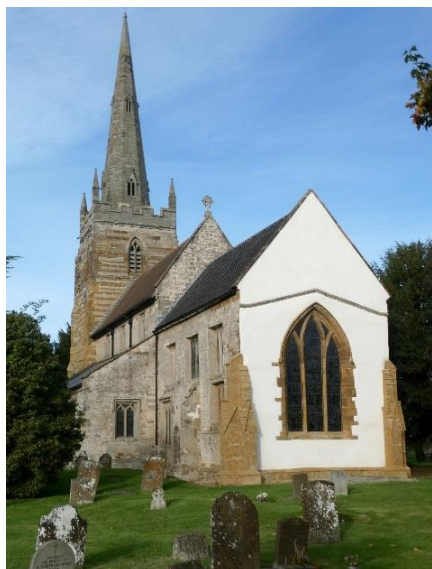




# WGCG

## Conserving Warwickshire's Geological Heritage



**Ladbrooke Church after repairs October 2021**

**See page 4**

Photo credit: Jackie West

**Mendips  
Field Party**

**See page 34**

Photo credit:  
Ray Pratt



**Newsletter**  
**Autumn 2022 Issue Number 44**



# Warwickshire Geological Conservation Group

## Hidden wonders in the landscape of Warwickshire

On the web:  
<https://wgcg.co.uk>



On Twitter:  
[https://twitter.com/wgcg\\_uk](https://twitter.com/wgcg_uk)

On Facebook:  
<https://facebook.com/WarwickshireGeologicalConservationGroup>



On Instagram:  
<https://www.instagram.com/warwickshiregwg>



YouTube <https://www.youtube.com/channel/UCf0fXO5P2BlsTFBsj9NWQrw>

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**Editor: Brian Ellis   Designer: Norman Dutton**

## Meanwhile.....

It is something of an understatement to say a lot has happened since the last Newsletter - a European war, two Prime Ministers, the death of the Queen, a new King.... . This makes the doings of WGCG rather parochial, especially when the plan was to write about 'things returning to normal'. But it remains true that 'Meanwhile' we can report in the Newsletter a much more normal range of activities.

We have had two residential field trips organised by the Education Committee – to the Mendips and to Mid-Wales, although with reduced numbers. Both reflect the importance of networking in the geological community. The Wales trip was hosted by Dr. Joe Botting and Dr. Lucy Muir. We heard of their search for research funding through the 'grapevine' and as a result we awarded them a Holloway Bursary of £2000. This they followed up with a *Zoom* presentation of their research at a Wednesday meeting. The Mendips trip was led by Dr. Martin Whiteley, who we know, in part, through the Geology Trusts, as well as personal contacts.

On a different tack, routine condition monitoring, through the Conservation Committee, of the Rowington Canal Cutting led to some new field investigations and some site clearance of the hitherto inaccessible north side of the canal. This led to the Education Committee organising a day trip studying the Arden Sandstones, which included a visit to Rowington. This is reported in the *Geoconservation in Action* piece.

Members will remember that we have supported, through Holloway Bursaries, places at summer schools on teaching geology to practising secondary school teachers. These were led by Professor Chris King, and we have reported his premature death. We received, early in 2022, a request for help from Pete Loader, who had assisted Chris in running the Summer Schools. Pete wanted to continue running them and the successful outcome is also reported in the Newsletter. We also get requests for help and information on the website. One such came from Ladbroke, which has potential for developing contact with primary schools. This too is reported here.

It was also good to hear from George Guice, a former schoolboy member and recipient of a Holloway Bursary. But it was equally sad to hear of the death of Thelma Gee, who probably only a few now remember. Regrettably, obituaries are becoming a regular feature of the Newsletter.

Finally, there are the details of the Winter Programme. One effect of a 'return to normal' is that we can now meet together face to face for the talks and renew the vital sociable side of our activities, with cups of tea/coffee and time for a chat. It is through the connections that develop then, that we are able to encourage, maintain, support and resource the range of activities described above.



# Ladbroke Church – A Geological Treasure Trove

## Jackie West

### Ladbroke Church – a major repair challenge

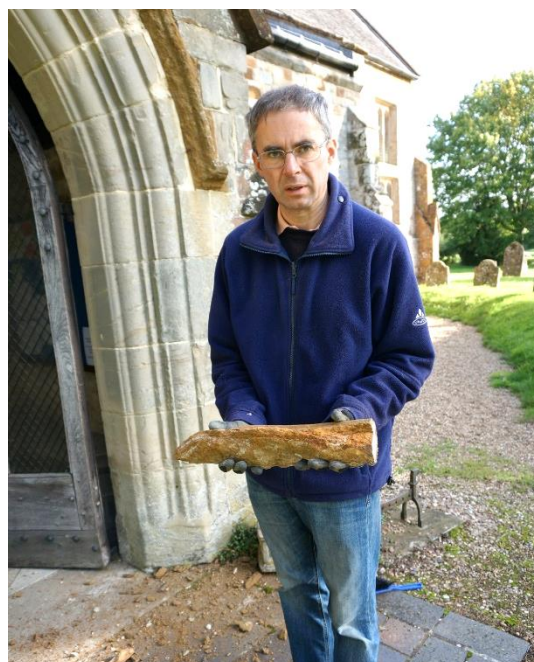
Ladbroke is an ancient village just south of Southam. At the time of the Domesday Book it had more than 30 households, so about 250 people; the population is similar today. Ladbroke Church is Grade 1 listed. It dates from the 13th century and has been extended and repaired ever since! The central nave and striped tower is 14th century.

Rope access inspection of each stone on tower to define which needed replacing.  
The Hornton Stone was in worse condition than the White Lias.



The aisles and upper clerestory were added in the 15th century and the spire sometime after that. In 1876 the eminent Victorian architect, Sir George Gilbert Scott (better known for the designing the front of St Pancras Station) restored parts of the building and refitted the interior at a cost of a mere £3049. In 2017 we needed half a million pounds for essential stonework repairs to walls, buttresses and windows

“It just came off in my hand guv!”.  
A loose piece removed from around archway after an inspection emphasised just how urgently repairs were needed.





This was an impossible challenge for our local community without major outside funding, so we applied for a grant from the National Lottery Heritage Fund. They do not give money just to fix old buildings but will fund repair-based projects which bring benefits to people and communities too. And that's where geology has helped us.

### **The benefits of geology**

Prior to the initial application to the Lottery, I had only a very superficial awareness of rocks and fossils but in the development phase I had to research what needs we could meet and learn from good practice by others. So, everything I visited or came across was looked at with this in mind, from the rocks section of the Primary School National Curriculum to an exhibition on the building of Burrator Dam in Devon.

Scroll on a couple of years to early March 2020, our bid for a grant was successful and our approved activity plan included these commitments:

- “We will produce a teachers support package to include worksheets, ideas, resource packs and hands on activities.”
- “We will run school sessions at Ladbroke, other churches and in schools and modify the resources for Family Sessions in Ladbroke.”

Later that month Covid hit!

### **Progress on several fronts**

Fortunately for us, building work was permitted during lockdown and, as project leader, I could talk to our friendly stonemasons (from a distance) during my daily exercise. The main stones they were replacing in the walls were Hornton Ironstone, or to be precise, the external 6 inches of much larger pieces. The Hornton quarry had exhausted all its building-quality stone and closed some years ago, so the masons were using ironstone from the Great Tew quarry, a few miles away. I also discovered that the old sandstone in some window mullions had become so soft it could be broken by hand! Both these facts and many more went into an online talk and subsequent video about the stonework repairs.

I had been developing the teachers' pack with a lot of help from what others, including what WGCG had posted on the internet. Their information about local stone, especially the WGCG Brandon Wall leaflet was invaluable in my early geological education and the website gave me contact details if questions arose. So, when the first scaffolding came down and I discovered an interesting inclusion.... could it be a geode?

Brachiopod colony  
in stone from  
dismantled buttress.



I contacted WGCG. Dr Jon Radley, Curator of Natural Sciences at WCC, along with Anne Morton, visited us and advised that my “geode” was a ‘nest’ of brachiopod fossils. They pointed out many other fossils in the stonework – belemnites, worm burrows and shell fragments and gave me new leads to follow. I told the stonemasons about the fossils and some weeks later they gave me an unexpected present – pieces of the buttress they were dismantling which were full of brachiopods! Then a few days after that they said a new block of stone had a crinoid in it and they had positioned it so it was visible. Now we didn’t just have a wealth of local rocks at church but a range fossils as well.

### **More and more**

Enthusiasm with local people about the project it began to snowball too:

- The 8-year-old grandchild of a local farmer wanted show me the fossils they had found on the farm and to lend me some for use with schools.
- We were given a huge ammonite that had been dug up during building work right next door to the church.
- Harbury Heritage Centre helped us produce a Jurassic Information panel similar to theirs about the Ichthyosaur and Plesiosaur fossils found in the 1920s in the cement works quarry a couple of miles from Ladbroke.

- A villager asked if we would be interested in a talk on Gravestone Geology by his friend, Philip Powell, co-author of a book on the subject (below). Of course we said yes. Following his guided strolls around the gravestones and the church itself we have published booklets on both topics, have loupes that can be borrowed by visitors and a u3a geology group were booked to come and see for themselves.



### **When can we show all this to live audiences?**

When children returned to school after lockdown, visitors and outings were out of the question so our school sessions went on hold, but we did have our first ROCK DETECTIVES family session in August 2021.



Rock detectives in action.



It was gratifying to see how quickly the children (and adults) using the Rock Identity game, learnt the difference between Blue Lias, White Lias, sandstone, Hornton and Great Tew Stone; and then were able to find these different stones in the building. They had fun making sedimentary, metamorphic and igneous chocolate too (see **Chocolate Rocks** below) and of course loved hunting for fossils. We have repeated it this year, lent out samples for bespoke family sessions and are planning to run variants at other locations too.

Finally, in 2022 the first primary school took us up on our geology offer, with an afternoon of activities in the classroom followed by a visit to the church. I know that 7/8-year-olds have had very covid-restricted educational opportunities, but to be told by some that the visit was “The best school day I’ve ever had” was extremely surprising and most gratifying.

### The future

The current round of repairs to the church is almost finished as are many of our promised activities, and we hope we can meet our targets for schools engagement in the 2022/2023 academic year, bringing the Lottery-funded project to conclusion. However, our pride in the geological treasure trove that is Ladbroke church and our desire to share it with people of all ages, especially children, will continue, specifically:

- the website [www.ladbrokeheritage.org.uk](http://www.ladbrokeheritage.org.uk) with the teachers’ packages on geology (and lots of other information)
- our booklets in print
- further talks and tours
- more ROCK DETECTIVE family sessions
- and, providing funding can be obtained, further Rocks & Fossils sessions for schools at Ladbroke, similar churches and/or in the classroom to help Key Stage 2 pupils meet and exceed the curriculum.

As I first discovered at Burrator reservoir, “Rocks are fun”. What’s more those very close to home are very interesting too. If you haven’t been to Ladbroke Church yet, do come and visit us. Let us know you are coming via the contact details below and we’ll find someone to meet and greet you or provide a guided tour, which ever you prefer. The geology at Ladbroke church is too precious to keep to ourselves.

Contact Jackie West, All Saints Church, via

email: [ladbrokechurch89@btinternet.com](mailto:ladbrokechurch89@btinternet.com)

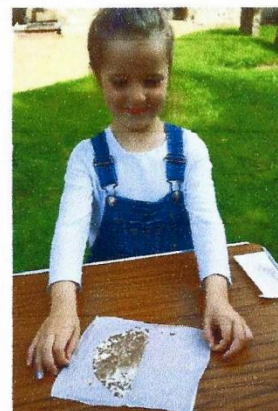
website: [www.ladbrokeheritage.org.uk](http://www.ladbrokeheritage.org.uk)

## Chocolate Rocks

### Materials

- White chocolate \* – coarse grated and stirred so mixture of sizes, including fines
- Milk chocolate \* – coarse grated and stirred
- Greaseproof paper / baking parchment cut into rectangles about 21cm x 17cm
- Foil pie cases (size that will sit with the base inside a mug, eg 111mm diameter, 22mm deep - but do check with your mugs)
- Extra greaseproof paper for the igneous chocolate
- If required, foil to wrap the samples at the end

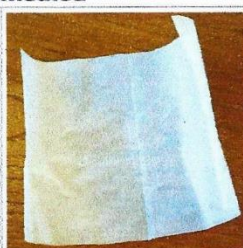
\* Note a teaspoonful of grated chocolate weighs about 6.5-8g so one 200g supermarket bar will give approx 25-30 portions



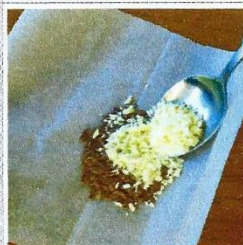
### Equipment

- 2 teaspoons
- Stirrer eg teaspoon or lolly stick per group
- Mug(s) of hot water

### Method



1. Fold the piece of baking parchment in half and open it up again.








2. Place a rounded teaspoonful of each type of chocolate on top of each other near the centre fold



3. Mix up the chocolate a bit using the stirrer



4. Fold the paper in half, then starting with the long edge, seal all 3 of the open edges by folding over approx 1cm of each side TWICE,

	<p>5. Press down all over until the chocolate starts to stick together but you can still feel it is made of particles.</p>
	<p>6. Carefully open the packet and you will see you have made sedimentary chocolate. It is quite easy to break between the particles.</p>
	<p>7. Wrap it up again and press down lots of times very hard with warm hands. To get them warm up you can sit on them or tuck them inside your clothes under your armpits. Keep pressing down with warm hands until to you can see and feel through the paper that the chocolate particles have merged into each other.</p>
	<p>8. Carefully open the packet and you will see you have made metamorphic chocolate with the particles merged into each other (except perhaps at the edges where it wasn't pressed as much).</p>
	<p>9. Put some fresh chocolate particles of both types and/or pieces of your sedimentary and metamorphic chocolate into the foil pie case and carefully put this over the mug of VERY hot water.</p>
	<p>10. When it starts to melt, stir it until all the chocolate is melted and mixed together. Then remove from the heat.</p>
	<p>11 Use a spoon, or pour directly, onto a piece of grease proof paper and let it set - this is igneous chocolate, that on the paper is like a lava flow from a volcano. The chocolate cooling in the pie dish is more like rock that has melted but then set very slowly underground.</p>



# Geoconservation in Action: Rowington Canal Cutting

Geoconservation depends on the hard work of many members and volunteers sometimes in activities that may seem unrelated in time, place and purpose. In WGCG these activities are generally organised by the Conservation Committee and the Education Committee, but often involves co-operation with other organisations and individuals. This report emphasises recent links between different activities, specifically WGCG's responsibility for designating the Local Geological Sites (formerly RIGS) in the county, the monitoring, maintaining and clearing of selected LGS and using sites for visits and educational purposes, both for members and the general public. The report reflects the considerable time and effort put in by many WGCG members.

## LGS Designation and Monitoring

Rowington Grand Union Canal cutting, just south-west of Rowington village, is a Local Geological Site (LGS 28). It was designated because it provides good sections through the Late Triassic Mercia Mudstone Group strata, including the Arden Sandstone. It is also one of the type sections of the Arden Sandstone in the BGS Redditch memoir. The LGS describes the sequence as consisting of 12m of dark red silty mudstones with thin green silty bands, overlain by 6m of Arden Sandstone Formation. There are exposures on both the north and south side of the cutting. There is a towpath on the south side but on the north side of the canal a steep slope leads straight down to the water.

Rowington Canal  
Cutting: August  
2022 visit





Monitoring in 2014, by Paul Akers and John Crossling, reported that the LGS was very overgrown and wooded on both sides of the canal, with no visible exposure within easy access on either side. Some loose blocks in landslips towards the road bridge at the eastern end of the cutting were noted. Small exposures of an iron-rich sandstone were noted at water level on north side, but access was again difficult except by boat. Recent tree felling on both sides of the cutting had exposed orange/ brown sub-soils in places, but no solid geology could be observed. Creating exposures at any point along the towpath would be possible, though not easy, by hand, but there is no access for machinery.

Monitoring since 2019 has been undertaken by Doug and Gill Aspell. In that winter sections of near horizontally bedded grey-green siltstones and thin shales could just be glimpsed on both sides of the canal (below left), but in the mid-season of 2020 these had become completely obscured by vegetation (below right).



Winter view of outcrop



Summer vegetation in Rowington Cutting

Further observation was therefore postponed in the hope that winter die-back would enable more accurate monitoring. By mid-winter 2021/2022 foliage had died back sufficiently for observation previously identified outcrops.



At an interim visit 2019 it was seen that a landslip on the north bank had occurred towards the middle of the Cutting at SP 19867 69226 (below).



Landslip in talus on north side of cutting 2019



Landslip two years later (2021)

Any rock outcrops which might have been exposed were covered by a layer of orange/brown subsoil. Observed again two years on, in the winter of 2021, the site was heavily re-populated and it was anticipated that with the growth of fresh vegetation in spring, all signs of it would disappear, as though it was never there.

Because of the absence of a towpath on the north side of the canal access to the disused quarry could only be gained from above. Recent monitoring has revealed an approach via an overgrown track just short of Bridge 62. (right). Subsequent investigation of this has made access the outcrops on the north side of the LGS possible.



Overgrown track on access to quarry



### LGS Clearing

The monitoring reports indicate that the density of tree and shrub growth severely limits the visibility of the outcrops although this varies seasonally (below).

A forbidding  
task for clearing



The density of growth also makes access to outcrops difficult. The reports also include evidence that the (talus?) slopes are unstable and the role of vegetation roots in stabilising the slopes should not be ignored and vegetation regrowth is quick, so the effects of clearance may be short lived. Nor should the ecological value of the trees and shrubs be ignored. However, in order to see the features of geological interest the clearance of vegetation has to be the focus of any conservation work. This needs to be carried out selectively and judiciously.

Stimulated by the most recent monitoring report and the associated field work the Conservation Committee set up a working party to clear a portion of one of the quarry faces on the northern side of the LGS. Invitations to members were sent out and the seven volunteers on the photo below (plus one) turned up on 26<sup>th</sup> February 2022 equipped with appropriate hand tools, suitable boots, weather-proof clothing, Hi- Viz vests and hard hats - as there was a risk from falling vegetation and other debris.





It turned out to be a cold, sunny and dry winters day, ideal for the labour involved. The clearance was undertaken with the collaboration of the Canal and Rivers Trust ecologist Shaun Pope, who came along to help. Rowington Parish Council are also supporting this project.

This part of the LGS 28, which formerly could only be glimpsed through the trees, is now accessible. A hard day's work resulted in a dramatic change in the appearance of the exposures (below):

Clearance from this .....



..... through this .....





..... and this .....



..... to this!



..... but some trees  
are best left alone





### Reading the Rocks

As part of the summer field visits programme, the Education Committee organised an 'Arden Sandstone' full-day visit on Sunday August 7<sup>th</sup>, led by Stuart Burley. It gave members an opportunity to see the results of the recent clearing of the exposures on the north side of the Grand Union canal, including the BGS reference type section of the Arden Sandstone (below).

The field trip party at the newly cleared site



Arden Sandstone exposed





Stuart explained to the field trip participants that this is not a good sequence to use as the type section for the Arden Sandstone Formation, as in many ways it is unusual. The sequence is sandstone-dominated (above), unlike more typical sections as at Blackford Hill in Henley-in-Arden, with thick sandstone sets (up to 1m thick) and evidence of channel incision. The exposed Arden Sandstone at Rowington records river channel input into the so-called Lake Arden, whilst most exposed sections reveal the lake margin deposits.

The field excursion visited other locations that expose the Arden Sandstone, including the Shrewley Grand Union Canal Cutting, a designated geological SSSI, where we expect to undertake clearance work later this year, and the Blackford Hill outcrop in Henley-in-Arden. Here the Arden Sandstone comprises green coloured mudstones and thinly-bedded sandstones with wave ripples, burrows and desiccation cracks representative of the Triassic Lake Arden marginal deposits (below left). One member of the party discovered *Euestheria* fossils (below right), the small clam shrimp know to survive extreme desiccation.



Dessication cracks in lake sediment



*Euestheria* fossils

### Geoconservation

Warwickshire is not rich in accessible geological exposures. The advantage of Local Geological Sites is that they give the opportunity to identify and conserve features of geological interest from across the 600 million years represented in the county. Although LGS designation does not give statutory protection, with the cooperation of local authorities, other organisations and landowners, WGCG is able to maintain a record of important geological sites that might otherwise be lost. It is a feature of British society that such responsibility is often left to the considerable time and efforts of individuals in voluntary groups, societies and charities of which WGCG is an example.

# Geoscience Summer Schools

## Brian Ellis and Peter Loader

### A change of plans

In the Spring 2022 Newsletter we marked the death of Professor Chris King. Chris was a geoscience educator and the driving force behind the week-long Geoscience Summer School for secondary science and geography teachers to train them to become geology teachers. The schools were organised under the umbrella of the Earth Science Teachers Association (ESTA). Unlike any other school subject, there is no longer any formal route for training geology teachers in the United Kingdom. Up until 2019 this task was undertaken by Chris and a team at Keele University with funding from the oil and gas industry. When this money finished, pre-pandemic, ESTA took on the responsibility with acquired sponsorships. WGCG had been funding two Holloway Bursaries a year to allow teachers to attend the schools. With Chris' death and the withdrawal by Keele University of support for the Summer School, WGCG anticipated that the Summer School would cease to run.

However, in January 2022 WGCG received an email from Peter Loader saying that he and ESTA were hoping to run the Summer School again in August 2022 in Chris' memory. Pete Loader, the UK Geoscience Education Field Officer for the European Geosciences Union, and co-director on previous summer schools, was determined to continue with this work. Peter said he would "like to talk to WGCG face-to face to discuss this as you are the main backers of geoscience education in the UK at the moment". We arranged a meeting in early April with John Crossling, Stuart Burley and Brian Ellis representing WGCG. The outcome was that WGCG agreed to provide £1500 to support the Summer School using money already budgeted for an ESTA project which had had to be cancelled for 2022. This is a 'one-off' arrangement with no commitment beyond 2022. Peter outlined plans for reducing the costs of running the Summer School and seeking additional sources of financial support. It was agreed that WGCG has a continuing interest in activities which support teaching geology in schools.

In the event Peter sought and found support from nine new sources of funding, in addition to WGCG. This enabled a slightly shorter course to run again from 1<sup>st</sup> – 5<sup>th</sup> August 2022 with volunteer tutors who gave their expertise for free in memory of Chris.

### Geoscience Summer School 2022

After an absence of a year because of Covid, the last Summer School was run in 2021 at Aquinas College, Stockport, for sixteen teachers with WGCG as one of the main sources of financial support. The college was chosen again as the base for the 2022 Summer School and twelve delegates were trained to be able to teach up to A level standard.





All had geoscience degrees and were qualified teachers of science and geography from all parts of the country; either recently qualified or coming back into the profession after a break. Of these, seven will be actively teaching exam classes at GCSE and/or A level in the next two years; three from this September. The other five are resolved to either look for geology teaching positions, encourage their school to start up GCSE geology or, at the very least, set up a geology club at their school to promote the subject amongst their students.

The course continued to cover all the pedagogical aspects of teaching geology as a school subject including practical work, integrated fieldwork, 3D spatial thinking skills and an understanding of the many misconceptions that are passed onto students by non-specialists and the media. Sessions were also provided in 'thinking like a geoscientist', climate change, critical resources, and marketing geoscience in schools. Prior to the course delegates were enrolled on an online course in 'Practical Geocommunication' and had to complete a written 'knowledge and understanding task' featuring a selection of A level examination questions. Many of the activities were documented on Twitter under the hashtag: [#EGSS22](#).

The delegates responses to the course were entirely favourable (see appendix below) and summed up by one delegate who answered the evaluation question – "Do you have a particular message you would like to forward onto your sponsors?" with the following:

*"Thank you for sponsoring this invaluable course which provided me with the resources for development in my own subject and the confidence to teach it. It has reminded me of all the reasons I enjoyed studying geology and I can't wait to inspire other students in the future. Thank you for recognising the importance of quality geoscience education at secondary level to produce the geoscientists we need in the future."*





Delegates at work





**Appendix: Student Feedback**

*"The workshops were all excellent, a mixture of lectures, demonstrations, practical activities, discussions and group work. I have picked up some excellent tips for teaching geology, I have used a wide range of resources and been introduced to many more that will enhance my teaching. I have thoroughly enjoyed all of the sessions and feel much more confident about delivering geology. I am totally reinvigorated and looking forward to getting back and continuing with the geology."*

*"Helped me gained confidence and enthusiasm for starting up GCSE Geology from scratch"*

*"Brilliant content comprising the GCSE and A Level spec for OCR and EDUQAS Geology. Invaluable field work opportunities for field work and map skills development and application to teaching."*

*"Absolutely brilliant. So inspiring. Loved the resources, demos/practicals, easily applied to other subjects as well as geology."*

*"Absolutely fantastic, really useful to update my knowledge and learn new ideas."*

*"The week was inspiring and provided lots of opportunities to think and question my understanding of geology and pedagogical strategies."*

*"The sessions were of excellent quality; speakers were knowledgeable, engaging and aware of the needs of the attendees. We were provided with a wide range of information (which supplemented a lot of the subject content I had forgotten since my own geoscience degree) and new teaching techniques to enthuse students. The whole week has given me a renewed sense of confidence and enthusiasm for teaching Geology; I will be leaving the session with plenty of new resources and ideas for getting ideas across to my students of all abilities in a more engaging way."*

*"It was well-organised and worked excellently. There were a variety of different sessions aimed from exams to subject knowledge, top ups to fieldwork. It was invaluable CPD that was never too much trouble to ask a question or to retract when you didn't understand, encouraging me to become more confident throughout the week in asking questions. I felt valued and respected throughout the time."*

*"This workshop has been an excellent experience. There has been a great many take-home messages that will impact positively on my teaching and also the outreach that I do as part of various academic societies. The course tutors are evidently highly experienced and inspirational educators. The breadth of activities has allowed us to explore not only the tricky concepts in the Earth Sciences but also how to effectively communicate them as well as broader themes that should underpin everything we teach within our subject. These ideas have given me a wonderfully new perspective on how to teach and communicate, address misconceptions and answer questions."*

*"It was excellent, very informative, I have learned a lot and my teaching will vastly improve as a result."*

## Can You Outpace and Erupting Volcano?

### George Guice

*We received an email recently from George. George lived in Wellesbourne and was a member of WGCG while still at Kineton High School. He got his BSc at Keele (2014), his MSc at Camborne School of Mines (Exeter University) (2015) and a PhD at Cardiff (2019). He visited us to give an enthusiastic talk on his travels in the search of geology. Since completing his PhD in Cardiff he has had a series of Post-Doc posts in prestigious institutions in the USA - Smithsonian National Museum of Natural History, then in the Department of Earth and Planetary Sciences at Johns Hopkins University. His latest email says he is moving to a post in the American Museum of Natural History Museum in New York. The life of Post-Docs can be very uncertain and peripatetic.*



*George says:*

"Hi guys,

I hope this email finds everyone well. It has been a while since I have been in touch, so I hope you remember me. I was one of the first recipients of a WGCG Holloway bursary, back in 2014!!

Just a quick email to share something that may be of interest to some of your members! I've recently started adding articles to my "What The Rock" series, which is aimed at introducing geologic principles to a general interest audience, hopefully in a fun and engaging way.

The first article – "Can you outpace an erupting volcano?" – can be found here: <https://george-guice.webnode.page/l/1-can-you-outpace-an-erupting-volcano/>

An intro to the series, as well as a link to sign up for email notifications when a new article is released, is here: <https://george-guice.webnode.page/whattherock-articles/>

If you think it will be of interest, I would really appreciate your help to spread the word!

Hopefully you are back having meetings and field trips now, and that the group is still thriving.

Best wishes

George"



## Obituary:

### Thelma Gee

We were sorry to hear recently that Thelma died on 17<sup>th</sup> July aged 94. Thelma was a former schoolteacher for some 40 years. She and her husband David were active members from the very early days of WGCG and Thelma was for a long time the Treasurer. Some of us remember her collecting subs in the days when we met in the loft of St John's Museum in Warwick. The budget was only a few hundred pounds, at best, and she watched expenditure very carefully and kept WGCG afloat. They were both honoured by being elected as Life Members of WGCG.

Thelma and David were intrepid travellers and were happy to share tales of their exploits in Nepal, for example. She was good at getting people involved. Jon Radley remembers her inviting him to the village heritage festival in Broadwell, where she and David lived, to take some Blue Lias fossils for display. They were also members of the Warwickshire Industrial Archaeology Society and Thelma was still attending meetings until the Covid lockdown. She retained her friendly and lively demeanour and was always happy to have a chat and hear news of WGCG activities.

Our condolences go to her son, Stephen and the family and friends.

## Field Trip to Llandrindod Wells: 13-15th May 2022

### Mike Allen

Members will recall that WGCG awarded a Holloway Bursary to help independent researchers, Dr. Joe Botting and Dr. Lucy Muir, to invest in improved equipment to assist with their work on a newly discovered Konservat-Lagerstätte in the Ordovician rocks of the Builth Inlier, Mid Wales. These are sites where exceptional preservation, including soft tissue, throw substantial new light on to the evolution of organisms and palaeoecology – especially groups that are otherwise lost from the fossil record, such as diverse groups of worms and un-mineralised arthropods. The inlier also has a complex volcanic history. Joe and Lucy gave WGCG a *Zoom* presentation on the subject in January 2021, which in turn led to this hosted weekend excursion, providing us with an opportunity to gain insight into how such cutting-edge research is conducted, and to visit some of the relevant locations.

#### History

It is perhaps worth mentioning at the outset that the area has been geologically important for over three hundred years. The first trilobite was described from here by Edward Llwyd in 1698. An innovative piece of research published in 1949 by O.T. Jones and W.J. Pugh, two doyens of Mid-Welsh fieldwork, reconstructed an ancient shoreline by detailed mapping (25-inch scale) around Newmead Farm near Builth Wells. Their wider mapping of the inlier at the same scale was distilled into a special 1:25,000 sheet published by the then IGS in 1977. In 1987 an epic study of trilobites by Peter Sheldon provided the first demonstration of extensive micro-evolution in the fossil record, which even featured on the front page of *The Times*.

#### Cefnlllys Bank

Cefnlllys Bank, a geologically unassuming hill two miles east of the town centre, is better known for the Iron Age hill fort on its summit and two Medieval castles on its flanks. A gently ascending track on the northern flank of the hill provided low and often somewhat overgrown banks revealing outcrops in the Middle Ordovician (Llanvirnian) Builth Volcanic Group, confined to a single biozone (*Didymograptus murchisoni*).

Some of the group members on Cefnlllys Bank studying the first outcrop, directed by Joe Botting (standing at left)





In an unusually forensic examination for the inexperienced or uninitiated, we were firstly asked to describe what we saw in as much detail as we could collectively muster. This initially elicited observations such as “well, it looks sedimentary, although the bedding isn’t that obvious”, “I think I can make out small fragments of crystals of something, perhaps igneous” and “could be a hornfels of some sort?”. After much discussion, and with a little expert ‘pushing’ in the right direction, we finally settled for the outcrop consisting of andesitic tuff. Once the general dip had been established, we were further able to conclude that it became more pumiceous and more obviously layered in character higher up. This was explained in terms of the deposit representing a pyroclastic flow, with a more massive, originally hotter, basal section, passing up into a more clearly bedded section formed by the cooler material settling out from the ash cloud.

In similar vein, we examined several further discontinuous exposures revealing a further mix of volcanic material, including vesiculated pillow lavas (below) and sedimentary material, variably ‘contaminated’ with reworked volcanics.

Here’s one Joe prepared earlier!  
Pillow lava from the Builth Volcanic Group: note the vesicular nature



All quite confusing to begin with, but gradually clearing as further explanation helped us to ‘read the story in the rocks’. Higher up in the sequence the pyroclastic input diminished as volcanic activity died down, replaced by predominantly shaly sediment in a deeper water environment, interspersed with further volcanic ash beds. This lower-energy offshore environment was conducive to the preservation of fossils: graptolites and trilobites as well as tiny obolid brachiopods with phosphatic rather than calcitic shells.

### Interpretation

Our handout notes help to put Cefnlllys Bank into a broader perspective. Volcanic activity at this location was represented by sedimentary beds elsewhere in the inlier, and vice-versa: thus, the volcanic centre migrated around the area through time. For instance, from the top of Castle Hill we could look across to the Llandegley Rocks. The site of another slightly older Lagerstätte assigned to the preceding biozone (*Didymograptus artus*) (incidentally demonstrating the utility of zone fossils in providing a relative time scale). By contrast, the volcanic rocks nearer Builth Wells have been shown to continue into the following biozone (*Hustedograptus teretiusculus*).

View east from Cefnlllys Bank near the summit:

The smooth, rounded profile of Radnor Forest (Silurian) contrasts with the jagged outline of Llandegley Rocks (skyline just right of centre - Ordovician rocks within the Builth Inlier)



Another thick volcanic deposit in the north of the inlier at Tre-lowgoed is probably related to a burst of activity further afield near Llanwrtyd (west of Builth) during the next biozone (*Nemagraptus gracilis*), after which the island became a focus of erosion rather than deposition, before subsiding completely beneath the late Ordovician waves. The many small intrusions (mainly dolerite) across the inlier are also of this age.

### Llanfawr Quarries

Intrusive dolerites are in evidence in the Llanfawr quarries situated on the eastern edge of town, but here the emphasis was on the palaeontology of the Llanfawr Mudstone Formation, in which some evidence of volcanism persists in the lower beds only. Unfortunately, the main quarry is partially flooded and remains inaccessible, but two other quarries can be visited, and fossils can be collected from loose rocks; as with all SSSI's, the outcrop must not be disturbed. This series of exposures around the edges of dolerite intrusions consist of little more than three metres of black shales in total. Their abundance of fossils, sometimes fully articulated (trilobites) or beautifully preserved in 3-D (graptolites), show striking variations from one bed to the next; all layers contain fossils, but the ecology changed rapidly. The quality of preservation seems all the more remarkable in view of the close proximity to dolerite laccoliths, lopoliths and their interconnecting conduits!

Llanfawr 'Lower Quarry'  
Searching for fossils from amongst the loose screes





In the 'Lower Quarry', now little more than a small patch of scree (above), we were invited to try our luck at finding whatever we could recognise and, sure enough, graptolites, trilobites and a few small brachiopods were soon being discussed with view to closer identification. Exceptional preservation of sponges, including *Cyathophycus loydelli*, was not uncommon, as well as other taxa, including nautiloids and bryozoans. Fragments of a rare stylophoran echinoderm were also found. Once known as calchichordates, this group were once erroneously believed to be the ancestors of all deuterostomes, which include you and I!

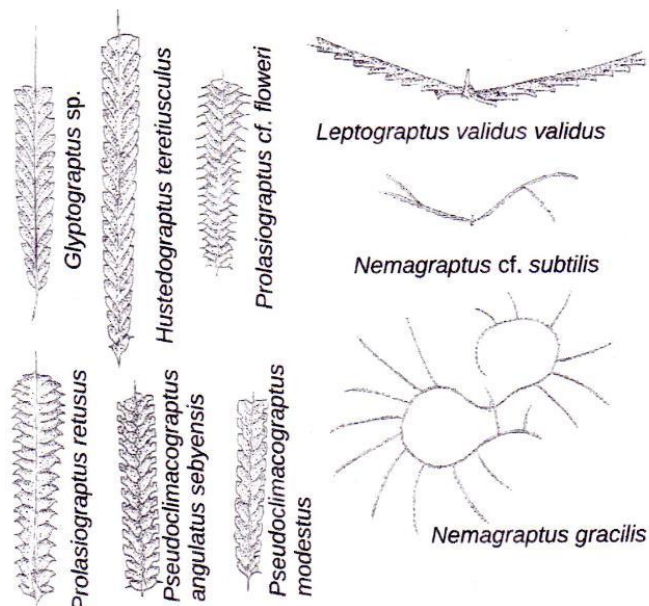
### Llanfawr 'Upper Quarry'

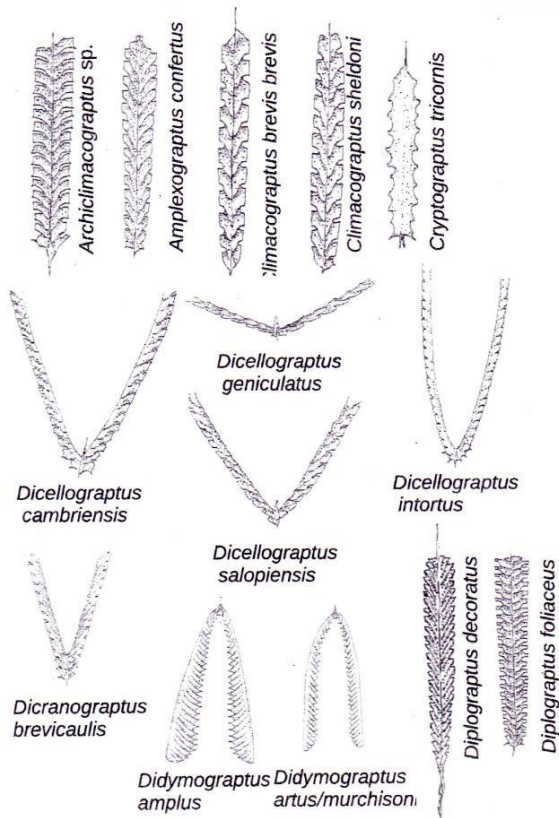
Well-preserved graptolites and sponges were an easy find amongst these scree



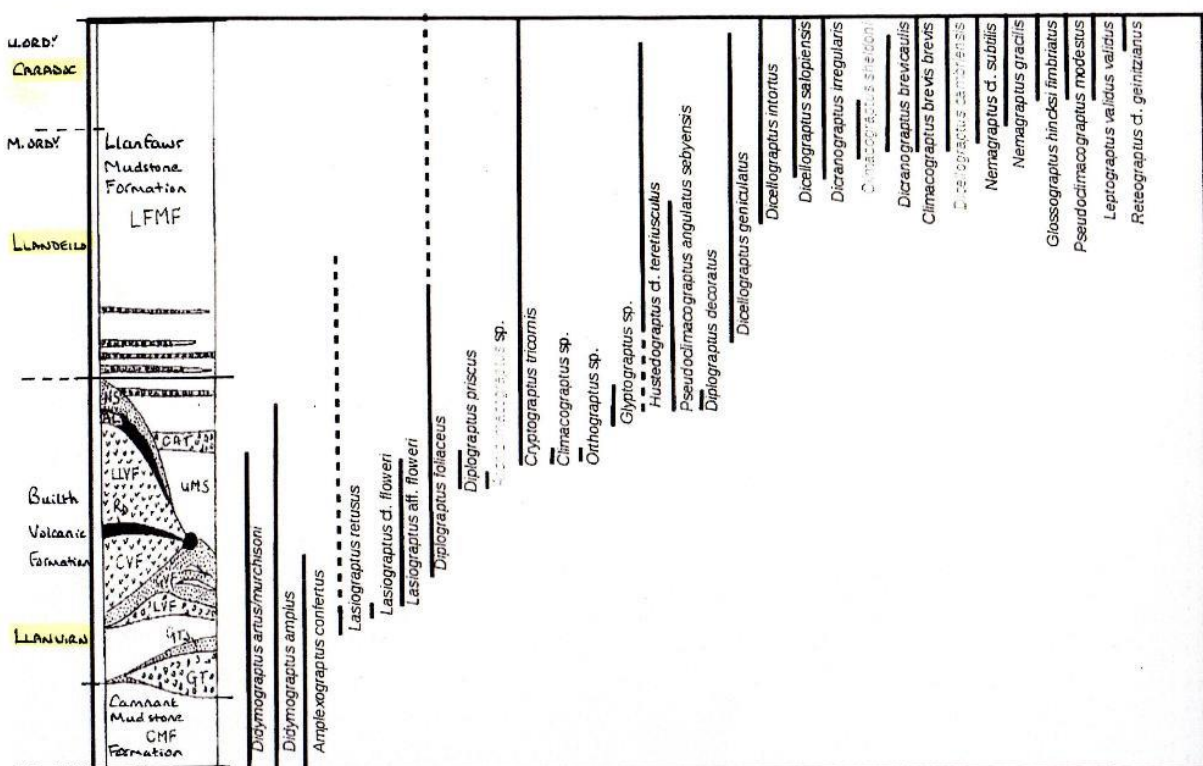
In the 'Upper Quarry' (above) our searches were to be more focussed upon graptolites, and we were invited to try and date the rocks as closely as possible with the help of identification drawings and range charts of graptolites recorded from the inlier (below). A collective effort arrived at the conclusion that this quarry was located high up in the formation, within the *Nemagraptus gracilis* biozone, based on several examples of the zone fossil, supported by the presence of *Leptograptus validus*, *Climacograptus brevis* and several species of *Dicellograptus*. Finding some convincing specimens of fossil sponges added to my day here!

Llanfawr 'Upper Quarry':  
A helpful guide to the  
graptolites was provided





## STAGE



Llanfawr 'Upper Quarry'

This range chart enabled accurate dating of the rocks



## Curation

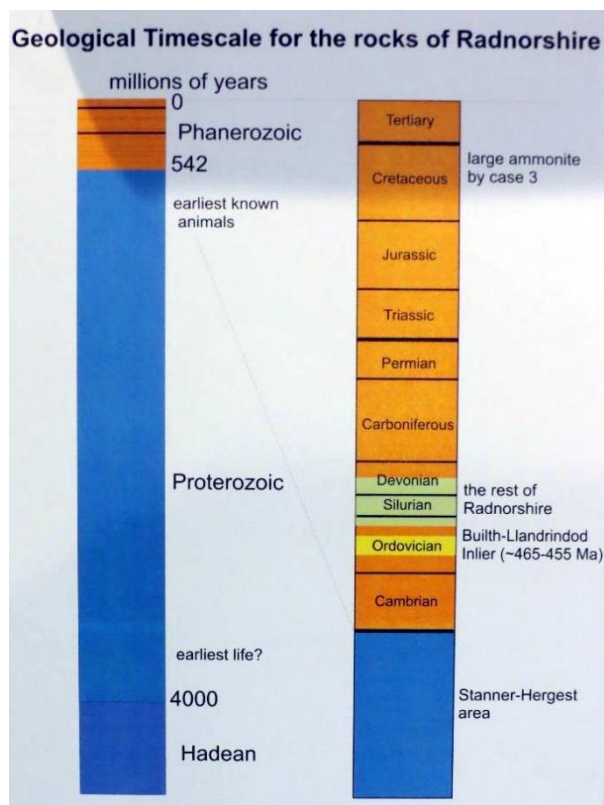
The weekend commenced on the Friday evening with a gathering at Joe and Lucy's 'workshop', where the context and importance of their work was further illustrated with an introductory talk. The Builth Inlier, we were informed, essentially preserves the life cycle of a volcanic island from emergence, through assembly and erosion, to ultimate disappearance. It also provided an interactive opportunity to handle and examine some of their discoveries. While some of the fossils can be hard to interpret at first glance, many are unique to this area, and together they reveal previously unknown aspects of the history of life. To illustrate this, they have furnished a significant collection in the Radnorshire Museum (Amgueddfa Sir Faesyfed) (below), which was our first port of call before venturing into the field.

The Radnorshire  
Museum in  
Llandrindod Wells

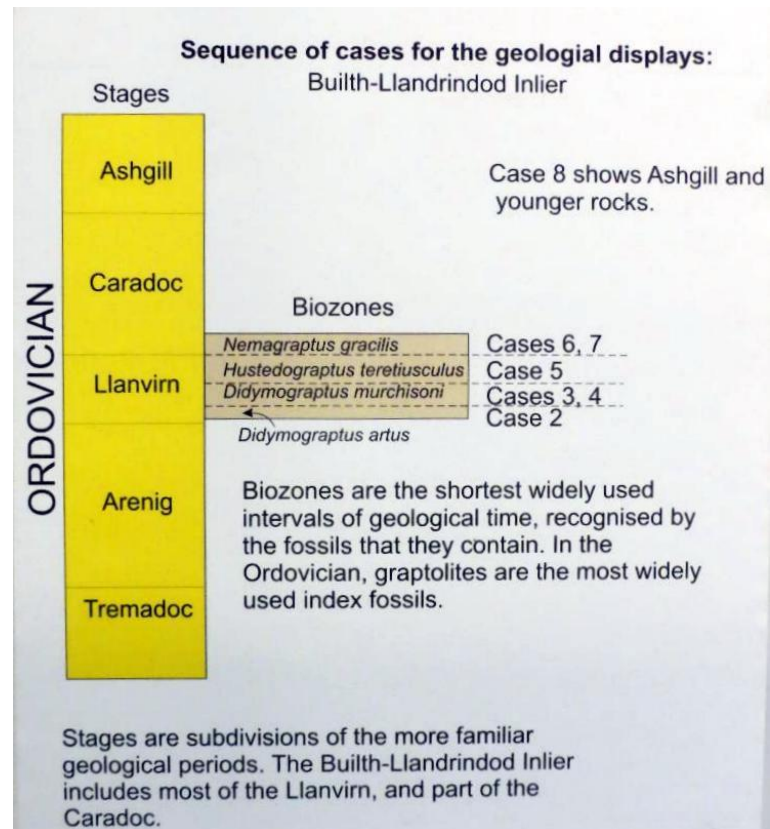


This collection offers an orderly description of the geology of the Builth Inlier, setting the scene with examples of the main rocks, their context within the geological time scale (right) and three annotated reconstructions giving an impression of what life looked like in Ordovician times.

Museum Display: Age of the Builth Inlier



Museum Display: Detail of the  
Graptolite Biozones

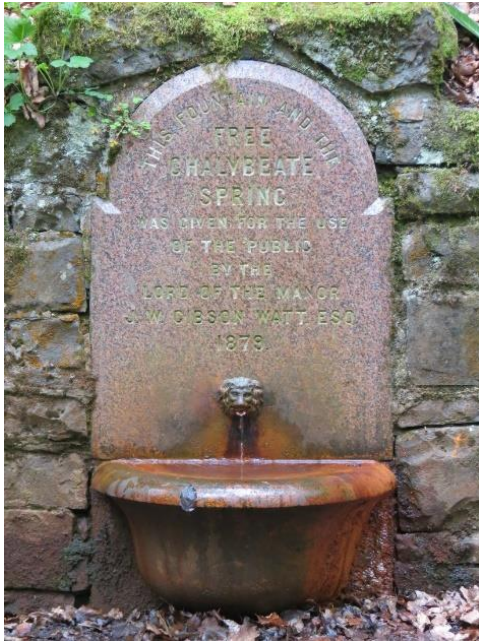


One poster reveals the diverse, but rather sparse looking, fauna that inhabited the water column and seabed; multicellular life had not yet crept on to the land. Eight display cases arranged in stratigraphic order present material covering the short span of time (just some 10 million years or so) represented by the inlier. For reasons not quite clear to me, there is also an ammonite (albeit 'giant' and indeed splendid) nestling next to showcase 3!

### The Spa

For those with less interest in fossil hunting or geological history, Llandrindod Wells offers much more.....the clue being in the name! Rather faded in glory these days, the chalybeate well (below left) has been known from time immemorial (referred to by the Romans as 'Balnes Siluria') and still flows. The spa gathered popularity in the early 18th Century with the rediscovery of both saline and sulphur springs in 1732. The arrival of a railway in 1865 prompted the construction of the Rock Park Pump Rooms (below right), and the heydays continued through the Victorian and Edwardian eras. These springs also produce lithium and radon, sure signs of a deep-seated granite (confirmed by gravity surveys), but it is fractured Silurian rocks west of the inlier through which the waters actually rise to the surface.





Llandrindod Wells Spa: The chalybeate spring still serves.....but not my favourite tippel!



Llandrindod Wells Spa: The Legacy.....the Rock Park Pump Rooms

### Erratic blocks

On a final walkabout our attention was drawn to two fine erratic boulders close to the main road south, and once again we were invited to discuss their provenance and significance.

The erratic block on the corner of Temple Street (A483) and Grosvenor Road (The GPS - 13cm. - provides a sense of scale)





The obvious one (above) is of a nondescript Silurian turbidite, but the larger one, hidden in the undergrowth, is derived from the Caban Coch conglomerate, well exposed in the Elan Valley some six miles away beyond Rhayader. This consists of a rather more impressive lithology of Llandovery age (Lower Silurian) crowded with pebbles of quartzite and gleaming vein quartz (below left) and representing the effects of falling global sea-levels during the end-Ordovician glaciation. Can you spot it in the photo (below right)?



Erratic block - detail of the Caban Coch conglomerate lithology



Erratic block in disguise!

I would like to end by thanking Joe and Lucy for sharing their insights and infectious enthusiasm which made the weekend a joy to attend, and finally to wish them well in their continuing work to highlight Llandrindod on the global geological stage.

*P.S. I also thank Joe for his significant corrections to an earlier draft of this report, and for his permission to use Figures 7 & 8.*



# Field Trip to the Mendips 30<sup>th</sup> & 31<sup>st</sup> July 2022

## Ray Pratt

### Introduction

Residential field trips take place in very lovely parts of Britain and are a great opportunity to plan a visit, or revisit, to the area. They combine great geology with local history and culture as well as social time with fellow members. This field trip ticked all those boxes and more.

The field trip commenced on the Friday evening where we met up in the skittle alley of the local pub for an overview of the upcoming trip, and a glass or two prior to adjourning to the restaurant for an excellent choice of fine food.



Woodborough Inn: Good food and good company



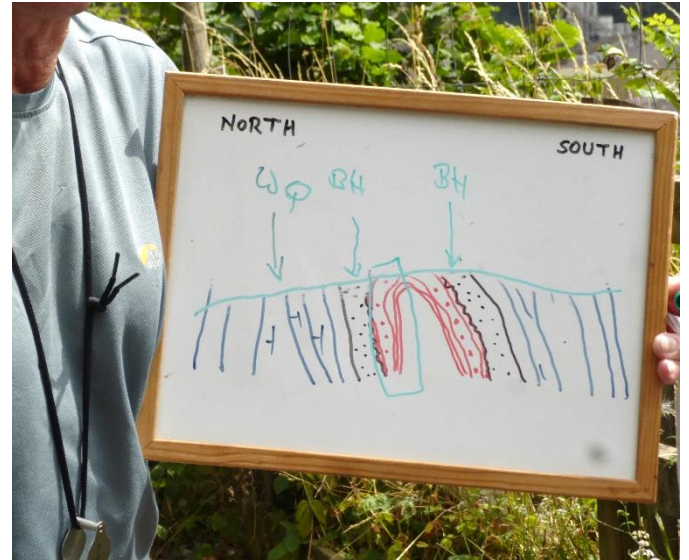
Dr Martin Whiteley

Suitably refreshed from a good night's sleep at the nearby Premier inn, a wonderful sunny day greeted us as we boarded the minibus for a prompt 09:00 start. The minibus was driven by our field trip leader, Dr Martin Whiteley, known to his friends as Mr Mendips (left). As the trip progressed, we were about to find out why. Given the small lanes and backwaters visited, it became obvious why Martin had insisted that we use a minibus rather than travel in a convoy of cars. An additional benefit was that as passengers we were able to relax and take in the sights of this area of outstanding natural beauty.

This was definitely a good decision. Martin was a brilliant field trip leader, extremely knowledgeable on the area, up to-date on current thinking. He was also an excellent driver. Through his good contacts we were able to visit key places that otherwise would not have been possible. As is often the case with WGCG weekend field trips, several members stayed on longer to enjoy the other delights the area has to offer.

### Geological overview

The Mendips is composed of a series of periclines (symmetrical anticlines) with the cores comprising Silurian igneous and Devonian sedimentary strata (right). These are not commonly exposed. They are overlain and largely concealed by younger Carboniferous Limestones forming the outer beds of the periclines. The proto-Mendip Carboniferous Limestone/Silurian/Devonian block formed an 'island' in Triassic - Jurassic times. This was eroded as the sea level gradually rose during the Triassic. Further sea level rises resulted in Jurassic material being deposited directly onto the Carboniferous limestones. This is known as an on-lap depositional setting. Today the largely Carboniferous Limestone surface of the Mendip Hills is gentle.



The eroded surface of the Mendips cuts across the structure of the pericline

### Silurian evidence



Moon Hill Quarry

We visited **Moon Hill Quarry** (left) to examine volcanic rocks, which originate from 425 million years ago and form the southernmost outcrop of Silurian rocks in Britain. There is quite a lot of colour variation - purple, green, orange etc. in the rocks which are a mixture of lavas and tuffs and are now outcrop in vertical beds. They erupted when Britain was 20-30 degrees South of the Equator as Avalonia collided with Laurentia. The eruptions commonly occurred in shallow marine settings, indicated by occasional interbedded mudstones containing marine shells. A Back Arc setting is implied by the chemistry of the lavas.

Montserrat could be considered as an analogue for this setting. The gases within the lava created vesicles which were later filled by a variety of other minerals, collectively known as amygdales.



The thickness of the combined flows are c. 450-500m. The quarry has been working it for 125 years and is 150m deep. During the Tertiary, surface weathering was strong, reducing the value of the rock. Consequently, the overburden has a low commercial value and is used in fill. The quality of rock improves with depth and the best roadstone is tens of metres below the surface.

This is the only quarry in the Mendips that quarries Pyroxene Andesite, a particularly useful rock for roadstone as the crystals of the rock are harder than the matrix preventing polishing, as the crystals will always protrude providing grip. It is crushed as aggregate to sizes of between 4 and 20mm.



A lava flow agglomerate at Moon Hill Quarry

### Devonian evidence

The Devonian rocks consist of pinky-purple, laminated, quite tough sandstones and conglomerates.



Devonian sandstones deposited in ephemeral desert rivers

The Devonian sandstones are tightly bound by iron cement resulting in very poor permeability. The core of the Devonian rocks is in the **West Twin and East Twin valleys**. They were also observed at **Beacon Woods**, where during the Iron Age the coarse-grained sandstones were cut and shaped to be used as grinding stones.

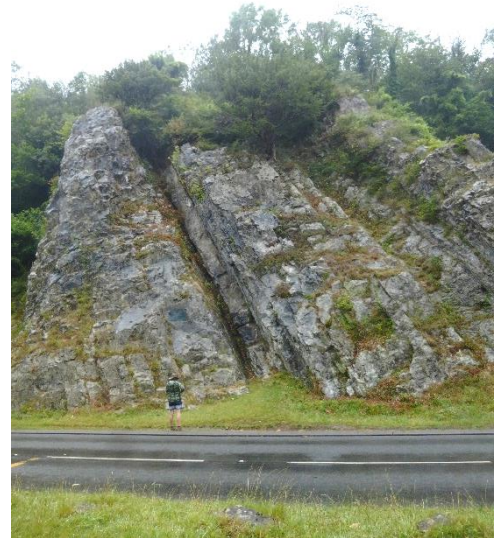


### Carboniferous Limestone evidence

The best exposures of Carboniferous Limestone are in quarries such as **Whatley Quarry** (below left). Quarry faces can make structure difficult to interpret but it is more obvious in the roadside cutting at Burrington Combe (below right).



Whatley Quarry



Steeply dipping Carboniferous Limestone

Limestone has a variety of uses - by the steel industry as a flux; in cement manufacture; in paint making; as a filler, commonly in plastic manufacture: as an aggregate; as well as agriculture. We use an average of 5 tons of limestone per person per year, most of which is produced in the UK. *[See Cameo 1 below]*

The Mendips are famous for **cave systems** and these were evident in the **West Twin and East Twin Valleys**. A break of slope and change in vegetation marks the boundary between the Devonian core and the Carboniferous flanks. Most of the water falling on the Devonian sandstones tends to run off due to their low permeability. On encountering the limestones chemical reactions tend to be erosive, leading to enlargement of joints and fissures with water flowing along the line of bedding and joints, creating a step profile of enlarged holes. One such is **East Twin Swallet**. (Swallet is a local name for a cave). Another example is **Avelines Hole**, a cave entrance discovered in the 1760's notable for the evidence that it was occupied by Palaeolithic people. *[See Cameo 2]*

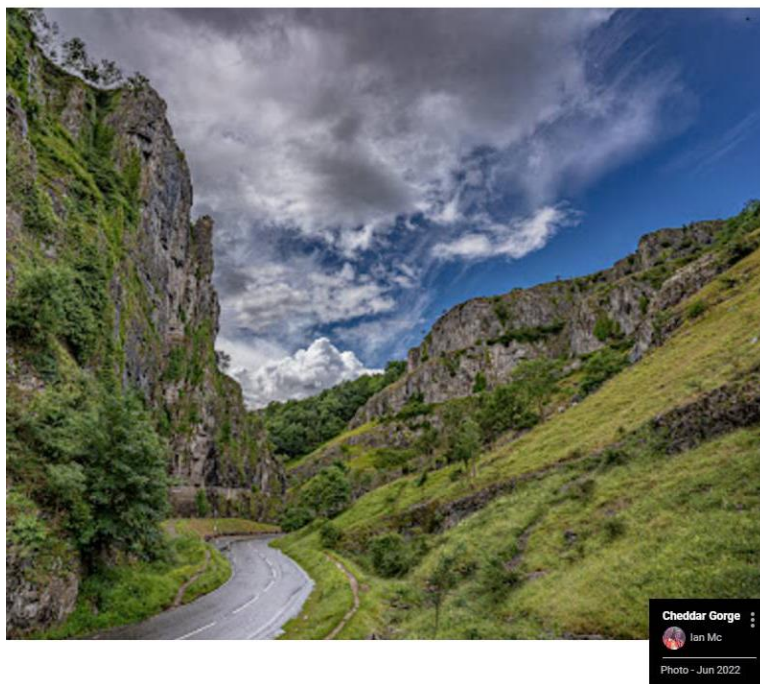


East Twin Swallet



The distinctive landscape feature of Mendip Carboniferous Limestone is **Cheddar Gorge** (right). The gorge is a V-shaped valley and was cut by surface water during periods of snow melt during cold phases when the water could not go underground. It is no longer thought that these limestone gorges result from the collapse of cave systems.

Cheddar Gorge  
(web photo)



### Carboniferous - Jurassic unconformity evidence

The proto-Mendip block formed an 'island' in Triassic-Jurassic times and the marine incursion eroded a platform across the Carboniferous Limestone land surface. At **Tetbury Camp**, the exposed the Carboniferous surface is riddled with tiny worm borings into which Jurassic sediments have collected. We also saw oysters that have cemented themselves to this surface as the Jurassic sea level rose. The rippled effect of the surface is due to variations in the rock strength of each bed and its inclusions.

At **Vallis Vale**, an old quarry (right) clearly shows the unconformity between the yellow-coloured, horizontally bedded Jurassic Inferior Oolite Limestone and the underlying grey, massively bedded and steeply dipping Carboniferous Vallis Limestone. The overlying Jurassic contains lots of gastropod and bivalve fossils. This is the location of the famous 'De La Beche' unconformity, described in the world's first Geological Survey memoir in 1846.



The Carboniferous Limestone/Jurassic unconformity at Vallis Vale

### **Cameo 1 Earth Sciences Centre (ESC)**

The ESC was set up in an old limestone quarry and supported by 5 quarrying companies in the area. Originally funded by Hanson, the Science Centre started off in 1999 in a small cabin at **Whatley Quarry**. After 10 years all the quarries came on board and the current Somerset Science Centre was established (right). This is a free service to the community. The aim is to educate the public about quarrying and geology. The demand was huge. The key users are schools, as the curriculum requires a module of geology be taught but few teachers are sufficiently knowledgeable. The kids love the experience. The message is to educate the public in the need for quarrying, particularly using sustainable methods with an environmentally considerate approach. Old quarries make fantastic wildlife habitats. Every year a monthly festival 'Mendip Rocks' is held, celebrating Mendip's geology which is hugely popular.



Earth Science Centre

### **Cameo 2 Banwell Bone Cave**

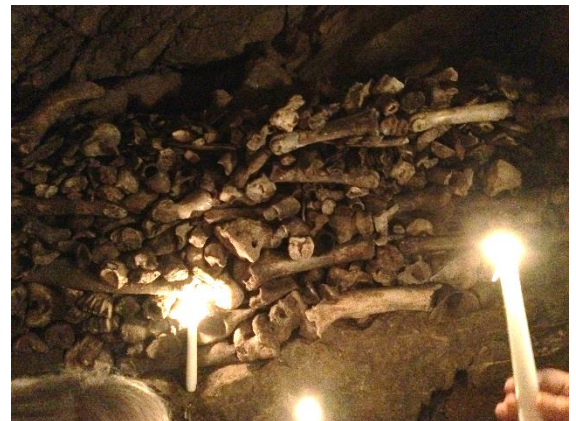
Banwell Bone Cave is unusual in that entrance is by invitation only, so we were very privileged that Martin was able to get us access. It is called 'The Druids Temple' despite it having nothing to do with druids. Following the visit to the caves we were treated to tea, coffee and cakes generously laid on by our hosts John and Yvonne, and afterwards allowed to take a look at some of their many specimens collected from the caves and in their grounds (right).



A well-earned cup of tea

The hilltop was mined in the 1720s for lead, zinc, and ochre (used for paint) and Calamine (Smithsonite) – a zinc carbonate mineral, an oxidised replacement mineral of sphalerite. This cave system was found during exploration for these minerals. On discovery, this cavern was completely filled from floor to ceiling with mud and tens of thousands of bones. The area was part of the estate belonging to Bishop Lord, the Bishop of Bath & Wells. He was pleased at their re-discovery as he saw this as evidence of the biblical diluvian flood. William Beard, a local farmer, was put in charge of the caves. It was he who stacked the bones up as we see them today.

There is a large mix of fauna including bison, wolves, bears alongside smaller mammals. These accumulated during the cold Devensian glacial period. Human bones have not been found as humans only occupied the area during interglacials. The bones are all disarticulated and mixed; none of the bones are gnawed. The prevailing theory is that dead animals were washed into the cavern over centuries and piled up in the mud at the lowest points (right). What we see today is a much-reduced display as many specimens have been looted or donated to museums. There are still many more bones to be found as the lowest caves have not been excavated.



The bones in Banwell Cave



# WGCG Winter Lecture Programme: 2022/2023

## Mike Allen

Tuesday 20 <sup>th</sup> September	Mike Benton	"Dinosaurs: New Visions of a Lost World"
Monday 17 <sup>th</sup> October	AGM & Social Event	<b>Venue, Date and Time to be confirmed</b>
Thursday 17 <sup>th</sup> November	Peter Gutteridge	"The Moine Thrust Controversy"
Thursday 8 December	Christmas Social Event	
Thursday 19 <sup>th</sup> January	* Jim Riding	"Astronomical Cycles and Climate"
Thursday 16 <sup>th</sup> February	Zoe Jackson	"The Birmingham Erratics Project"
Thursday 16 <sup>th</sup> March	Peter Worsley	"The Voyage of the Beagle and its geological significance"
Thursday 20 <sup>th</sup> April	Haydon Bailey	"HS2 through the Chilterns Chalk"

\* subject to confirmation from the speaker

*Our Traditional Winter Lecture Venue:*

*St Francis Church Hall, Warwick Road (Kenilworth main street), Kenilworth CV8 1HL*

