a fine and warm afternoon.

St Mark's Church Graveyard

After lunch, we continued along the former Pensnett Railway, forming the reserve's western edge, from where, through a gap in the hedge we got views overlooking the Tansey Green Claypits *(see photo above).* Here the Etruria Marl was extracted for brick making and, at the southern end, ash layers were encountered that include silicified conifers from when the active volcano covered them with fine ash. With heat charring the outer bark, the inner structure was preserved and subsequently silicified to give the world's oldest conifer fossils, examples of which can be seen in the Dudley Museum. ►

East of the Pensnett Railway Walk, the underlying Etruria Marl provides ideal conditions for hay meadows. These support various grasses and wildflowers, including lesser knapweed, tormentil, cat's ear, meadow buttercups, yarrow, smooth hawksbeard and oxeye daisies. Here, large pools also provide marshy areas where lady's smock, lesser spearwort, rushes and sedges grow.

Eventually, turning east off the Pensnett Railway Walk, we entered the remaining ancient Pensnett Chase woodland with its mature oaks, ash, beech and sycamore. In spring and summer, other ancient woodland flowers, including bluebells, yellow archangel, violets and wood melick, cover the woodland floor.

Leaving the wood, we followed a route up through St Mark's Church graveyard with its graves displaying varied geologies and black tiles, local to the area, before returning to the cars. ■

Andy Harrison

References:

Wildspace Project – Countryside Walks in Dudley leaflet, Barrow Hill, published in 2001.

Barrow Hill – The Dudley Volcano leaflet, published 2005. (A pdf is available on our website here.)

La Soufrière Volcano, St. Vincent, Eastern Caribbean

During April 2021 the usually dormant volcano called La Soufrière, on the Caribbean Island of St. Vincent, sprang to life. The explosive eruption made headlines in the world news (Fig. 1). Fortunately, there were no casualties as the 16,000 residents who live near the volcano had been evacuated in plenty of time. The early warnings were the result of good geological monitoring, which had been in place. Since the 1700s La Soufrière has only erupted 4 times before, the frequency being slightly longer than the average lifespan which, together with the lack of historical record, has meant that the real threat from the volcano gets forgotten.

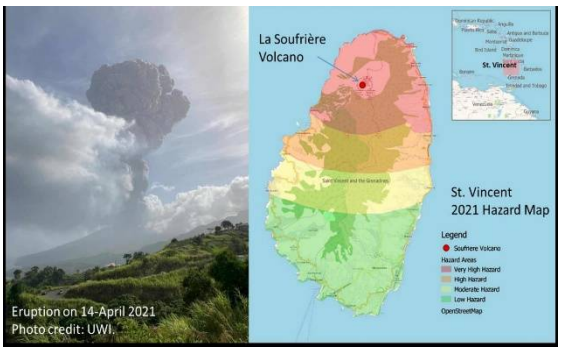


Fig. 1: St. Vincent and La Soufrière Volcano

The Islands of St. Vincent are located towards the southern end of the Lesser Antilles, a chain of volcanic islands in the Eastern Caribbean. The volcanoes are a result of the collision of the Caribbean plate and the Atlantic plate. The Caribbean plate is overriding the colder and older Atlantic plate, a process called subduction. As the Atlantic plate sinks it melts and the resultant magma rises to form the volcanic chain of islands from Grenada in the south to Saba in the north.

My 2013 Visit to La Soufrière

Back in 2013, during my time on assignment with BP Exploration in the nearby island of Trinidad, I had taken a short holiday on St. Vincent and the Grenadines. Rather than staying at the popular beach resort to the south of the island, the geologist in me wanted to explore the volcano. I had researched my trip and discovered accommodation close to the volcano and a guide who could take my wife, Kerry, and I to the summit. ►

Fig. 2: La Soufrière, view from the beach

The accommodation was at the Richmond Vale Academy. It was more of a youth hostel than a hotel with very cheap rooms and communal meals. The Academy was run by a Danish organisation and pursues educational and environmental projects with the help of volunteers. We stayed there three nights and they organised our guide, a local man named Franklin, to take us up the volcano.

On the morning of 24th Feb 2013, we set off from the Richmond Vale Academy to climb the volcano. There were four in our party; Franklin our guide, Kerry and I, plus a friendly Venezuelan called Ricardo. The first part of the hike involved walking along the black volcanic beach (Fig. 2), until we came to a deeply incised gully which a stream had cut through the layers of ash and lava (Fig. 3).

I recorded the route on my GPS. We climbed from sea-level to the crater rim at 934m (3,065ft) then descended 180m (576ft) into the crater (Fig. 4). The first part of the trail had tree cover and good shade. However, the second part had no shade, exposing us to strong Caribbean sun, 27°C temperatures and high humidity. On approaching the crater edge, we encountered strong winds as we were no longer sheltered on the lee-ward side of the island but exposed to the full force of the Atlantic Easterlies (Trade Winds).

Fig. 3: Walking up the incised gully through layers of lava and ash

The view from the crater rim was stunning (Fig. 5). The sides were steep and layers of ash and lava from previous eruptions could be clearly seen. A lava dome had grown inside the crater since the last eruption in 1979 but was now covered in vegetation. During the wet season a lake is often formed inside the crater but when we visited it was quite dry although there was still quite a bit of vegetation giving everything a green colour. A fumarole on the southern edge of the lava dome, which had no vegetation, was the only sign of activity. This was our target as we prepared to descend into the crater.

Fig. 4: GPS track of our route and profile
11 miles round trip

We descended into the crater using rather old and worn ropes to prevent us from slipping. (Fig. 6). The descent was difficult with loose and unconsolidated ash and lava underfoot. On reaching the crater floor I was exhausted and short of water, but I was also quite exhilarated about being inside the crater of a volcano! ►

Once on the crater floor we headed to the area of the fumarole on the south side of the lava dome. (Fig. 7.) Wafts of steam could be seen and there was a strong smell of sulphur. The ground was very hot. I collected a few rock samples and we investigated the fumarole before starting on the return journey. The ascent out of the crater required a lot of crawling on all fours due to the loose material and proved to be easier than I had anticipated. From the crater rim it was then all downhill to the sea.

Fig. 5: Panoramic view La Soufrière crater in February 2013

Fig. 6: (Left) myself and Ricardo resting on the crater rim. (Right) Our guide Franklin leading the way into the crater, note the fumarole in the distance.

The 2021 Eruption

As La Soufrière came back to life during December 2020 scientists from the UWI (University of the West Indies) Seismic Research team began monitoring the volcano closely. The photo below (Fig. 8) shows the new lava dome had begun to form to the west of the fumarole which I had visited in 2013, indicating a new vent had opened up to the west. This new lava dome continued to grow in the early months of 2021.

Fig. 7: Inside the crater of La Soufrière heading for the fumarole. Feb 2013

The scientists from the UWI Seismic Research team use a variety of techniques to monitor the volcano; direct observations, gas analysis, seismic detectors, tilt meters and satellite GPS measurements. In December 2020, earthquake swarms referred to as 'Volcano tectonic earthquakes' were recorded at a depth of 3km and suggested that magma was moving deep inside the volcano stressing the rock and causing it to fracture. This was followed by more earthquakes on April 5th 2021 at a depth of 6km, suggesting even more magma was rising and building pressure within the volcano. Seismic activity is known to occur as a precursor to most large eruptions, so the Island was put on alert. By April 8th alert levels had been raised to 'Red' and 16,000 people were evacuated from their homes in the northern part of the island. Then on April 9th 2021 an explosive eruption sent clouds of ash 6km into the air, falling like snow on St. Vincent and the neighbouring Caribbean Islands.

Explosive History

I described earlier that La Soufrière was a usually dormant volcano. Prior to colonial times the only clues we have are in the rocks as the indigenous people kept no records. Since the 1700s there have been four recorded eruptive phases; 1718, 1812, 1902, 1979 and now in April 2021 the fifth recorded event in the last 300 years. ►

An account of the 1718 eruption is recorded by Daniel Defoe, the author of Robinson Crusoe, in the 'Mist's Journal'. Defoe (1718) gave a detailed account of the volcanic explosion of the island of St. Vincent, relying on letters he had received describing the event. He described tephra falling on ships in the region and on several other Caribbean islands. At this time St. Vincent was only populated by the indigenous Caribs and there is no information regarding casualties.

Fig. 8: La Soufrière crater in January 2021 showing new lava dome. (Photo credit: UWI)

Discovered by the Spanish, St Vincent changed hands several times between the French and the British. It was under British control when the next major eruption occurred on April 30th 1812. The observations were made by Hugh Perry Keane, a barrister and plantation owner. The sketch he made of the eruption was the basis for the dramatic painting made by William Turner (Fig. 9) now in Liverpool Museum and Art Gallery. Few casualties were reported from the 1812 eruption.

1902 was the next major eruption occurring on May 7th 1902, accompanying the eruption of Mont Pelée on the neighbouring island of Martinique. This eruption is well documented, (Anderson 1902). There were multiple earthquake precursors to the main eruption for about three weeks from mid-April 1902. On the north side of the island numerous earthquakes were felt, causing small landslides and rocks to dislodge and roll down the slopes. On May 6th clouds of steam were observed being emitted from the centre of the old crater along with noises, sounding like cannon fire. The climax occurred on May 7th 1902 when a great black cloud swept from the crater to the sea, burning and suffocating those in its path. This event is now recognised and referred to as a nuée ardente, or pyroclastic density flow. It is estimated that 1,500 people died, the death toll being higher on the windward side of the island because their view of the summit had been obscured by clouds. The volcano had eruptions later in May, September and October 1902, with a final explosion in March 1903.

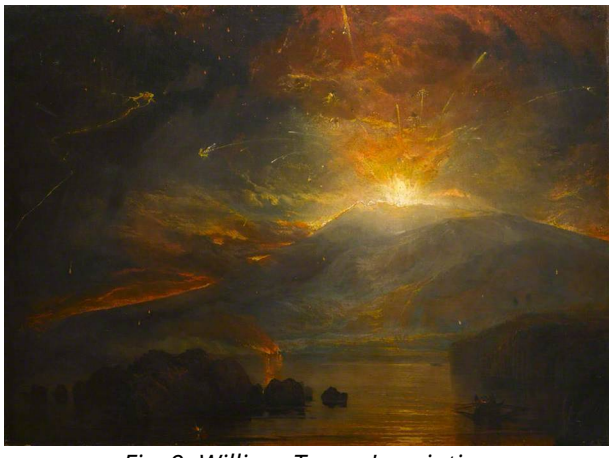


Fig. 9: William Turner's painting of the April 30th 1812 eruption

An even more devastating loss of life occurred on the neighbouring island of Martinique where more than 30,000 people were killed by the eruption of Mont Pelée. This was the start of the serious study of volcanoes and the modern science of volcanology.

La Soufrière erupted again in 1979. The eruptions were preceded by a strong local earthquake on April 12th 1979. 20,000 people were evacuated and major loss of life was avoided. The seismic activity increased throughout the day, leading to continuous harmonic tremors, indicative of magma rising in the vent. Then powerful explosions produced ash clouds and pyroclastic avalanches as the blockage in the vent was opened up. ►

La Soufrière volcano is a Peléan type volcano, named after the nearby Mont Pelée volcano. It is characterised by having viscous magma that rises but blocks the vent. As gases and magma continue to rise the subsequent eruption is explosive often with nuée ardentes - pyroclastic density flows of super-heated material that kill and destroy anything in their path.

Following such eruptions poor weather conditions also create further hazards, especially in valleys close to La Soufrière volcano. Ash can be mobilised as lahars or mudflows in rainy conditions. Flooding, landslides and heavy accumulation of volcanic ash can result in collapsed roofs of buildings. Vegetation and livestock can be severely impacted. History suggests that the volcanic activity may persist for six months to a year before recovery of the human population can get underway. Meanwhile those affected must rely on friends or the government for help and shelter. The only upside is that the volcanic ash is very fertile and with a warm wet climate vegetation soon gets growing again once the volcanic activity stops.

My visit to La Soufrière in 2013 has certainly left me with a memorable impression and appreciation for the hardships faced by those who live on the volcanic island of St. Vincent. ■

Graham Hickman

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Postcards from Canada

Mike Williams has treated us to several short items from his geologically-themed adventures at home in the UK and abroad. Here he brings us two 'postcards' from his recent holiday in the provinces of Prince Edward Island and Nova Scotia on the eastern seaboard of Canada. Ed.

Fancy a 'Dirt Shirt'?

The Canadian province of Prince Edward Island is famous for the novel 'Anne of Green Gables' by L.M. Montgomery and for hosting the Charlottetown conference in 1864 which would lead to the creation of the Confederation of Canada in 1867, potatoes and the 'Dirt Shirt'. ►

The Acadian orogeny which began in mid-Devonian times was active for some 50 million years, leading to areas of subsidence in the Gulf of St. Lawrence known collectively as the Magdalen Basin. Permian coal swamps formed in these basins resulting in extensive coal deposits within a thickness of up to 12km of late Palaeozoic sediments.

Rocks from this sequence comprising red sandstones and siltstones are well exposed along the island's coastal sections. It is from these strata, utilising a simple procedure of staining cotton garments, that the 'Dirt Shirt' is obtained *(see front cover photo)*. A thriving cottage industry now exists with numerous retail outlets in the capital, Charlottetown, all originating from the geological setting of this beautiful island which we had the pleasure of visiting for the second time in September 2024. ■

Mike Williams

An Ice-Sculptured Landscape - Peggy's Cove, Nova Scotia

The tourist hotspot of Peggy's Cove, just one hour from the city of Halifax, gives easy access to a landscape known locally as 'Bogs and Barrens', strewn with erratic boulders and lacking in soil and significant vegetation.

The collision of two micro continents, Meguma and Avalonia, 400 million years ago led to the formation known as the 'South Mountain Batholith'. It is exposures of biotite granite from this feature which form the extensive coastal scenery around Peggy's Cove and St Margaret's Bay. Glacial activity during the Wisconsinan Glacial Stage 75,000 to 10,000 years ago resulted in the smooth sculptured appearance of the landscape. Many of the outcrops are roche moutonnées with gentle rounded slopes facing inland but steep ice-plucked faces pointing seaward. These faces are known today as 'black rocks' due to wave impact and are considered dangerous to walk on. Additionally, hundreds of erratic boulders are strewn over this landscape. It is a very beautiful place to visit but with a tragic backstory involving the loss, on September 2 1998, of Swissair Flight 111 some 5 miles to the south of the cove. Today this is commemorated by a memorial just outside the village. ■

Mike Williams

Mike's Musings No. 55

The Wold Cottage Meteorite

At risk of pursuing a theme for too long with yet another 'extraterrestrial' essay, the particular tale of the Wolds Cottage meteorite is one that bears re-telling, and this seems like an appropriate time to re-tell it!

Fig. 1: The Wold Cottage meteorite monument erected by Topham

Fig. 2: Detail of the inscription

Should you ever be inclined to explore the Chalk Wolds of Yorkshire and find yourself near the small village of Wold Newton, high above Filey Bay, you might chance upon a curious, and unique, monument (Fig. 1) in the shape of an elegant, 7.6 metre tall pillar of brick construction. This is maintained in the middle of a field, within a small enclosure, served by a short permissive track that extends from the end of the driveway to The Wold Cottage (a rather fine bed and breakfast establishment). On one face of the pillar (Fig. 2) an inscription informs you that on this very spot a most unusual incident occurred on 13 December, 1795: namely an *'extraordinary stone fell from the atmosphere'* (they had a way with words in those days!). This was at a time when such things had barely been recorded, let alone captured in such remarkable detail. Indeed, it was only the year before, in 1794, that Chladni (the 'Father of Meteoritics') had arguably initiated a new science with the earliest catalogue of meteorites, published in Riga and Leipzig. In this he argued for an extraterrestrial origin for these strange messengers from the heavens, a notion that was not favoured by the conservative establishment of the time.

Fig. 3: A portrait of Edward Topham by John Russell Wikimedia Commons

Edward Topham

The pillar was erected at the direction (and expense) of the contemporary landowner, one Captain Edward Topham (1751-1820) (Fig. 3), described as *'a man of an enquiring mind'*, by whose foresight the occasion was commemorated for posterity. So who was this Edward Topham? Well, it seems that he was quite a character himself. In his privileged youth he had led a rebellion against his masters at Eton and later attended Trinity College, Cambridge. This he left, like many students of his social standing at the time, without graduating, to embark upon the 'Grand Tour'. This latter activity culminated in 1775 with a six month residence in Edinburgh during which he gained scientific knowledge by attending courses delivered by some of the most accomplished men of the time, Edinburgh being the centre of the Scottish Enlightenment. On his return to London he published his volume 'Letters from Edinburgh' in which he pronounced upon the nature of the legal system in Scotland, in particular where he felt things wanting in regard to truth and honesty. ►

The purchase of a commission in the army followed, acting as adjutant for seven years before being made a Captain in the Yorkshire Wolds Gentleman and Yeomanry Cavalry. In 1780, the highlight of his distinguished military career came as defender of Parliament at the time of the Gordon Riots, receiving personal thanks from the King (George III) himself. As something of a dandy, a colourful interlude followed engaging with fashionable society as author, poet, playwright and journalist. He founded a newspaper (some would say 'scandal sheet'!) which clearly added to his inherited wealth, but often, it seems, pushed the bounds of respectability, and ultimately brought down on his head an accusation of libel. He just about successfully defended himself against this on appeal, but it seems to have contributed to his decision to sell up and withdraw from public life.

Thus it was that in the early 1790's he retired to Wold Cottage (with his three surviving daughters, the progeny of another tangled episode!) with a farming career in mind, where he could also indulge himself in dog breeding. He owned the most famous dog of all time, a greyhound called 'Snowball', and kept what some considered to be the finest kennels in the land.

The meteorite strike

Nature, or perhaps fate, conspired to keep his name in the news when the aforementioned 'gift from heaven' chose to make its impact upon his land, albeit while he was personally away from home. So what do we know of that fateful day? We know for certain that it was workmen of his who were the actual witnesses to the event, in particular a 17-year old ploughman, one John Shipley, who came within a few metres of becoming the first recorded fatality to a meteorite strike.

Fig. 4: Wold Cottage meteorite. A chondrite which fell near Wold Cottage Farm, near Wold Newton in 1795. Wikimedia Commons

It was only on Topham's hasty return home on hearing of this event that he went to extraordinary lengths to preserve accurate and honest eyewitness accounts. These were published in various places, the first such account incorrectly giving the date of the fall as Sunday 20th December! This was corrected in subsequent accounts, which confirmed the other basic details: *'a stone weighing 3 stone 13 pounds'* (around 25 kg.) had buried itself *'to a depth of 19 inches in soil and, after that, in 6 inches of solid chalk rock'* and *'when taken up it was warm, and smoked'*. Two additional witnesses to the scene were *'a carpenter and a groom of mine within seventy yards'*. A number of explosions were heard by all three witnesses as it fell, and all recorded a strong smell of sulphur. The 'stone' itself was described by Topham as having *'the texture of grey granite*', '*of which I know of none that may be called natives of this country*'. Furthermore it was recorded as falling out of a clear, blue sky at about three in the afternoon and as far as could be told '*was from the south-west*'. Some additional comments gleaned from the surrounding populace were added to this original record. ►

Over the coming weeks Topham gathered together statements from the three workmen, as well as from two locals, one the curate of Wold Newton, who were also witness to the fall. These were given independently without any embellishments or fanciful notions, and duly signed under the rigorous presence of Topham himself, albeit not under oath as formal affidavits.

Saved for Posterity

But accurately preserving a record of the event was only part of Topham's legacy. What were needed to make a real mark through this opportunity were both publicity and credibility, and this is where he was so vital to the occasion.

Firstly, Topham's earlier activities ensured that he knew how to go about spreading the news; he had the contacts that could make a difference. On February 8 1796 he wrote to the editor of 'The Oracle' newspaper with a full account of the event from which the above quotes were taken. He also arranged to have the stone itself exhibited under security in London, at No.2 Piccadilly, opposite the Gloucester Coffee House, with an advertisement placed in 'The Times' of July 7 announcing the display. Visitors would be charged one shilling (approximately £6.50 in today's terms) and receive a copy of all the testimonies together with an engraved illustration of the stone (Fig. 4, above). A copy of Topham's letter was reprinted in 'The Gentleman's Magazine', an organ of some note at the time.

Secondly, although Topham's background was not without some elements of controversy, his particular views on the importance of honesty in human affairs, as well as his own integrity, were generally recognised by people who knew him well and whose opinions mattered, dating back to his conduct at Eton and his sojourn in Edinburgh many years beforehand. These established the credibility of the accounts of the event in the eyes of people who carried any weight, and were sufficient to overrule those who were inclined to doubt the whole story. ►

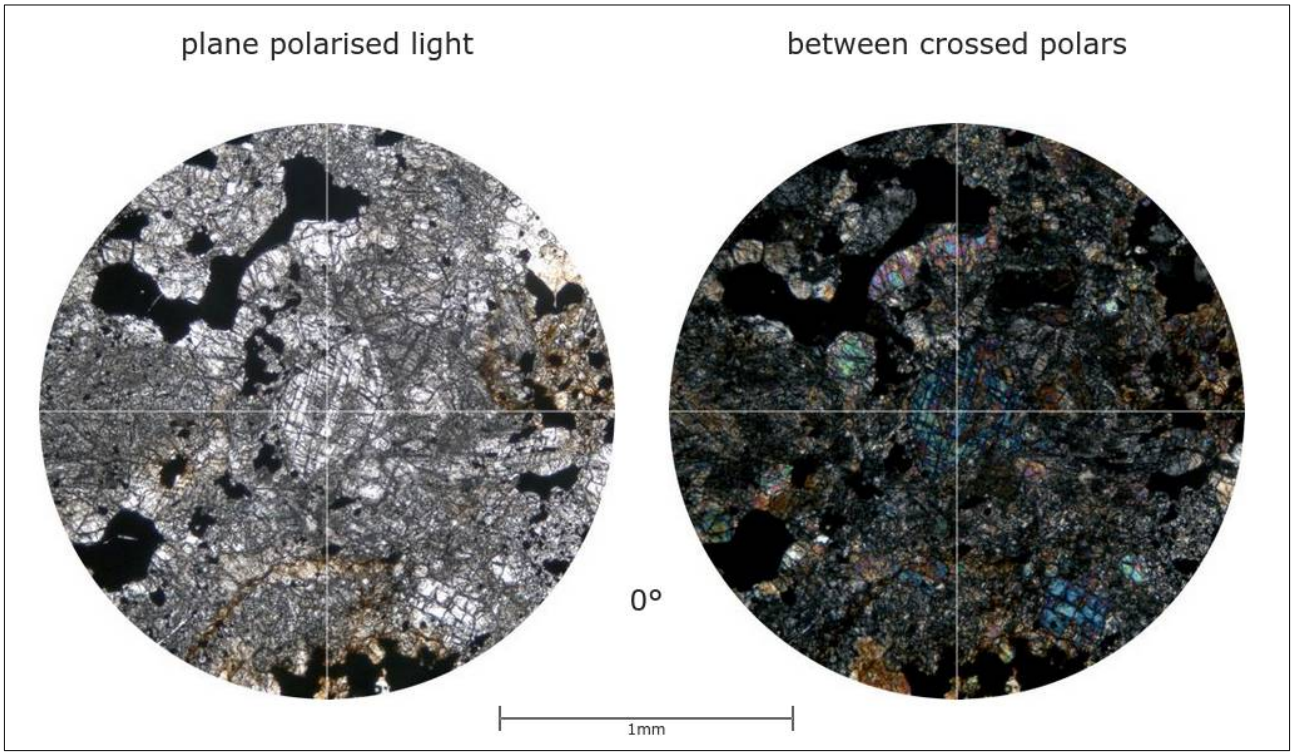

Fig. 5: Taken from Wold Cottage - Natural History Museum virtual microscope

The importance of Topham's endeavours to get the event recorded for posterity is that while interest in such matters was fast gaining momentum, it came into the hands of a respected British chemist, Edward Howard (after whom the class of meteorites known as howardites was named), who conducted careful analyses on this and several other similar looking meteorites. They all contained 'globular bodies', which we now know as chondrules; they all contained pyrites 'of a peculiar character'; they all had a coating of black iron oxide; but most importantly, they all happily contained some native metal which proved to be an alloy of iron with nickel. This helped to establish the extraterrestrial credentials of meteorites (although, as noted in my last piece, not all meteorites contain metal).

Further studies have shown that the Wold Cottage meteorite belongs to the L6 class of ordinary chondrites (Fig. 5). It still remains the largest (at 25kg) single observed meteorite to have fallen in Britain; indeed second only in Europe to the Ensisheim (Alsace) LL6 ordinary chondrite (a whopping 127 kg), delivered to planet Earth in November 1492.

In 1804 Topham acceded to a request from James Sowerby, a leading mineralogist of the day, to display the stone in his private museum. His terms were, as ever, generous, inviting payment of just 10 guineas, roughly £1,300 in current value. An engraving of the stone appeared in Sowerby's celebrated 'Catalogue of British Minerals', where it took pride of place at the beginning of Volume II. It later passed into the collections of the British Museum (which became the BMNH) in 1835 for a rather more handsome sale price of £250 (worth around £40,000 today).

And where is the stone today? Where it probably should be: still in the British Museum of Natural History. ■

Mike Allen

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'The Floating Egg' by Roger Osborne (chapter 6).

Wonders of our Website!

Did you know? On the events pages of our website there are some helpful links that you may not have noticed.

1. Each event has a link to a Google map showing where the event will be. This should be of most use with field meetings and geoconservation days. Have a look – this may help you find the spot!

2. At the bottom of each event entry you will see 'iCal'. Unless you know what this is it may seem a bit cryptic. It is in fact a link to an ics file which you can download to make an entry in your computer/phone calendar. The ics file that you download is called my-calendar-1-bcgs.ics. (The number may be different.) This can be imported into your computer/phone calendar.