

**2020 was an unprecedeted year due to the COVID-19 pandemic. The Society was unable to meet physically after the March 2020 indoor meeting. This document records the Newsletters which we produced to engage with members throughout 2020.**

### **April 2020**

- Five tips for taking up your time and keeping you sane in these crazy times. –Kerry Hickman
- Recollections of a Geology Student – Part 1 by Phil Burge
- Geology beneath my House - by Graham Hickman
- Marcasite Nodule – Opening up for Easter! by Bob Mustow

### **End April 2020**

- My Eureka moment! Isabel Buckingham
- Keeping Occupied! - Charles Hiscock
- What's the oldest object in the BRLSI Collection? - Matt Williams

### **Letter to Members May 2020**

- Dear Members – by Graham Hickman

### **End May 2020**

- The Moeraki Boulders by Isabel Buckingham
- Thornbury Building Stones by Charles Hiscock
- Garden Fossils Bath by Dr Sam Medworth

### **End June 2020**

- New Developments in Plate Tectonics by Phil Berge
- A new exposure of Cromhall Sandstone by Charles Hiscock
- Fossil Coal-Measure plants-Twerton, Bath. by Maurice Tucker

### **End July 2020**

- My early days in the Bath Geological Society– Charles Hiscock

### **End September 2020**

- ‘Breaking news – meteorite impact causes devastation near South Gloucestershire village’ by Charles Hiscock
- Jenni Patterson obituary

### **End October 2020**

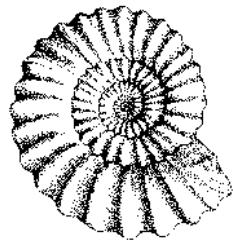
- Mell Freeman shares some of her favourite finds
- Graham Hickman investigates the Warleigh Fault
- Upcoming GA Festival of Geology on Nov 7th 2020

### **End November 2020**

- Website Update by our Webmaster James McVeigh.
- Recorded talks from the GA Festival of Geology until 31.Dec
- Half a decade of change in just a few months – Graham Hickman
- 2019 Excavation of the Strawberry Bank Lagerstätte
- More of Mell’s Rocks

# Bath Geological Society Newsletter

## April 2020



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In order to reduce the spread of the Coronavirus Covid-19, on 17th March 2020 the Bath Geological Society suspended the evening lectures in BRLSI and postponed our field trips. It is not known when the program will be resumed but at this point we anticipate that the closure will run until May.

With time on our hands and confined to our homes a number of us decided to write short articles for a Newsletter to maintain contact with our members and promote our common interest in geology.

This is not intended to replace the Journal, indeed longer articles may well be published in our journal at the end of the year. We hope you enjoy reading it.

Graham Hickman  
[chairman@bathgeolsoc.org.uk](mailto:chairman@bathgeolsoc.org.uk)

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Dear members, I hope you are all safe, well and coping with the necessary restrictions we are all living with at the moment.

Following on from Graham's message, this is an ideal time to write an article for our journal.

It can be about your rock collections, past trips, building stones of your home or a book review. A few pages long, or just a few lines with some photographs. Anything rock related!

Take care and we will see you soon!

Mellissa Freeman  
Journal Editor

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## **Five tips for taking up your time and keeping you sane in these crazy times. – By Kerry Hickman**

1. Catalogue your rock and fossil collection. If you're anything like my husband this will take years, so you now have time to get it started. This should keep you occupied for some time, even if you don't fancy cataloging them you can gaze at them in admiration.

2. Been meaning to re-read the classics, or even read them for the first time? Some are free from the Gothenburg project ( <https://www.gutenberg.org/> ) just click on the title and it appears on your screen. First timers, it's probably not the best idea to start with Great Expectations or indeed War and Peace. If you want to finish one, may I suggest you start with one of the following:

- Lord of the Flies – William Golding.
- Of Mice and Men – John Steinbeck.
- To Kill a Mockingbird – Harper Lee.

3. Go for your daily exercise wearing a coat with very deep pockets. The pockets must be big enough to carry your hammer and bring home any 'samples' you stumble upon along the way.

4. Many museums are doing online tours? Search for the name of the museum in your web browser and find the link, most are free. Below are a few suggestions:

- British Museum, London.
- Natural History Museum, London.
- Vatican Museums, Rome.

5. Instead of focusing in what you can't do, change your thoughts to what you can do. So instead of thinking 'I can't go on geology field trips', think, 'I get to play with my rock collection.' Instead of thinking, 'I can't see my children/grandchildren/ relatives,' think, 'I get to speak to my children/grandchildren/ relatives via the telephone, Skype, Zoom.' (Insert your preferred method of communication here.)

**Stay safe. Stay positive. Stay home!**

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### **Recollections of a Geology Student – Part 1 by Phil Burge**

A light-hearted story of my mapping exercise. Labelled as Part 1... perhaps there may be a Part 2 which could be a more detailed discussion of the geology.

I accepted a place at Reading University to read Geology. So in October 1976 I duly presented myself to discover that in the first year all students undertook three subjects and so in addition to taking first year geology, I studied botany and zoology. The only remarkable aspect of these two subjects was that I shared classes with the young woman who became my wife. One of my fellow

geologists in the first year became my flatmate and then my best man. Colin's short best man speech went thus: "Phil only wanted two things while at Reading – a first class degree and to marry Trish. Well at least one of them was first class". And then he sat down.



Photo: The young Phil Burge circa 1977

Among my lecturers were many esteemed geologists though of course you do not know this at the time and so I did not take full advantage of their knowledge and enthusiasm for the subject. Percy Allen, John Allen, Sandy Stewart, Bruce Selwood. Ken Bailey, Bev Halstead and my tutor Roland Goldring all did their best to impart their knowledge. I regret to say that I should have tried harder!

While many of my friends spent the vacations earning money in part time jobs, we geologists spent ours on field trips in exotic locations like the Jurassic Coast, Jersey, the highlands of Scotland and North Wales. The latter was where we learnt how to undertake field mapping in preparation for our six week mapping exercise that took place during the summer vacation at the end of our second year.

A list of approved areas was posted on the notice board and among them was an area around Loch Diabagh to the north of Loch Torridon. As I had heard of Torridon I suspected that the associated town might be of a goodly size and so I selected this offering.



Our only guidance notes as far as I recollect, included the instruction to purchase the required OS map (not a geological map), not to take any geology guides of the area, to write our field notes directly onto the OS map and to present the completed field map and write up for assessment. As I always follow the instructions this is what I proceeded to do.

However, when it comes to logistics and supplies I took more care. A Morris Minor van was procured and loaded into this van: A pup tent with one bent pole, a two burner gas stove with perished rubber gas tube, an army camp bed, a camp cooking table (circa 1960), shovel, axe, billy cans, plastic plates, cutlery and a bucket. But surprisingly no food! Why would you when think you will be close to a town?

My classmate Peter arrived at our home in Newbury one June day and off we set. I had not driven much more than 30 miles away from Newbury up to this point and there we were heading 550 miles north with little idea of what we were about to undertake. We stopped in Glasgow, and . we found a camping store and a replacement tent pole was procured but no replacement rubber tube. Never mind, fearlessly we continued on our way around Loch Lomond and into increasingly deserted country with increasingly narrower roads and an increasing sense

of anxiety as to where we might end up. By the time we got to Shieldaig and dropped Peter off at his selected campsite, I realised that the nearest large town was Inverness – 90 miles away.

The sun was shining and the temperature very pleasant. I pitched camp by the side of the road in Upper Diabaigh, approximately dead centre of the mapping area. When I say pitched camp I mean that the tent pole bought in Glasgow was too long which meant that the door would not zip up properly, the camp kitchen table fell apart and I could not use the stove. Neither did I have any food. Luckily there was a small shop in Inveralligan a few miles from my camp. It was at this time that I discovered the Highland midge. I slept in the car.

The next day I drove to Inverness and bought a new camp stove and felt better. On the way back a red light lit up on the dashboard which I ignored.

Now with food, plenty of water from a small stream that flowed past my camp I could begin mapping. So armed with map case, map, pencils, compass, clinometers, hammer as well as cheese and marmite sandwiches, I set off in good spirit. I had decided to have a quick recce of the whole area to get a feel for the geology. The feeling I got was that I did not have a clue as to what the rocks were. Well you might not if you hadn't read up on the area beforehand would you? Peter will know, so I drove over to see him. He was very helpful as he had copies of the necessary guides. He kindly explained to me that if I see a thin dark rock I should label it dolerite and call it a dyke, if it's grey then it is Lewisian gneiss. If it looked like a red sandstone it should be labelled Torridonian Sandstone – of course I said I know sandstone. I was now fully armed and could begin mapping and I drove back to my camp full of hope. Then it rained -

the campsite was washed out. The next day the sun came out and shined for the next seven weeks!

In retrospect the geology, at least from a mapping point of view was fairly straightforward. To the north of Loch Diabagh is found superficial deposits with Torridonian to east and west. To the south is largely Lewisian gneiss with endless numbers of dolerite dykes trending south east to North West. Structurally the areas have few faults, a major one passes approximately perpendicular to the dykes, though I do not believe this has any significance!

There were two intriguing observations, neither of which appeared on my map nor on the BGS map. The first, discovered early on was a fairly substantial outcrop above Lower Diabagh which was similar to the Lewisian but of an orange colour. It remains a mystery to this day. The second discovery had me scratching my head for some time. Just above the road as it turns left and heads to Lower Diabaigh can be found Torridonian Sandstone within the Lewisian, bounded in the north by the major fault. This outcrop was about one meter wide and could be traced for around 10 meters. Fortunately, Percy Allen, who had a holiday cottage in Inveralligan came by to visit me bringing with him a gift of half a bottle of whisky. Good man. I was explaining this curious discovery and he simply asked me what looked. I thought about it and decided the best description was a "sandstone dyke". We then discussed an excellent outcrop alongside the road of clay and silt with ripple marks forming a second Torridonian fascies.

Crikey those midges. Smoking a pipe and virtually sitting in a camp fire did not prevent the little devils from spoiling an otherwise lovely evening. The whisky helped a little.

Remember the little red light on the dashboard? This continued to burn brightly until the battery went flat. Luckily a crofter about half a mile away would charge up the battery for me – but not on a Sunday.

Midway through the exercise I drove down to Skye where Trish and family were having their summer holiday. I knew that the battery would probably go flat and so I picked up a hitch hike to help jump start the car if necessary. As we drove into Loch Carron the exhaust pipe fell off at the manifold and the battery died shortly thereafter. The hitch hiker ran away. I knew that there was a garage in Loch Carron and so I decided to take the battery to them for charging. The battery on a Morris Minor is right at the back of a surprisingly big engine bay. I lifted the bonnet and the bit of metal that holds the bonnet up snapped off – ouch. It is quite difficult to take a battery out with a bonnet resting on your head. Here my luck changed. As I set the battery down a camper van stopped and asked me if I needed help. This good Samaritan drove me and battery to the garage, drove me back to the car, explained what the red light indicates and then said that he probably had some new alternator brushes in his van and he would fix me up. Which he did, while his wife gave me tea and biscuits. Two hours later I was on my way, making a terrible din as there was no attached exhaust pipe, but the red light had gone out.

On Skye I took the car to the garage to have the exhaust pipe repaired and replace two badly worn tyres.

On the morning that I was due to leave the car would not start. Not even the red light this time but a completely dead battery. I called the AA to ask for help and was told that a patrol man would bring a new battery. The AA man duly arrived,

replaced the battery and then informed me that I did not owe him anything as the vicar, I had met the day before, had paid. What an incredible act of generosity.



Photo: The car before it fell apart.

This meant that I could leave Scotland and go home. The car made it more, or less, in one piece and waiting for me was a meal of steak, eggs and chips (but only after I had had a bath). For most of the previous seven weeks I had eaten nothing but porridge, cheese and marmite sandwiches, rice, baked beans and tinned spaghetti. It was a wonder I did not get scurvy. This diet did lead to 1 ½ stone weight loss.

I still have my map and write up. I look at it every now and then and wonder if this work added or subtracted from my degree classification. I like to think that it did no harm.



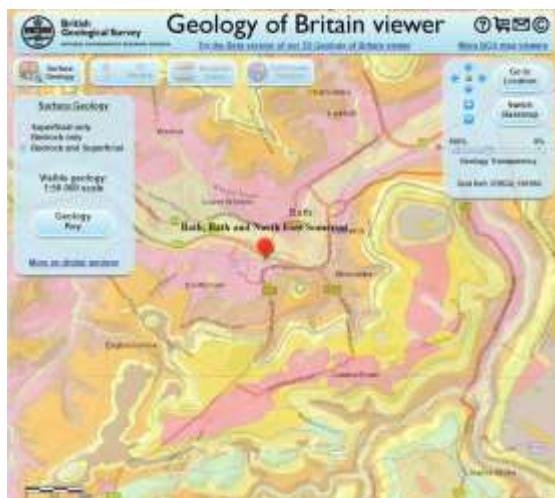
Photo: Part of the finished map!

# Geology beneath my House

- by Graham Hickman

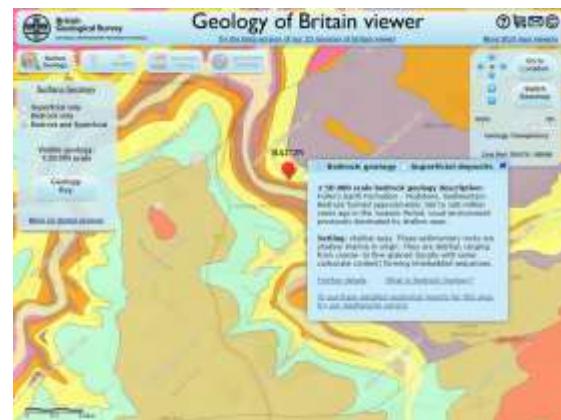
'Stay at home, protect the NHS and save lives' we are told and with that the geological field trips I was planning on attending for the next few months are cancelled or postponed... but wait a minute there is geology all around us and in particular under our feet.

The British Geological Survey have a whole host of maps and data to explore 'The rocks beneath your house' [https://www.bgs.ac.uk/enquiries/rocks\\_beneath.html](https://www.bgs.ac.uk/enquiries/rocks_beneath.html) simply by entering a post code you can display a geological map with a pin locating your home.



The transparency of the geological overlay can be modified so that the underlying street map can be seen more clearly. You are now ready to explore the geology. By clicking on the various colours descriptions of the rock units are displayed.

My house is located just south of Bath on the B3108 half way up Winsley Hill, on the Fuller's earth Formation.



The rocks on the slopes of the hills are poorly exposed, in part because they are dominated by easily weathered mudstones, but also because of the actions of glacial and periglacial processes that have degraded the slopes.

The Fuller's Earth Formation is around 40m in thickness and is divided into three members. It takes its name from a 2m thick bed of Fuller's Earth Clay which was commercially exploited in the past and is located midway through the UFE. The bed has its origins as a volcanic ash deposit and is not evenly distributed throughout the area.

Upper Fuller's Earth Member. (UFE)	27m thickness
Fuller's Earth Rock Member. (FER)	4m in thickness
Lower Fuller's Earth Member. (LFE)	10m in thickness

My house sits close to the Fuller's Earth Rock Member which is about 4m in thickness. It separates the upper and lower parts of the formation and consists of rubbly, shelly limestones with thin marl bands.



**Photo: White limestones of the Fuller's Earth Rock Member exposed in the footings.**

During recent building work on my house some of this material came to light. One particular bed was very hard indeed and consisted of extremely coarse well cemented shelly limestone.



Interestingly my neighbour who lives a little bit further down the hill only found clay of the Lower Fuller's Earth Member in his footings. He also has an intermittent spring in his garden which I believe is probably the boundary between the permeable FE Rock Member and the impermeable Lower Fuller's Earth Clay Member.

Graham Hickman

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## Marcasite Nodule – Opening up for Easter! By Bob Mustow

I thought you might be interested in this nodule. I got it in 2011 from a friend, after I'd been to Peru and had brought back a less spectacular one. So I don't know exactly where this one came from.



It has sat on a shelf since then, nine years, and was brown all over originally so I was surprised recently to see it covered in sulphur-yellow patterns.



On picking it up the end crumbled away revealing the inside. They look like iron filings but it are not attracted by a magnet, nor is any of it magnetic. It's strange that it has just chosen now to hatch out.

I hope you are all keeping safe and well in these difficult times,

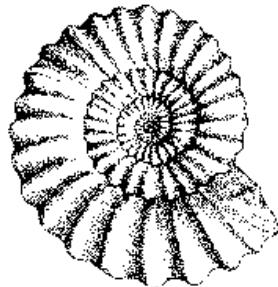
Bob Mustow

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## Membership

While we recognise the Society's events are currently on hold, we would encourage those who are financially able, to re-join and continue their support.

<https://bathgeolsoc.org.uk/membership.html>



## Updated Website

Why not visit the Bath Geological Society Website?

[www.bathgeolsoc.org.uk](http://www.bathgeolsoc.org.uk)

James McVeigh our webmaster has been busy updating it so it is mobile friendly and has lots of new features.

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## STOP PRESS

### Bath Geological Society's 50th Anniversary Celebrations.

As many of you know 2020 is an important year for the Bath Geological Society as we celebrate the 50<sup>th</sup> anniversary of the Society.

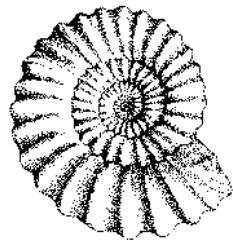
A short history of the Society can be found on our Website here;

<https://bathgeolsoc.org.uk/about/history.html>

We are planning to hold a Special Meeting in October 2020 and invite our neighbouring geology groups. We have applied for a grant from the Geologists' Association to help with costs.

# Bath Geological Society Newsletter

## End-April 2020



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As I write the forward to this newsletter, I am reminded that the UK has now been in lockdown for a month. It's beginning to feel like the new normal as people adjust to this strange existence. I am finding it hard to remember what day of the week it is and to motivate myself to use this time wisely. Like me, I am sure many of you are talking more to your family and friends using a host of different electronic communications media.

As a Geological Society we will need to formulate our own response to the situation we find ourselves in. Resorting to electronic communications, such as this newsletter and virtual committee meetings via conference calling are just the beginning. Perhaps virtual lectures may be next? Our host in Queens Square, BRLSI, is starting to provide more online content and will be exploring the possibilities for the many other groups that hold their lectures there... we will keep you posted.

The GA has published a host of online resource entitled 'Geology from the sofa'.

<https://geologistsassociation.org.uk/sofageology/>

I would highly recommend some of the short videos on YouTube entitled "2 minute geology" by Nick Zentner. They are short, entertaining and informative.

<http://www.nickzentner.com/>

As stated before, this newsletter is not intended to replace the Journal, indeed longer articles may well be published in our journal at the end of the year. If you have some geological news you would like to share we would love to hear from you. We hope you enjoy reading it.

Graham Hickman

[chairman@bathgeolsoc.org.uk](mailto:chairman@bathgeolsoc.org.uk)

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Dear members,

Following my request for material for the next journal I am pleased to report that I have received two articles from Charles Hiscock and one from Maurice Tucker. Please keep them coming.

Take care and we will see you soon!

Mellissa Freeman

Journal Editor

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## **My Eureka moment!** Isabel Buckingham

My father was in the Regular army and had many travellers' tales. He saw the 1944 eruption of Vesuvius close up as he had volunteered to help with evacuating some of the Italian population, then stayed as part of the cordon round Naples to contain a typhus epidemic. He had also spent 5 months in Japan based at Kobe and had the chance to travel there. He had always been interested in geology and had several books.

When he left the army, we were living in Kelso in Roxburghshire and he worked for as a driver for a butcher partly delivering orders and partly selling from a mobile shop. His rounds were the local rural area of large farms and their workers small villages. One week in the summer holidays I would go out with him and he would tell me all about who we were visiting and bits of local history.

One day after lunch he announced he was going to show me something and we went further up the hill and got out. The Cheviot Hills were behind us and we were looking North West with the river Teviot incised below and the Tweed valley stretching west to east slightly further away. To the west we could see the Eildon Hills, and the smooth rounded slopes of the Southern Uplands were interrupted by occasional darker craggier hills. He began to explain about the Carboniferous volcanism and how these were the stumps remaining from the long gone volcanoes. It suddenly struck me that the hills were not just random bumps but each had a reason for that shape. That curiosity has never left me.



The location is at NT732297 on the NW side of Bowmont Forest. (Photo; Scott's View. Courtesy of Visit Scotland). I went back 3 years ago and the shelter belt has grown up bisecting the wonderful panorama. These volcanic stumps are called locally, Laws, and have wonderful names, Peniel Heugh, Dawn Law, Black Hill of Earlston with White Hill just to the north and Wooden Hill. I was so used to the landscape of the Kelso volcanism, I had not realised how unusually dramatic it was. Do visit if in Southern Scotland.

## Keeping Occupied! - Charles Hiscock

In the April Newsletter which was started as a result of the coronavirus pandemic, Kerry, the wife of Graham, our Chairman, suggested some ways that we can keep ourselves occupied during this prolonged period of enforced time at home. One of these ways she suggested is to catalogue your collection of specimens. Well, that's what I have done to some recently collected specimens – and with a surprise or two along the way!

During the 1980's, 90's and early 20's I spent much of my spare time in the Tortworth Inlier, a small area of Silurian rocks to the north east of Thornbury. Indeed, during those years I pretty much exhausted all the exposures, making a large collection of fossils and rocks which now reside in the collections of Bristol Museum and Art Gallery. It was my intention to cease collecting and become an armchair geologist! However, in the last few years, as most of us will be aware, there has been much new house-building and the villages in the Tortworth area are no exception. In the last twelve months work has started in Falfield, about 4 miles from Thornbury, with access to the new estate off Moorslade Lane. Now, with Health and Safety so strict, access to the building site is impossible but I found that the contractors had also widened the lane, excavating a lot of loose rock in the process. My main form of exercise is cycling, so frequent excursions along Moorslade Lane enabled me examine the loose brash lying on the road banks. During the winter (which we will remember as being extremely wet) much of the loose rock fragments were well washed so anything which seemed remotely interesting could be easily seen.

Falfield lies at the western end of the Tortworth Inlier and is underlain by, predominantly, the Tortworth Beds of the Llandovery Series of the Silurian epoch. These are fine sandstones, characterised by the bedding being largely flat and parallel with occasional thin horizons of mudstone. However, there are also thin horizons of fossiliferous beds, mostly of 'rottenstone', where the fossilised shells have been dissolved away, leaving empty moulds of the organisms. On recent excursions, I have collected a few promising small rocks for examination at home (yes, I couldn't resist the urge to collect!). After washing and drying, these have been examined and any that showed recognisable fossils were kept, entered into the catalogue and then placed in the specimen cabinet.



Recently, after 'lockdown' started I took the few specimens out and examined them more closely with a hand lens. On the flat surface of one, two minute streaks, pale against the red of the sandstone matrix, neither longer than 4mm, showed up. On further magnification they were revealed as Tentaculites, now known to be a form of internal skeleton, similar to the modern day cuttlefish 'shell' common on our beaches, which has a tapering form with annular rings. I had found Tentaculites on a few occasions in the past, preserved in the Damery Beds which underlie the Tortworth Beds and in the Brinkmarsh Beds of the Wenlock Series, the topmost formation in the Tortworth Inlier. However, these tiny specimens are the only Tentaculites which I have found in the Tortworth Beds. So, had I not had time on my hands these little and rare specimens would probably have been overlooked. I was able to photograph them, which was a bit of a challenge, and I attach the photos. Photo 1 shows the rock specimen while 2 is the longer of the Tentaculites with an empty mould alongside.



As already mentioned, 'Rottenstone' is the term given to rock where the aragonite and calcite forming the shells of brachiopods, bivalves and other shelly creatures have been dissolved away by water percolating through the beds of rock, leaving hollows reproducing the external forms of the creatures. One of the specimens from Falfield was a piece of reddish sandstone, hard and compact on one side but composed of 'rottenstone' on the other. So, with a few judicious taps with a small chisel along the edge of the block I was able to split it into two uneven pieces. This revealed a large semi-circular form about 30mm wide and 40mm long. There are no obvious characteristics to enable identification but it strongly resembles the orthoconic cephalopods which I had found in the Ludlow Series of the Silurian in Herefordshire many years ago. Again, whatever the correct identification, it is the first

specimen of its kind that I have found in the Tortworth Inlier. Maybe somebody with expert knowledge will be able to identify it so I attach a photograph.



Although I had pre-empted Kerry's suggestion to re-examine one's collection, nevertheless in doing so I have turned up two surprising and interesting results. So, go to it folks, enjoy your collections. Keep safe and well during this strange and testing time.

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**Stay safe. Stay positive. Stay home!**

## What's the oldest object in the BRLSI Collection? - Matt Williams

The answer may surprise you. Our oldest museum specimen is more than 18 times older than the first dinosaurs and more than six times as old as the earliest known complex multicellular organisms.

This object was given to the BRLSI in 1828 by Sir Richard Hoare, 2nd Baronet, Fellow of the Royal Society and then owner of Stourhead. Precisely how Hoare obtained it remains a mystery, but we know that the larger mass that it was cut from came from Krasnojarsk, in southern-central Siberia. It was studied and collected by the German naturalist Peter Pallas in 1772, and was part of a 1794 study by Ernst Chladni entitled *Über den Ursprung der von Pallas gefundenen und anderer ihr ähnlicher Eisenmassen und über einige damit in Verbindung stehende Naturerscheinungen* (On the Origin of the Iron Masses Found by Pallas and Others Similar to it, and on Some Associated Natural Phenomena) which established the reality of meteorite impacts on Earth and the extra-terrestrial origin of the 630kg object Pallas had taken to St Petersberg Museum.



The Krasonjarsk Pallasite, as it is now known, was the first stony iron meteorite and first extra-terrestrial object to be formally described as such. Over the 250 years or so since its discovery our knowledge of the physical nature of the universe has progressed immensely, and Pallasites form part of this story.

Pallasites consist of a matrix of iron and nickel with sub spherical crystals of minerals known as olivines and pyroxenes. We now know that Pallasites were formed during the period of

planetary accretion as our solar system formed. Initially the material orbiting the young sun had eccentric orbits which caused frequent collisions between proto-planetary bodies and asteroids. Pallasites are thought to have been formed by the admixture of core and mantle materials from the interior of a destroyed terrestrial planet (one which was composed primarily of silicate rocks and metals).

We have strong evidence that our own planet has a core of iron and nickel and a mantle (the layer between core and crust) of olivines and pyroxines, including the composition of pallasites and the measuring of how seismic waves are diffracted as they pass through the planet.

The Kranojarsk Pallasite, one of just 61 Pallasite meteorites known on Earth, has been radiometrically dated to 4.2 billion years old, and as such is one of the most ancient objects on the surface of our planet.

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## More from BRLSI

An exhibition at BRLSI of Strawberry Bank fossils, entitled 'Jurassic Ark' was due to open in April and run through to October. At this present time it is impossible to say when BRLSI will be open again to the public. In lieu of opening the scheduled exhibition, Matt Williams has directed us to a video presentation originally intended as a gallery installation. In it you will learn about how an exquisitely preserved ichthyosaur skull of the genus Hauffiopteryx has been studied using modern scientific techniques



### Getting Inside an Ichthyosaur's Skull

Click on the LINK Below:

<https://youtu.be/sfR-IUIAQTC>

BRLSI have also put a [Facebook film of Matt Williams](#) selecting and preparing fossils for display for the Jurassic Ark exhibition. The film shows the storage facilities in the basement.

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## LATEST NEWS

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25-28<sup>th</sup> May 2020. The Oxford Geoheritage Virtual Conference aims to bring people interested in geoheritage and geoconservation together, wherever they may be, at this difficult time.

OxGVC is fully online, open to all, free to attend and registration is open now – we hope you'll be able to join us.

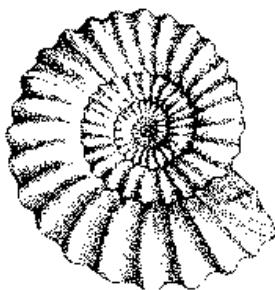
More details can be found online at [www.oxgvc.co.uk](http://www.oxgvc.co.uk)

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James McVeigh, our webmaster, has been busy updating it so it is mobile friendly and has lots of new features including article search of past Journals.

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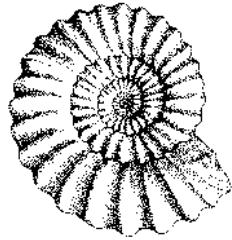
A short history of the Society can be found on our Website here;

<https://bathgeolsoc.org.uk/about/history.html>

We are planning to hold a Special Meeting in October 2020 and invite our neighbouring geology groups. We have been given a generous grant from the Geologists' Association to help with costs.

# Bath Geological Society

## Letter to Members - May 2020



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Dear Members,

In the same way as many businesses and organisations, we are unable to operate as normal during lockdown and the unknown period of social distancing that will follow. We are writing to you to share our plans for keeping the society going and our plans for our 50th Anniversary celebrations.

### **Newsletter and Journal**

Recently you will have noted that we began a Newsletter to maintain interest in Geology and engagement with the society. While in lockdown many have had the opportunity to prepare an article for this years' Journal. If you haven't done so already there is still plenty of time left in which to write, not only a long piece for the Journal but perhaps a short precis for the newsletter as well.

### **Monthly Lectures**

BRLSI closed their building to the public on March 17th 2020 and their website states that it will remain closed through to the end of September 2020. This obviously impacts the Society in that our physical lectures will not take place while COVID-19 restrictions are in place. As a committee we are considering holding virtual lectures for our members and we are evaluating suitable technologies such as ZOOM conferencing. We are also approaching our planned guest lecturers with ideas of how to achieve this. We would welcome suggestions from members who are familiar with virtual technologies or any who might be able to give talks.

### **Financial Report**

No one likes to discuss finances, but unfortunately we do not have the luxury of unlimited money in the bank and therefore we must be open and honest with our members regarding the funds available. The trend has been for costs to exceed income for the last few years and this is something that we have been addressing. During 2019 we have focused on reducing costs by moving to a smaller room, using local lecturers (thus reducing travel expenses) and eliminating coach trips and offering an electronic version of the Journal; avoiding high print costs. Our sources of income are the annual membership subscriptions and visitor payments at our monthly lectures, during 2019 membership numbers have continued to decline but visitor numbers remained steady. During the lockdown we still have to make payments for public liability insurance, affiliation payments, plus costs related to the general running of the society. However, BRLSI will refund for our meeting room payments or offset them against future bookings. The society has sufficient cash flow to see us through 2021, which gives us the next 12 months to expand the society. We will continue to seek out ways to reduce costs and increase the membership/income. We welcome any suggestions from our members.

## **Membership**

The annual subscription is the main source of revenue for the society. The lockdown has come at an unfortunate time for the society and we have only received renewals from around 40 of the 60 members we had in 2019. If the Society is to thrive, we must discover ways to recruit new members, without whom we are unlikely to survive. We are aware that members have paid a full year's subscription and may only get a half year's benefit (apart from the kudos of belonging to BGS in its 50<sup>th</sup> anniversary year!). As a committee we are considering various options and would welcome any input from current members. At the moment top of the list is a recommendation that members consider the 2020 subscription as part subscription, and part gift to the society. When social distancing is no longer in force, we plan to hold an exclusive 'members only' reception event to say thank you to those who were happy to donate and support the BGS with their 2020 subscription. We believe this approach would improve the financial well-being of the society and enable us to continue to offer a diverse programme with local and world renowned experts.

## **50th Anniversary Celebration**

Many of you will be aware that we are planning a 50th Anniversary Celebration in October, in Collaboration with BRSI and support from the Geologists' Association. However if BRSI remain closed till the end of September this is likely to be postponed, probably into 2021 giving us more time to plan an excellent event. Our plans are for a reception in BRSI around the Jurassic Ark fossil display on a Saturday afternoon, followed by short talks and posters in the evening. We are also considering offering some events suitable for children earlier in the day, or over the same weekend. As well as being a wonderful experience for our members, it is also a fantastic opportunity to promote Bath Geological Society and invite friends, or neighbours, that you think would be interested in any of the events or may like to become new members. The committee is still working on putting together a programme of events and if you can help, or have any ideas or professional contacts, please email the committee.

The proverb '**hindsight is 20/20**' can certainly be applied to the year 2020. It's incredibly hard to predict the future, we are all in this together, if you have any comments or suggestions we would love to hear from you. On behalf of your committee thank you again for your support.

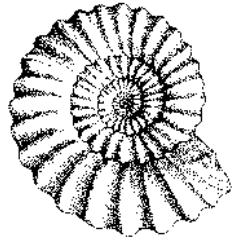
Graham Hickman  
[chairman@bathgeolsoc.org.uk](mailto:chairman@bathgeolsoc.org.uk)

## **Committee:**

Chairman – Graham Hickman  
Membership Secretary - Polly Sternbauer  
Treasurer - Phil Burge  
Journal Editor - Mellissa Freeman  
Lecture Programme Secretary - Anne Hunt  
Field Trip Programme Secretary - Sue Harvey  
Field Trip Health and Safety Officer - Bob Mustow  
Webmaster - James McVeigh  
Committee member - Prof. Maurice Tucker  
Committee member - Linda Drummond-Harris

# Bath Geological Society Newsletter

## End-May 2020



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As I write the forward for the newsletter there are glimmers of hope that the lock down, imposed at the end of March, is beginning to lift. The Society has been unable to meet due to the COVID-19 restrictions in place and the BRLSI building looks like it will remain closed to the public through to the end of September 2020.

However, since the last newsletter the committee have been working with our next speaker, Simon Kay, to deliver the June lecture as a virtual Zoom conference call. We have had a number of trial zoom calls with members of the society and believe that this is a viable and exciting way forward. Members will be automatically registered and have been sent the meeting ID and password. Non-members are invited to attend but will need to register by email to receive the log-in details. As always the lectures are free to members and we are inviting donations from non-members.

In mid-May, after the travel restrictions in England were lifted, I was also able to visit Aust Cliff by the Severn Bridge ahead of the planned field trip in July. With the help of my wife I was able to record a number of short videos and take lots of pictures. My intention is to put these together as a 'virtual field trip' which we can share with members in place of a physical excursion.

As stated before, this newsletter is not intended to replace the Journal, indeed longer articles may well be published in our journal at the end of the year. This month Melissa Freeman, our Journal Editor, has received two further articles for the Journal from Phil Berge and Isabel Buckingham. Please keep them coming. If you have some geological news you would like to share we would love to hear from you. We hope you enjoy reading it.

Graham Hickman

[chairman@bathgeolsoc.org.uk](mailto:chairman@bathgeolsoc.org.uk)

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### In this Issue:

<b>The Moeraki Boulders</b> By Isabel Buckingham	<b>Thornbury Building Stones</b> By Charles Hiscock	<b>Garden Fossils Bath</b> By Dr Sam Medworth
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## Now that is what I call a Concretion!

Isabel Buckingham

It takes all day to drive from Christchurch to Dunedin following the national speed limit of 50mph in NZ with overtaking only at designated locations and priority to trucks. The braided rivers of the Canterbury Plain are now mostly dry due to over abstraction of water for the massive dairy herds, and the Southern Alps look spectacular to the west. So by mid-afternoon the Plain is left behind, there are occasional glimpses of the sea to the east and the rain was hammering down. Perfect for another a hot drink stop.

**The Moeraki Boulders** are signed at the turn off to the east, and there is a car park and café. You either pay to use the walkway and steps built to allow easy beach access or tramp almost a mile on a circuitous route. It is well worth paying.

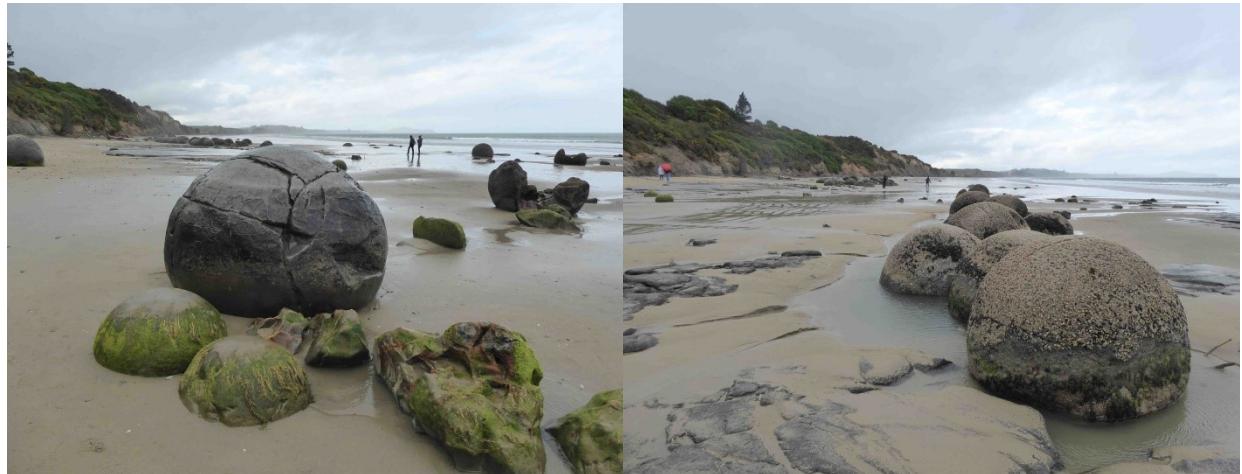


The eroding cliffs are of mudstone formed about 60 million years ago as muddy sediments accumulated on the sea floor with assorted shell fragments and plant debris. All of Otago was then under a shallow sea. This was well bioturbated which destroyed and original layers in the sediment.

While wet, under the sea, calcite gradually crystallised around these nuclei to form spherical nodules. It has been calculated that it took 120,000 years for a nodule 0.5m across to form and 4 million years for one >2m.

The outer part of the concretions then became hard and brittle and the material inside began to dehydrate, causing shrinkage cracks to propagate outwards from the core to the rim. Subsequently the cracks became filled with calcite crystals. Tiny crystals of brown calcite grew first, followed by larger crystals of yellow calcite.

The area then became uplifted from the sea as part of the ongoing Kaikoura Orogeny which started in the Miocene. In the last few million years weathering wave action and sun has exposed the mudstone which erodes leaving the boulders.



Early visitors took the smaller concretions as souvenirs but now the site is protected. The Maori have legends to explain the boulders. There were Maori settlements and a moa hunting site. Europeans came to hunt fur seals and later established a whaling station.

Just to the south at Shag Point is a location known for marine reptile fossils which I did not visit, but the concretions there are older than at Moeraki.

My technical information is from a publication of the Institute of Geological and Nuclear Science. See: [www.gns.cri.nz](http://www.gns.cri.nz). This small location is certainly worth a stop. Do detour if you are in the area

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## Bath Geological Society's 50th Anniversary Celebrations.

As many of you know 2020 is an important year for the Bath Geological Society as we celebrate the 50th anniversary of the Society. We are planning to hold a Special Meeting and invite our neighbouring geology groups. We have been given a generous grant from the Geologists' Association to help with costs. We were aiming for October but this may need to move to next year.

A short history of the Society can be found on our Website here;

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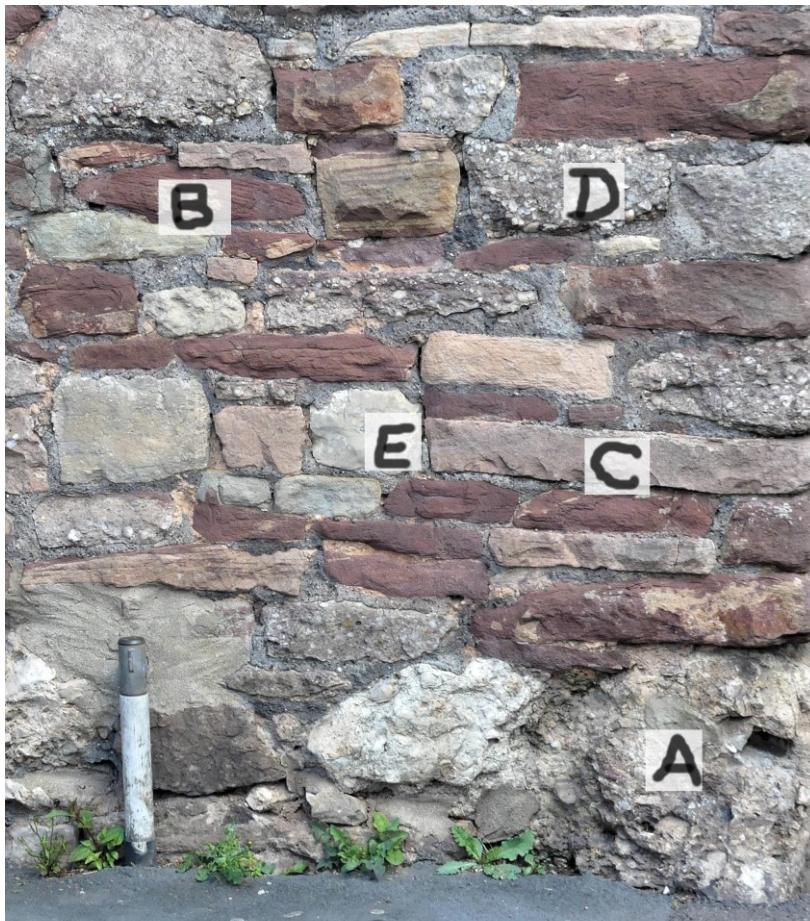
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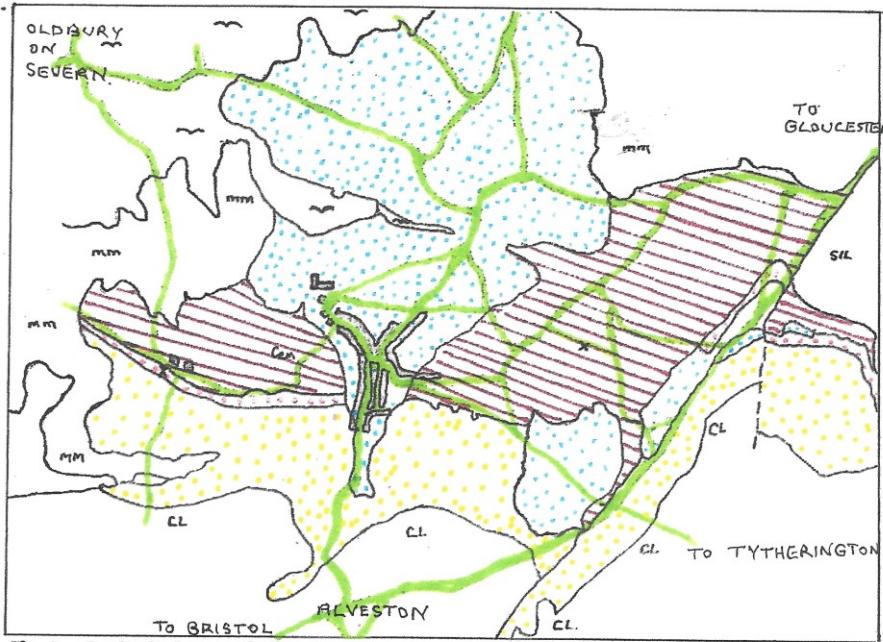
## Thornbury Building Stones - Charles Hiscock

At the end of the 20th century I was involved in a project run by Thornbury Heritage Museum to survey the medieval walls of the burgage plots that line the High Street, Castle Street and the top end of Gloucester Road. The aim was to map, photograph and measure the walls then record the different materials that had been used and, if there had been repairs, were they in keeping with the historical nature of these ancient property boundaries. I had been enrolled on the project because of my knowledge of the local rocks and ability to identify them (or most of them!).

At the end of April 2020, during 'lockdown' for the coronavirus pandemic, on a sunny but blustery afternoon not suitable for my usual cycle ride, I decided to revisit one aspect of the burgage plot walls project. As a long-time resident of Thornbury I had always been fascinated by the variety of rock that had been used. So, camera in hand I walked around the town examining the oldest buildings and photographing the walls and individual stones. During the 15th to 19th centuries builders used the rocks that were closest to the jobs and Thornbury was no exception.

There is abundant use of the following rock types (modern names in brackets). Photo 1 below on the right shows all four types in the wall in Chapel Street.

A. Triassic Dolomitic Conglomerate locally called Thornbury Rock (Mercia Mudstone Group)	
B. Silurian Thornbury Beds (Raglan Mudstone Group)	
C. Devonian Tintern Sandstone (Tintern Sandstone Formation)	
D. Quartz Conglomerate (Quartz Conglomerate Formation - Forest of Dean)	
E. Carboniferous Limestone clast derived from the Dolomitic Conglomerate. Carb. Limestone is abundantly used but only from the early 19th century when the quarries at Alveston, south of Thornbury, were opened.	



**Fig. 1 – Geological map of Thornbury area (from BGS Bristol District Special Sheet 1962)**

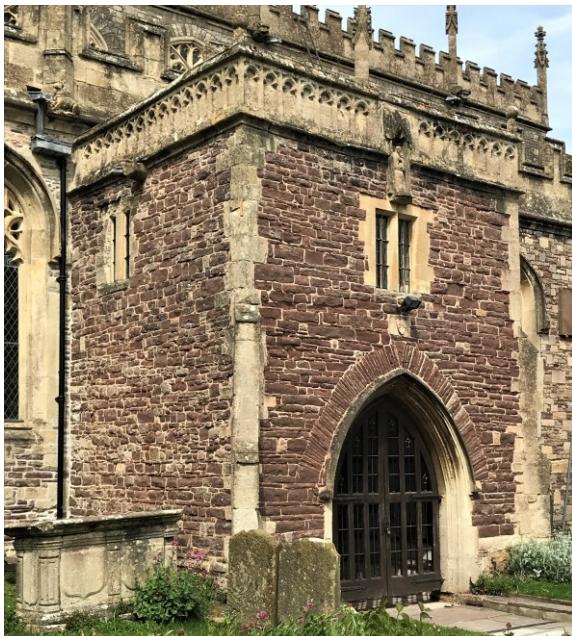
**Key**

	Thornbury Beds (Silurian)	X – Known old quarries
SIL -	Other Silurian formations	
	Tintern Sandstone (Devonian)	
	Quartz Conglomerate (Devonian)	
CL	Carboniferous Limestone	
MM	Mercia Mudstone (Triassic)	
	Dolomitic Conglomerate (Triassic)	
~	Alluvium	

Figure 1 is a diagrammatic sketch map of the rock outcrops that can be seen in the walls and buildings of Thornbury, taken from the British Geological Survey Bristol Special Sheet (1962)

Examination of the Bristol District Special Sheet geological map clearly shows that all the rock types used in the town were available within less than a mile. Indeed, the Bristol road which runs down off the Carboniferous Limestone at Alveston follows a narrow outcrop of the **Dolomitic Conglomerate** which extends down the High Street and fans out north of the town. The Dolomitic Conglomerate is a scree formation, derived by erosion of the Carboniferous Limestone mountains, washed by flash floods off the higher levels during the Triassic Period. North of Thornbury the deposit is an outwash fan of an ephemeral river containing quite small angular limestone clasts in a yellow sandy matrix. However, in the gully west of the church a low cliff displays boulders of limestone over 1 metre across, indicating that the river developed considerable force at times. Many of the old buildings use large blocks of the Dolomitic Conglomerate for foundations while smaller pieces are seen higher in the walls. Photo 1 - Dolomitic Conglomerate being used as foundations in Chapel Street. The rock is the only one of the four that can be examined in exposure. A stream rises on the edge of the Carboniferous Limestone ridge and flows in culverts under the eastern edge of the town centre and then emerges in St David's Road to flow through a shallow gorge in the Dolomitic Conglomerate under Gloucester Road, through another shallow gorge until it merges with the mill stream. These gorges have been made into the Streamwalk, a pleasant stroll away from the roads allowing access to the low cliffs. In past times the gorge was home to the town gasworks, of which the base of the storage tank is the only remnant.

The Dolomitic Conglomerate has covered another, much older, rock type within the bounds of the town which can be seen in very limited exposure west and east of Thornbury, the Silurian '**Thornbury Beds**' (I stick with the old names, particularly as this one reflects the proximity of Thornbury!). They are composed of dark red fine sandstone fissile flags which are thinly bedded and, because of the soft nature are only exposed in one locality, a stream bank in Kington Lane about half a mile west of the cemetery.



The church porch has been built exclusively of the red fissile flags with Cotswold stone for the porch, window, buttresses and battlement mouldings. Photo 2.

However, in Hacket Lane the 1880 map of Thornbury district shows a quarry in the Thornbury Beds which is no longer extant. Could this be the source of the red Thornbury Beds used in the porch of the church? In the same area of fields there are other depressions which could be the remains of shallow quarries from which the beds were extracted.

Flanking the narrow outcrop of Dolomitic Conglomerate along which Bristol Road runs and extending east and west for about a mile in both directions and down to the top of Castle Street is the **Tintern Sandstone** which is a pale cream to red fine hard quartzitic sandstone. Many of the 19th century houses are built from it, including the impressive rank of two storey dwellings in Gloucester Road, about a quarter of a mile north of the town centre. Again, this material can be seen in the assortment of stones that were used in the older buildings.

Accounting for a significant amount of the building stones in the town is the **Quartz Conglomerate** which, in exposure, accounts for a very small contribution to the local geology. The narrow outcrop lies along the boundary between the Thornbury Beds and the Tintern Sandstone but, due to its hard and rugged nature, has been extensively used within the town. There are no extant quarries but about a  $\frac{1}{2}$  mile west of the cemetery, the hamlet at the road junction in Kyneton is recorded on some maps as Kington Quarry. At the junction the cottages and boundary walls are built exclusively of the conglomerate. Further outcrops of the Quartz Conglomerate occur on the south eastern flank of the eastern outcrop of the Thornbury Beds, again as very narrow bands. It is a very hard quartzitic sandstone incorporating abundant quartz pebbles which are often brightly coloured.

We are fortunate that Thornbury still has most of its old buildings, due in no small way to the conservation area in which most of the old part of the town lies. Due to the proximity of a range of geological formations within a mile or so of the centre, the materials used in these old buildings can be easily examined. I wonder how many towns have such a wealth of rock types literally on their doorsteps.



Photo 3.

In Castle Street in the wall of Fairfield House the high wall incorporates much of the conglomerate including one block with a small piece of red jasper.



Photo 4.

Shows the Quartz Conglomerate forming the greatest proportion in the middle part of the photo.

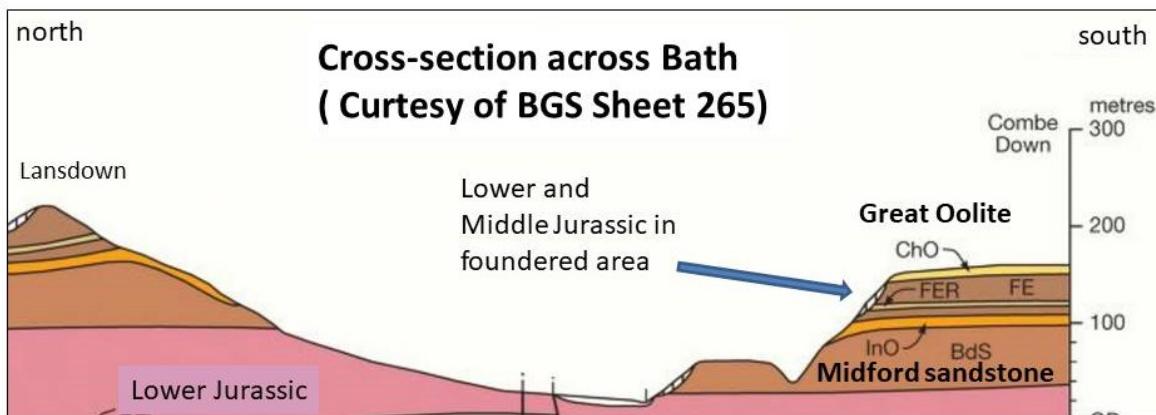


Photo 5.

Shows the Quartz Conglomerate topped by the addition of Carboniferous Limestone at a later date.

## My Garden Fossils – Dr Sam Medworth

We live on the southern slopes of Bath, roughly halfway between Combe Down (of Oolite fame) and the river Avon. Sheet 265 of the BGS 1:50000 maps shows this as “Lower and Middle Jurassic in a founded area” and I can confirm this from my own experience, having dug up pieces of chalky white limestone as well as clay from the Fuller’s Earth formation, rubbly limestone, Midford Sandstone, and Oolitic limestone which may be builders’ rubble or may have slipped down from higher up the hill.



### Key.

- ChO - Chalfield Oolite [ **Great Oolite** ],
- FE - Fullers Earth,
- FER - Fullers Earth Rock,
- InO - **Inferior Oolite**,
- BdS - Bridport Sandstone [ **Midford sandstone** ]

Over the 35 years that we have lived here, I have collected a number of fossils and thought members might like to see some pictures. I decided to present them as a quiz which will be published in the Journal. For the newsletter I have included some curiosities.

1. Cutting into a piece of rubbly limestone, I accidentally cut through a burrow with a shell inside, possibly the creature that made it!



2. Found in my garden, but cheating as mixed in with imported flint-based gravel for the path. Fossil sponges



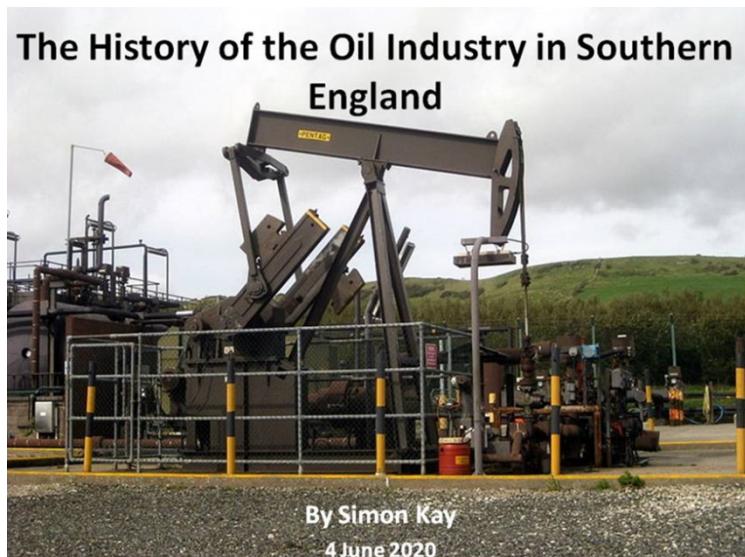
3. A fossil whose age I know to the exact year. A leaf imprint in concrete laid in an earlier garden makeover in 1991.



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## Upcoming Zoom Lecture: June 4th 2020 at 7pm by Simon Kay

This talk will address the history of the oil industry in Southern England. People are often surprised at the long history of oil extraction onshore in the UK, some not realising that we have many productive onshore oil and gas fields. Oil was extracted by digging oil shales and retorting to recover oil as long ago as the 1850s in Dorset and in Scotland. Just over one hundred years ago, in October 1918, Britain's first oil well was drilled at Hardstoft in Derbyshire. Since then around 2,000 wells have been drilled and today there are 120 sites producing oil onshore, the largest of which is in Dorset. Although there are not (yet) any oil or gas fields in the Bath area, we are not far from many fields, big and small, in Southern England.



Simon Kay moved to Bradford on Avon from Scotland seven years ago. He is a professional geologist, and worked in the oil industry for many years. He also worked as an environmental engineer, cleaning up contaminated sites in Alaska.

To hear this lecture you will need to have a free programme called **Zoom** on a computer / tablet or smart phone. Zoom can be downloaded here: <https://zoom.us/download>.

Please email: Anne Hunt. To register and receive the meeting ID and password  
[programme@bathgeolsoc.org.uk](mailto:programme@bathgeolsoc.org.uk)

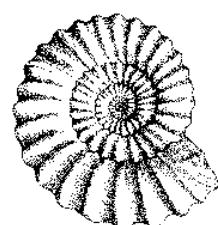
Free to Bath Geological Society members. Non-member £2 donation

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## Membership

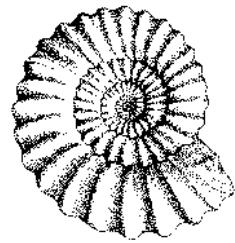
While we recognise the Society's events are currently on hold, we would encourage those who are financially able, to re-join and continue their support. Thank you.

<https://bathgeolsoc.org.uk/membership.html>



# Bath Geological Society Newsletter

## End-June 2020



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On June 4<sup>th</sup> 2020 the Society held its first virtual lecture using the Zoom video conferencing application. Simon Kay, petroleum geologist, gave the lecture from his home, in Bradford-on-Avon, whilst our members and non-members listened and watched from the comfort of their homes. While Covid-19 restrictions have lifted a little and we are no longer required to stay home, the 2m social distancing measures remain in place.

We plan to hold virtual lectures in July, August and probably September as it looks likely that the BRLSI building will remain closed to the public through to the end of September 2020.

Our next **virtual Zoom lecture will be on Thursday July 2<sup>nd</sup> 2020**. The speaker Dr Mick Oates will talk to us about ammonites. The title is 'from Mythology and Folklore to geological relevance'. Members will be automatically registered and have been sent the meeting ID and password. Non-members are invited to attend but will need to register by email to receive the log-in details. As always the lectures are free to members and we are inviting donations from non-members.

As stated before, this newsletter is not intended to replace the Journal, indeed longer articles such as the one from Maurice Tucker will appear in our journal at the end of the year. If you have some geological news you would like to share we would love to hear from you. We hope you enjoy reading it. Stay positive and stay safe.

Graham Hickman

[chairman@bathgeolsoc.org.uk](mailto:chairman@bathgeolsoc.org.uk)

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### In this Issue:

<b>New Developments in Plate Tectonics</b>  By Phil Berge	<b>A new exposure of Cromhall Sandstone</b>  By Charles Hiscock	<b>Fossil Coal-Measure plants-Twerton, Bath.</b>  By Maurice Tucker
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## New Developments in Plate Tectonics - By Phil Burge

My newsfeed has been abuzz with excitement over the latest developments in our understanding of plate tectonics. First is a report about the emerging subduction zone along the South West Portuguese coast at the junction between the African and Eurasian plates. Joao Durate from the University of Lisbon has studied old and more recent earthquakes in the region around Lisbon, where earthquakes are least expected as the area is a sparse abyssal plain. The seismic data is interpreted as a serpentinisation front propagating through the upper mantle. This would suggest the onset of a new subduction zone.

Secondly, we have reports from South East Asia of earthquakes to the west of Indonesia showing that the Wharton Basin, the India-Australia-Capricorn plate is splitting at about 1.7mm per year. The earthquakes in question did not happen under a subduction zone but in the middle of the plate. The work by Aurelie Courrier-Curveur from the Institute of Earth Physics of Paris, shows the development of depressions along strike-slip faults, some as long as 5 miles deep and 1.8 miles wide. A new plate developing or a new transform fault?

Our third report comes from a team based at Yale University led by Meng Guo, who have used Argon (40Ar), a decay product of 40K to compute the levels of atmospheric argon that has accumulated over time which is a proxy to determine the age of continental growth. They estimate that the mass of continental crust already reached 80% of the present day level during the early Archean. Their paper, a melange of complex chemistry, mathematics and thermodynamics (and therefore incomprehensible) reports that plate tectonics likely began 1 billion years before current theories suggest (4.4 billion rather than 3.5 billion years ago).

But, our fourth report suggests quite the opposite that plate tectonics began around 700 million years ago during the period known as the “snowball earth”. Robert Stern and Nathan Miller used a meta study approach reviewing all the literature on the genesis of the snowball earth and concluded that the onset of plate tectonics begat the change in climate necessary to induce the total covering of the planet in ice.

Our next report is somewhat odd. We are all aware that tectonic forces at convergent plates cause mountain building – think the Andes or the Himalayas. Apparently the mechanism that controls the height of mountains has been a subject of debate for some time. There are three events controlling mountain height – tectonic plate movement, isostasy and climate controlled weathering. Work published in Nature (582, 2020) by Armin Dielforder et al has calculated that at convergent boundaries the primary tectonic force is provided by the major fault at the boundaries. This stress can be calculated (estimated) using the strength of the fault and various thermal and mechanical properties. The researchers then considered that the horizontal stress was balanced by the vertical stress. The weight of the rock column is proportional to its height and therefore the estimate of tectonic force can be used to calculate the theoretical mountain height. Lo and behold the estimates match observed mountain heights. Therefore, at least for orogeny at convergent plates the effects of climate controlled weathering on mountain heights are not significant.

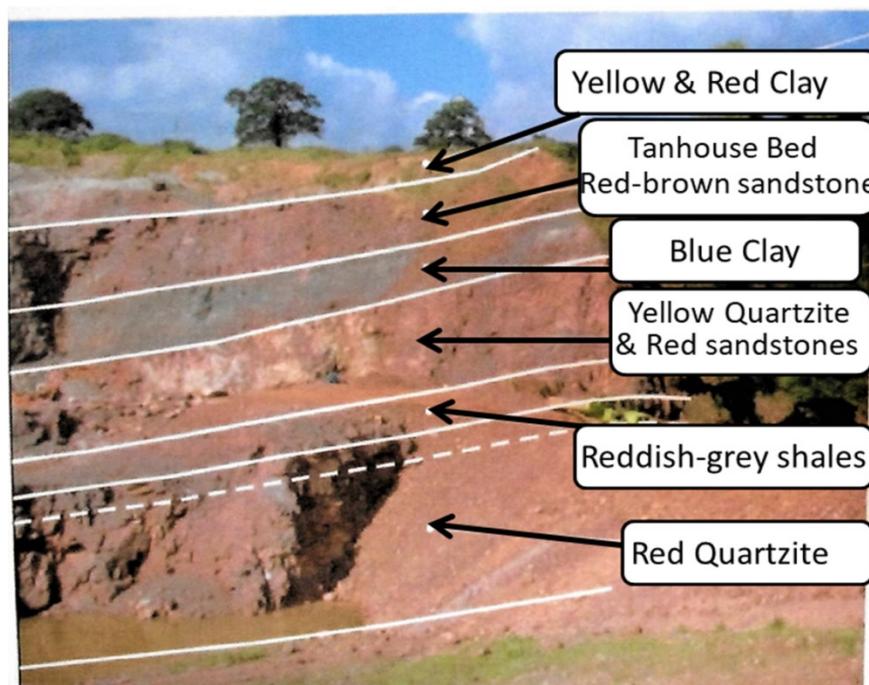
Finally some reassuring news. Cheng Quiming of the China University of Geosciences has calculated that plate tectonics will end 1.45 billion years from now due to cooling of the mantle. For those worried about the end times caused by an exploding Sun, that will not be for another 5 billion years. However without plate tectonics there will be no mountain building and without this and assuming normal weathering processes the continents will erode into the oceans creating a water world as it was in the beginning.

## A new exposure in the Upper Cromhall Sandstone – Charles Hiscock

In 2004 I carried out a survey of the RIGS sites in the northern part of the Avon RIGS Group area in order to ascertain if previous surveys were still applicable. One of the quarries I visited was Cromhall Quartzite Quarry which had supplied road stone, with a high skid resistance.

The Cromhall Sandstone Formation is fluvial in origin and formed of fine grained, often intensely iron stained quartzitic sandstones. They were formed approximately 330 – 345 ma in the Carboniferous Period (Arundian/Holkerian). The lower boundary is taken to be the base of the lowest sandstone which overlies the Clifton Down Limestone in the Bristol area. Indeed, the locality at Cromhall is at the top of a steep track that drops away north into a valley cut in the Clifton Down Limestone. The small stream in the valley supplied the power for the old Cromhall mill, Sodam Mill, in the oldest part of the village.

My visit in 2004 coincided with a period of wet weather and the bottom of the quarry was flooded by a bright orange, almost fluorescent pond caused by the iron staining in the sandstone being leached out by the water. The face of the quarry showed bedding which varied from bright red sandstone, the quarried road stone. The blue shales and mudstone, was considered waste material and was used for infilling the worked out areas of the quarry.



**Photo 1** shows the quarry with the bedding marked to indicate the different levels worked by the quarry company.

The quarry is, or was, the only significant exposure of the Upper Cromhall Sandstone in the locality from which it was named. The very accommodating staff of the quarry company permitted access so long as prior contact was made. Then, in 2008 the notorious financial collapse occurred! Within a year or so the quarry was closed and has remained so since that time, robbing geologists of the excellent exposure of the Upper Cromhall Sandstone. Indeed, a Google Maps satellite image, taken in 2015 shows the quarry to be completely flooded



Photo 2 is of the east face of the quarry and clearly displays the red sandstones and the blue-grey mudstones and shales. In the bottom right corner the bright orange pool can be clearly seen.

About early 2019 I was making one of my frequent cycle outings around the Cromhall area and discovered a new roadside exposure in Cromhall Lane (map reference ST692906) near the top of Abbotside Hill about 300 yards WNW of Cromhall Parish Church. The small exposure (Photo 3) at most 20 feet long and 10 feet high, is the Upper Cromhall Sandstone and is a significant exposure at the top of the Cromhall Sandstone Formation and shows bedding dipping at about 40 degrees SE with evidence of slickensides. During the winter of 2020 when there was so much heavy rainfall the face was well washed of loose material affording an easily accessible and clear locality.



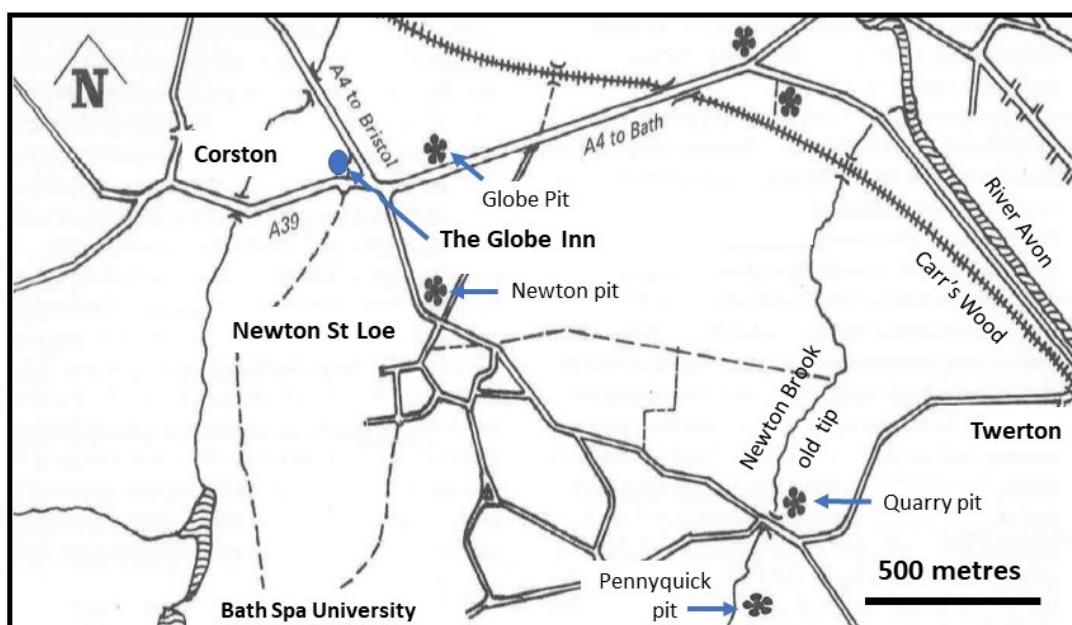
Photo 3 shows the new exposure of Cromhall Sandstone in April 2020.

The purpose of the new exposure improves access down the track into the back entrance of Tortworth Lake, part of the Tortworth Estates. It lies alongside Cromhall Lane and can be examined without leaving the road but access is not allowed down the track.

## Fossil Coal-Measure plants from Twerton, Bath - By Maurice Tucker

One is accustomed to Jurassic sedimentary rocks in the Bath area but it is also possible to see Carboniferous rocks – such as the Pennant Sandstone pavements of Bath. The Pennant Sandstone is in the Upper Carboniferous and is a clean quartzitic sand deposited by major rivers flowing from south to north. This very hard, weather-resistant sandstone was exploited at Willsbridge, just 8 km northwest of Bath, and farther afield; you could visit the quarries on your way to the Longwell Green retail park in the nature reserve of Siston Brook valley at Willsbridge Mill (Grid Ref ST666 708). However, Carboniferous plant fossils can be found near Twerton where there is still some material from an old coal tip near Pennyquick Park (ST714 646).

Back in the 18th and 19th centuries, there were several coal mines in this area, just a few km west of Bath at Twerton, Corston and Newton St Loe (Fig. 1). There is a small area of Pennant Sandstone at the surface in the Corston area, which might have alerted prospectors to the possibility of coal down below. Indeed, coal had been worked in open quarries to the west of Corston before 1730. The first coal mines were established in the 1730s near the Globe Inn on the A4 (the Globe pits) and at Newton, and these lasted until 1845. Conveniently, the Globe pit, near the 17th century Globe Inn, provided coal for the coking ovens which were necessary for the brewing of beer (encouraged by the Government of the time to reduce the amount of gin being consumed by the general populace). It was often better for one's health to drink beer than water in those days too!

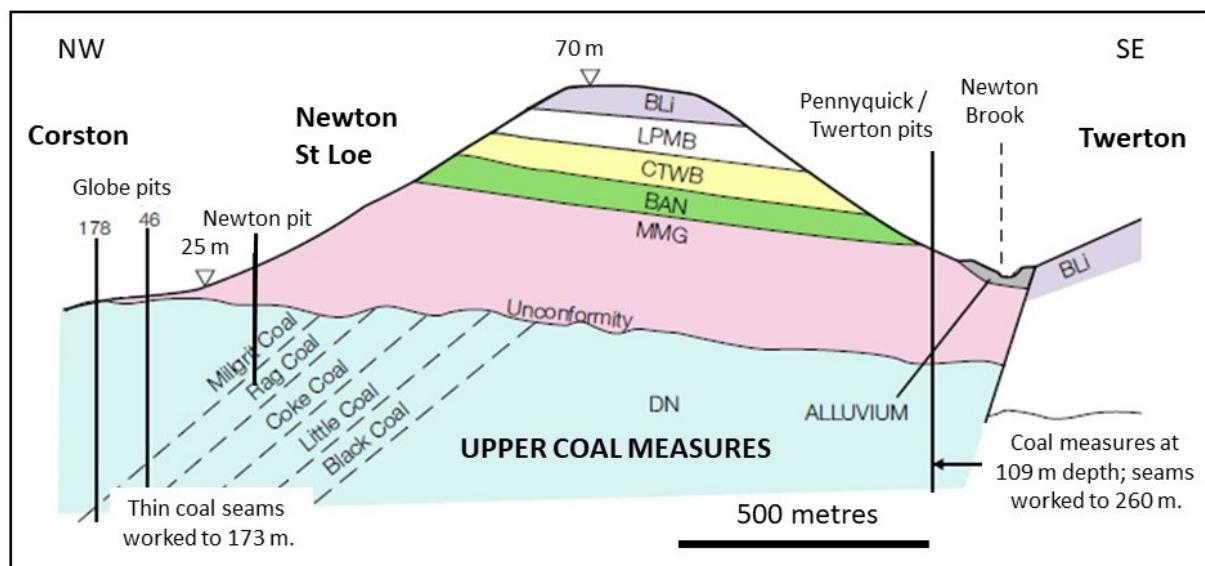


**Figure 1.** Location of the coal mines in the Newton St Loe, Twerton and Corston area (modified from Davies 1977, Bristol Industrial Archaeological Society Journal, 10, 27-33.)

There were two pits in Twerton; one known as Quarry pit, started in 1834, was located at the junction of Newton and Whiteway Roads. In 1841 a new mine was opened at Pennyquick, a km to the south, and this lasted until 1877. Much of the coal extracted from these mines was high grade and it provided coking coals for the local industry in Bath, including brass-making at Saltford and Keynsham, and, later, fuel for the cloth industries in Twerton itself, and Widcombe and Lyncombe.

The coal mines provided employment for around 100 men and boys judging by the returns on the 1841 census, with most living in Corston and Newton. Although a dangerous and tough environment, working in cramped spaces with the danger of rock-falls and explosions, the coal miners were generally better paid than agricultural workers. In the early 1800s, a hewer in the mine working a 6-day week would be earning up to 18 shillings whereas a farm labourer in Somerset would be receiving around 7 shillings.

The coal measures in the Twerton-Newton area are on the eastern edge of the Bristol Coalfield and on the northeast side of the Pensford Syncline. The strata belong to the Upper Coal Measures, i.e. the Westphalian C (Bolsovian sub-stage), and are within the Downend Member of the Pennant Sandstone Formation. The rocks appear to be quite faulted and locally folded, as recorded in the mine records, and the general dip is towards the NW at quite high angles. The coal seams in these pits were relatively thin, mostly 0.4-0.7m, but they were at quite shallow depths. In the Pennyquick mine, 13 coal seams were encountered, but many of these were quite thin (<0.4m) so that only 3 were worked, at depths of 110, 120 and 210m, with thicknesses of 0.7, 0.6 and 1.5 m, the last being known as the Great Seam.



**Figure 2.** Cross-section from Twerton to Corston showing the geology and the location of the coal mines. **Key:** BLI = Blue Lias, LPMB+CTWB+BAN = Rhaetic, MMG = Mercia Mudstone, DN = Downend Formation (modified from BANCES 2010 Slope geological instability and undermining study, Twerton and Odd Down. Report 028/10, Ove Arup & Partners Ltd, Bristol.).

The coal mines around Twerton naturally produced a lot of waste material but unfortunately, for fossil hunters that is, these tips have been removed or flattened and grassed over. In fact, in the 18-19th centuries it was a requirement that land disturbed by coal mining be returned to its original state when the mining activity ceased. Hence, there is no evidence of the pits and opencast sites in the area near the Globe Inn at Corston. With material from the pits near the A4 and the Globe Inn, it is thought that some of this was used to construct the embankment of the GWR railway line built by Brunel in the 1830s. The waste rock from the Quarry pit at Twerton was landscaped to form Pennyquick Park, adjacent to Newton Road, towards Whiteway Road.

In spite of most evidence from the coal mining industry being lost in this western area of Bath, it is possible to find pieces of Coal Measures rock hereabouts. One location is along the footpath in a wooded area that runs south from the A4 to Whiteway Road, following the

line of the Newton Brook. Look along the footpath itself and in the adjacent bank, above Newton Brook on the eastern side, opposite Bath Mill.

Here can be found many pieces of coal, black mudrock with coaly streaks (referred to as 'scares' by miners) and carbonaceous shale, which may contain plant fragments. Round to egg-shaped nodules of siderite are present; these consist of very fine grains of iron carbonate ( $\text{FeCO}_3$ ); they weather brown on the outside but have a steely grey colour when fresh. There are also pieces of sideritic mudstone with rootlets, derived from a fossil soil. Siderite is a common mineral in coal measures and forms in an anoxic freshwater environment, such as marshes and waterlogged soils. There are fragments of sandstone, fine-grained, thin-bedded samples with cross laminae and generally larger pieces of more massive coarser sandstone derived from a thicker bed. Sandstone was likely deposited in streams, on floodplains, in deltaic channels and in shallow bays.



**Figure 3.** delicate leaves of *Neuropteris*

Of the fossil plants, there are many fragments of seed ferns (pteridosperms), including the simple *Annularia* and delicate leaves of *Neuropteris* are also present (Fig. 3). One of the most common fossil plants seen in the mudrock samples are specimens of *Calamites*, this is a relative of the present-day horsetail, *Equisetum* (Fig. 9), which can be found in many damp places near streams and in woods.

It is always exciting to find fossils; they got me started when I found my first one at the age of 7. But it is almost even more exciting to find fossils lying about which are from rocks not exposed at the surface. The small pieces of Upper Carboniferous mudstone with fossil plants shown here from Twerton are testament to the hard work of a long-gone generation of coal miners, all part of our rich heritage of endeavour.

[**Editor's Note:** A full version of this article will appear in the journal with a full set of the photographs that accompanied it.]

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**Upcoming Zoom Lecture: July 2nd 2020 at 7pm - Dr Mick Oates**

# Ammonites

**from Mythology & Folklore to Geological Relevance**

By  
**Dr Mick Oates**  
**July 2<sup>nd</sup> 2020**



Dr Mick Oates is a retired professional geologist who has had a lifelong enthusiasm for rocks and fossils and in particular ammonites! His collection is now housed at the Barrow House Museum, a two story annex to his home.

He gained a BSc in Geology and PhD, from University College, London before working as a geologist in oil and gas exploration/development for about 40 years. He served on various Natural Environment Research Council review and advisory committees; the University of London Board of Studies (Geology), Imperial College MSc external examiner and is a Fellow of the Geological Society and member of the UK Stratigraphy Commission. He has served on the Geologists' Association Council and Rockwatch committee since 1992.

To hear this lecture you will need to have a free programme called **Zoom** on a computer / tablet or smart phone. Zoom can be downloaded here: <https://zoom.us/download>.

Please email: Anne Hunt. To register and receive the meeting ID and password  
[programme@bathgeolsoc.org.uk](mailto:programme@bathgeolsoc.org.uk)

Free to Bath Geological Society members. Non-member £2 donation

## Bath Geological Society's 50th Anniversary Celebrations.

As many of you know 2020 is an important year for the Bath Geological Society as we celebrate the 50th anniversary of the Society. We are planning to hold a Special Meeting and invite our neighbouring geology groups. We have been given a generous grant from the Geologists' Association to help with costs. We were aiming for October but this may need to move to next year as the COVID-19 situation evolves.

A short history of the Society can be found on our Website here;

<https://bathgeolsoc.org.uk/about/history.html>

Charles Hiscock has written an article on his first memories of the Bath Geological Society and this will appear in a future newsletter. Below is a photo from the society's 25<sup>th</sup> celebration in 1995 taken at Tucking Mill.

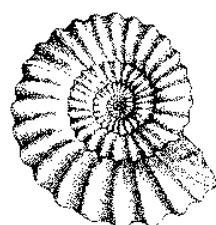


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## Membership

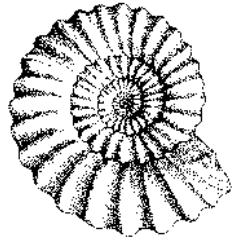
While we recognise the Society's events are currently only online, we would encourage those who are financially able, to re-join and continue their support. Thank you.

<https://bathgeolsoc.org.uk/membership.html>



# Bath Geological Society Newsletter

## End-July 2020



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During July the Society held its second virtual lecture using the Zoom video conferencing application. Dr Michael Oates spoke to the Society about 'Ammonites Mythology and Folklore to Geological Relevance' It was well attended by members and guests who listened and watched from the comfort of their homes. Dr Oates similarly was able to give the lecture from his home in North Lincolnshire. Our thanks go to Dr Oates for an interesting and stimulating lecture.

The Covid-19 lockdown restrictions have lifted further during July and we are now able to go shopping, eat at pubs and attend the cinema. However, social distancing measures remain in place. The BRLSI building remains closed, but there are plans being made to reopen in September, with certain conditions including restrictions on room capacity. We plan to continue holding virtual lectures in August and September. The committee will review the situation and advise when we feel it is safe to return to physical lecture meetings. If members have further views or feedback from the virtual lectures they have attended we would love to hear from you.

Our next **virtual Zoom lecture will be on Thursday August 6<sup>th</sup> 2020**. The speaker **Stuart Blake** will talk to us about the geology of the Isle of Arran from his home on the Island. The title is '**The Isle of Arran - One small island with a great many stories!**' Members will be automatically registered and have been sent the meeting ID and password. Non-members are invited to attend but will need to register by email to receive the log-in details. As always the lectures are free to members and we are inviting donations from non-members.

This newsletter is not intended to replace the Journal, indeed longer articles will appear in our journal at the end of the year. It is hoped that this regular communication with our members will encourage engagement and get us through these difficult and uncertain times.

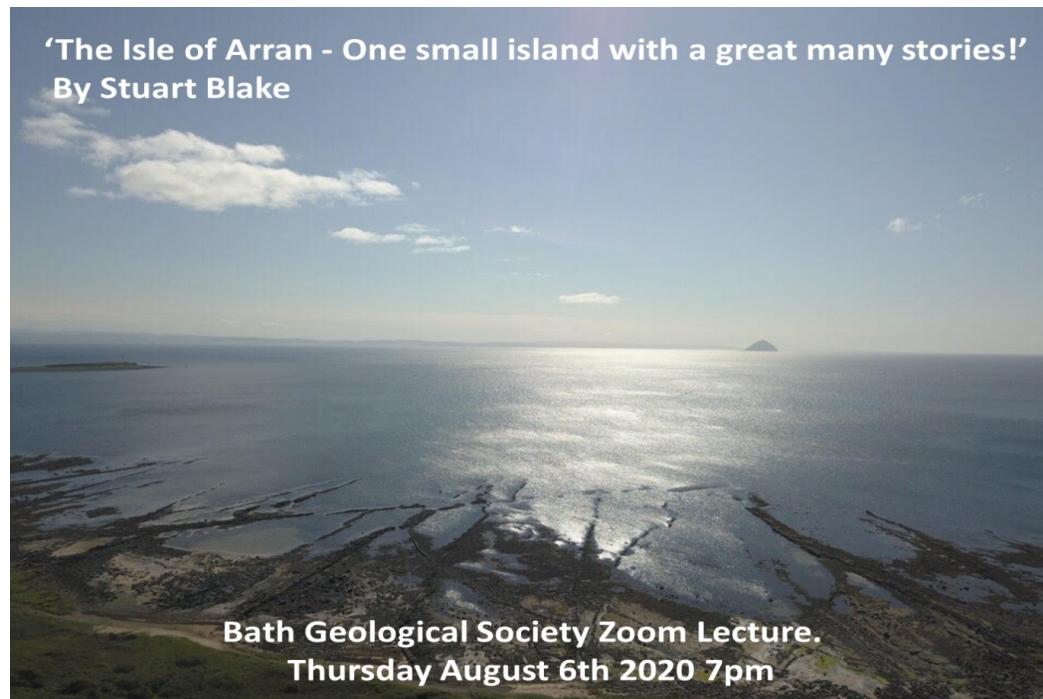
In our 50<sup>th</sup> anniversary year this issue carries an abridged article written by Charles Hiscock remembering some of his early memories of the Bath Geological Society. The full article will be published in the next Journal.

If you have some geological news you would like to share we would love to hear from you. We hope you enjoy reading it. Stay positive and stay safe.

Graham Hickman  
[chairman@bathgeolsoc.org.uk](mailto:chairman@bathgeolsoc.org.uk)

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## **Upcoming Zoom Lecture: August 6<sup>th</sup> 2020 at 7pm**



Title: The Isle of Arran - One small island with a great many stories!

By: Stuart Blake

Thursday August 6th 2020 7pm

This well-illustrated talk will highlight the vast amount of different geology and landscapes to be enjoyed by a visit to this little island and show why it is such a popular destination for geologists and tourists alike.

Stuart Blake is an Instructor and the Director at the Lochranza Centre. He arrived on Arran some 38 years ago as a graduate and teacher of geology to take on the role of an instructor. He has taught geology and acted as a mountain leader, both on Arran and overseas in Iceland for most of that time. He also enjoys visiting and sampling geology from other areas - his most recent excursions having been to the Azores, the Caribbean and Ireland.

**To register please email: [programme@bathgeolsoc.org.uk](mailto:programme@bathgeolsoc.org.uk)**

**We will send you joining instructions and the Zoom meeting info.**

## **My early days in the Bath Geological Society**– Charles Hiscock

In autumn 1981 I attended an extra mural geology course at Bristol University to further my very scant knowledge of the subject. Two of the participants also on the course were Pam Skeet, a member of the Bath Geological Society, at the time Membership Secretary, and Mike Curtis from Thornbury, namesake of the Curator of Geology at Bristol Museum. Pam suggested to Mike and I that we might like to attend the lectures of the Society to see if the subjects suited us. So that is how I started attending the Bath Geological Society. In fact, the first or second of the lectures we attended stands out in my mind, not for its content but for the hairy drive home from Bath to Thornbury in a blizzard with the distinct possibility that Mike and I would spend the night in a snowdrift. Thankfully we made it home and it was the start of my long association with the Society.

The first couple of years attending the Society lectures were most interesting and I continued my ‘further education’ at Bristol University and the City Museum. However, by this time I had been spending all my spare time in the Tortworth Inlier collecting, photographing and recording everything that I came across, guided by the papers published by Dr M L K Curtis, the Curator of Geology at Bristol Museum. In 1984 the Society Chairman was Ron Smith, later to produce the booklets on the geology of Brown’s Folly and of the Cherry Gardens railway cutting at Oldland Common. Ron very much took me under his wing and his passionate interest and extensive knowledge was inspirational.



Photo 01 shows Ron talking to the public at Brown’s Folly on 27th July 1996

In 1985 Ron Smith persuaded me to join the committee. The Society subscription in 1985 was £3 per year but, like now, was excellent value particularly for a very ‘green’ amateur. By 1988 Joy Coppin was a very sick lady and so I agreed to take on the secretary job. Joy gave me as much help as she was able but sadly died later that year. Joy had been a founder and very active member of the Society and, as a mark of respect, we named one lecture during each year the ‘Joy Coppin Memorial Lecture’ with a high-profile speaker and subject.

It was during Joy Coppin’s period as secretary, through her contacts with the Cardiff University and the National Museum of Wales that the Society had already enjoyed a couple of weekend field trips led by Dr Mike Bassett, Keeper of Geology at the National Museum of

Wales in Cardiff. He was a good friend of the Society, an excellent teacher and a big inspiration for me. One 'field' trip that Mike Bassett led was to the stores of the National Museum of Wales where he drew out the storage trays that house the large Jurassic ichthyosaur specimens that had been transferred from the BRLSI to Cardiff in earlier years.

The late 1980's was a difficult time for the Society. The Queens Square building was owned by the BRLSI, a charitable organisation, but had been taken over by the local authority, Bath City Council, as the city library. Then, without any notice, the Council announced that they were going to sell the building and everyone was given a week or two's notice to quit, leaving the Society to find another venue. Fortunately, we were able to move to Bath Abbey Church House where we held our lectures for some years. Due to the hard work, lobbying and determination of a lot of people, not least Bob Whitaker, onetime chairman of the Society, the matter was resolved, the Council were shown the error of its ways and the building in Queens Square reverted to being used by the BRLSI.

I remained as secretary for 5 years until becoming the Chairman in 1993. It had been a rewarding time enabling me to build up much knowledge and experience from the lectures, field trips and contact with the speakers and trip leaders. By this time, Elizabeth Devon had joined the Society. Elizabeth was head of Earth Sciences at Stonar School, a school for girls just outside Melksham and she brought boundless enthusiasm, knowledge and experience as well as her entourage of students from the school, many of whom entered geological careers after leaving the school. Often the numbers at meetings were close on 100, swollen by all the young ladies from the school.



In photo 02, on 5th April 2003, Elizabeth is seen at Wootton Bassett mud springs energetically stirring up the mud, tethered to Isabel Geddes in case she was sucked in!

It was through Elizabeth that we made contact with Dr Chris Cornford, an oil geologist, of the Hallsannery Field Centre near Bideford in Devon. Our first weekend trip to Hallsannery was in June 1990 (photo 03) and yearly then until 1995, all within the area of north Devon and Somerset although we did follow the geology down to the Torquay area on one weekend.

Photo 03 – Bath Geological Society first weekend trip to Hallsannery in June 1990



Photo 04 - is a photograph of Chris Cornford sitting on the beach at St Audries Bay heating a test tube containing Westbury Beds oil shale with a blow lamp so that the oil boiled off and condensed on the upper sides of the tube. Chris was that sort of teacher – good humoured, caring and very hands on and happy to teach those who were keen to learn there about his subject.

In 1993 the members put on a display in Bath Central Library to publicise the Society which was very successful and resulted in a number of new members.

In 1995 we celebrated our 25th anniversary in grand style with many special events. On the 15th June 1995, Bob took us on a tour of the building stones of Bath.

In the evening we all gathered in lovely warm sunshine for a garden party at Heleigh House, Box, by kind invitation of Elizabeth and Martin Devon.

Photo 05 - 20th 1995 May Bob Whitaker & Reg Bradshaw led the William Smith Trail walk.



[Editor's note: The photo taken at Tucking Mill during this anniversary walk appeared in the June newsletter.]

My photograph collection starts in 1988 with a view of members climbing over the slippery rocks of Flat Holm in July that year led by Dr Gilbert Green. Gilbert had worked for the British Geological Survey and mapped both islands in the Bristol Channel during his work, leading us on a trip to Steep Holm in 1991 after two false starts due to rough weather in earlier years.

I am hopeful that the photograph album can be made available when we are able to celebrate our 50th anniversary later this year or next. Unfortunately, one of the casualties of the digital age is the printed photograph! We take so many digital photos these days, store them on our computers and phones but very few are printed. Maybe somebody can be persuaded to put a selection on the Society website.

The Bath Geological Society Journal was started in 1981 and although modest in size, was packed with interesting articles, many by professional geologists. I'm told that this article will be published, in full, in this year's Journal to stand as a testimony to the longevity of the Society alongside some of the photographs from my album.

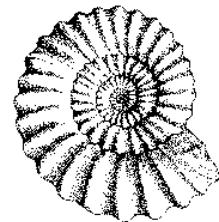
Membership of the Bath Geological Society has been a great encouragement to me over the years particularly those when I was secretary and chairman. I have greatly valued the contact with the host of professional geologists who have given of their time, knowledge and experience during the lectures and field trips. I have mentioned just a few but there are many others who have contributed to the life of the Society. At this difficult time of coronavirus lockdown and restrictions it is my sincere hope that we will come through to celebrate our 50th anniversary and move forward to many more years of excellent activities. Finally, I record my thanks to all the officers and committees who have guided the Society through the last 50 years. Well done! Here's to the next 50 years.

Charles Hiscock

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## Membership

While we recognise the Society's events are currently only online, we would encourage those who are financially able, to re-join and continue their support. Thank you.

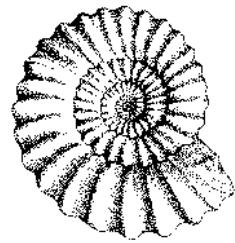


<https://bathgeolsoc.org.uk/membership.html>

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# Bath Geological Society Newsletter

## End-September 2020



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Cases of Covid-19 are on the rise again during September and social distancing measures remain in place. The BRLSI lecture rooms are now open but with a maximum occupancy of 30, no microphones, no laptops and the usual social distancing measures. Consequently your Committee has decided to continue the programme of Zoom lectures for the remainder of the year and we will review the situation again in January 2021.

During August and September the Society held two more virtual lectures using Zoom video conferencing. On August 6th **Stuart Blake** spoke to us about the geology of the Isle of Arran from his home on the Island. The title was '**The Isle of Arran - One small island with a great many stories!**' Then on September 3<sup>rd</sup> **Doug Robinson** spoke to us about the '**Whin Sill and the Geology of the Alston block**'. Both talks were well attended and our thanks go to both speakers for interesting and stimulating lectures. Members were able to ask follow-up questions and the slides from both talks are available for viewing in the member's area of our website.

Our next virtual **Zoom lecture will be on Thursday October 1st 2020**. The speaker will be **Jonathan Turner** from Radioactive Waste Management. Members will be automatically registered and have been sent the meeting ID and password. Non-members are invited to attend but will need to register by email to receive the log-in details. As always the lectures are free to members and we are inviting donations from non-members.

In November members of the Society normally attend the Geologists' Association **Festival of Geology** held at UCL Gower Street, London. However this year the Festival will be held virtually, details will be available at <http://festivalofgeology.org.uk/>

If you have some geological news you would like to share we would love to hear from you. We hope you enjoy reading this Newsletter. Stay positive and stay safe.

Graham Hickman

[chairman@bathgeolsoc.org.uk](mailto:chairman@bathgeolsoc.org.uk)

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### In this issue;

Breaking news – meteorite impact causes devastation near South Gloucestershire village'

Jenni Patterson remembered

**Upcoming Zoom Lecture: October 1<sup>st</sup> 2020 at 7pm**



Tunnel boring machine in Callovian-Oxfordian claystone some 500m beneath the eastern Paris basin at ANDRA's underground rock laboratory, Bure.

Photo: ©Jonathan Turner

**Title: What is a geological disposal facility and what opportunities does it present for the geoscience community?**

By: Jonathan Turner – Radioactive Waste Management

Thursday October 1<sup>st</sup> 2020 7pm

This presentation has two main aims: to give a flavour of the range of geoscience skills that will be needed to support the deep geological disposal (GDF) programme; and provide an introduction to some of the ‘whats’ and ‘whys’ of radioactive waste disposal.

Jonathan Turner is Chief Geologist at Radioactive Waste Management Ltd. He has spent most of his career in oil & gas exploration, working for big companies on some of the most technically and environmentally challenging projects in the world. For fifteen years he was an academic at Birmingham University, including taking students on fieldtrips and residential courses, and has led the graduate development programme for some 60 international exploration geoscientists in a large UK PLC.

**To register please email: [programme@bathgeolsoc.org.uk](mailto:programme@bathgeolsoc.org.uk)**

**We will send you joining instructions and the Zoom meeting info.**

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## **'Breaking news – meteorite impact causes devastation near South Gloucestershire village'**

In this internet age we are also constantly being bombarded by news flashes from across the world onto our mobile phones, computers and tablets. The news may be a few seconds old when it reaches us. Some of it will be ‘fake news’, a scourge of modern media that leaves us wondering if we can believe some, or all of, that which we see or hear. The constant information and warnings we get about ‘fake news’ prompted me to wonder what it would have been like if instant communications had existed in the Triassic Period. More precisely, 214 million years ago! Hence the title of this short article (and no, it is not ‘fake news’, it is true – but a bit delayed and embellished!).

In 2009 I was invited by Mark Mitchelmore to have a tour of Churchwood Quarry about a mile north of the village of Wickwar. Mark Mitchelmore was a geologist for Cemex UK, the owning company and operator of the quarry. On a fine day in September we walked around the perimeter of the quarry on the excavated level at the top of the marine Lower Carboniferous Clifton Down Limestone (340 mya), the material that was processed in the quarry and sold as aggregate for the road and house building industries. However, the Clifton Down Limestone is overlain by first the Triassic Dolomitic Conglomerate, a scree and alluvial fan deposit laid down by the erosion of the Carboniferous mountains, which grades upwards into a fine yellowish sandy matrix. This, in turn, grades into the desert sediments of the red Mercia Mudstone Formation. The break at the top of the Clifton Down Limestone represents an unconformity with a gap of about 74 million years.

In 1973 A. Kirkham was in Churchwood Quarry when he discovered ‘unusual green spherules up to 1mm diameter within erosional troughs along the unconformable top of the marine, Lower Carboniferous, Clifton Down Limestone’. The spherules were found initially in a ‘cross bedded deposit of hard and soft silty marls occurring discontinuously at similar stratigraphic levels along much of the western face of the quarry’. Subsequently, the spherules were analysed, photomicrographed and dated to ‘between Late Carboniferous and Late Triassic although Triassic is more likely’. He also considered the origin of the spherules, suggesting that ‘they were created as molten ejecta associated with a meteorite impact’. (Kirkham 2003 – abstract below)

### **Glauconitic spherules from the Triassic of the Bristol area, SW England: probable microtektite pseudomorphs**

**A. Kirkham**

KIRKHAM, A. 2003. Glauconitic spherules from the Triassic of the Bristol area, SW England: probable microtektite pseudomorphs. *Proceedings of the Geologists' Association*, **114**, 11–21. Marine Lower Carboniferous Limestone is unconformably overlain by Triassic desert sediments at Wickwar, Bristol, SW England. Deposited by fluvial activity along the unconformity are pockets of partly cross-bedded marly limestones containing abundant glauconitic spherules with distinctive internal architectures, such as spheres within spheres. They are accompanied by shocked-quartz and probably pseudomorph altered glass spheres representing former microtektites created by a meteorite impact with Earth. Their possible link with mass extinction events are considered.

In the late 1980's Gordon Walkden was working in the Carboniferous quarries of the Bristol area on the lizard and small dinosaur remains that had been discovered in the Triassic fissures in the quarries. He made a visit to Churchwood Quarry but it proved unrewarding for

the fossil remains but he did collect 'a lump of pink rock with green balls in it'. He called it 'a pretty curio with no immediate explanation. It just went into a drawer to await developments'. Ten years or more later, when working on a thin section of the Cretaceous/Tertiary impact deposit from Haiti, the penny dropped. He realised that those little green balls he had collected from Churchwood Quarry were the same, or similar to the KT boundary deposit. (Walkden 2004)

I had read the both articles shortly after publication so, in 2009 when I visited the quarry, I asked Mark Mitchelmore about the spherulitic deposit. He said that most had been quarried away in the intervening years but, with a bit of luck, we might find some small pieces. We walked around the south west face of the quarry on the top of the limestone until reaching the graded face of the Mercia Mudstone. Within the red rock were small pieces of yellowish sandy rock more akin to the fine sandy deposits at the top of the Dolomitic Conglomerate. However, it was not plain sailing and we had to search a lot of the material before pieces were discovered containing the tell-tale little green balls. Mark told me that the original deposit was loaded with them but the pieces I was able to collect contained more sparse numbers. The photographs in the journal reports showed the green spherules to be abundant almost to the exclusion of other materials. Nevertheless, the specimens that we collected were good quality and show the spherules very clearly, photos 1 and 2. During lockdown I rediscovered my specimens of the green spherules which I collected that day and they inspired me to write this article.



Photo 1



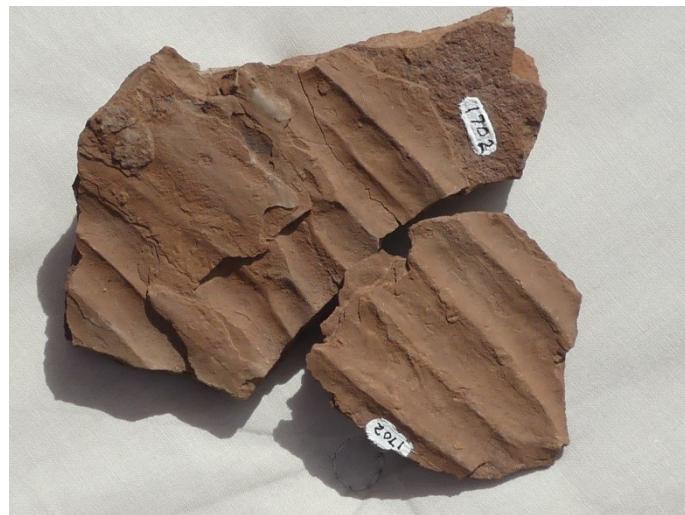
Photo 2 – Closeup

Gordon Walkden's scientific sleuthing on the green spherules eventually led to the conclusion that they had been formed by the impact of an asteroid at Manicouagan in northern Canada where a 100km crater exists from an impact that occurred during the Triassic. By dating techniques it was possible to place the age of the deposit at 214-215 mya.

Fake news? Well, up to a point because the impact was 2000 km away from Britain (since the Triassic, that distance is now 4400 km due to plate tectonics and the opening of the Atlantic Ocean). Not just up the Triassic road from Wickwar but the result of the impact, as we see, did leave its mark on the south Gloucestershire village, albeit in a way not obvious or devastating to the locals! There was no Atlantic Ocean in between us and Canada and the terrain at the time was an arid, windswept desert making it an ideal place for the landfall of an asteroid with the minimum of disruption to life on earth. There was been no major extinction recorded at that time in the Triassic. The impact caused melting of the rocks and

ejected it into the atmosphere. It was only over a long period that the finest ejected material slowly returned to earth but the coarser particles rained down across the planet a short time after impact. They were then washed from the surface by heavy rain storms into playa lakes, pools and wadis where they aggregated into shallow deposits (Curtis 1982).

At the quarry, these lagoons formed in the undulating topography of the Carboniferous limestones and concentrated the spherules in lenses. While looking for the spherule samples, I found some well-preserved fossil ripples in Mercia Mudstone, indicative of the shallow lagoonal conditions, photo 3.



In 2020 the only evidence of the effect of the impact about 214 mya, 20,000 km from Wickwar, lies in various museum collections and the scientific papers written about it. Nevertheless, it is a sober reminder that these events do happen albeit rarely and that, maybe sometime in the future there will be a similar deposit of little green balls over the village of Wickwar. Now, that would be true news!

### References

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Charles Hiscock

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## Jenni Patterson

It is with great sadness we share the news that one of our members Jenni Patterson passed away at her home in Bath on August 27<sup>th</sup>. Jenni will be sadly missed by all who knew her. She was quite an alternative thinker, a free spirit, and had her own way of interpreting geology. Jenni enjoyed the social coffee after the lectures but she enjoyed the field trips most. Jenni did not allow her illness to stop her way of life in any way; she managed to be in Australia for Christmas to meet her newest granddaughter but then had to return the UK just before lockdown. She is survived by her husband Ian, two sons and two young granddaughters. It is suggested that donations in her memory should be made to Dorothy House who cared for Jenni during the last few weeks.

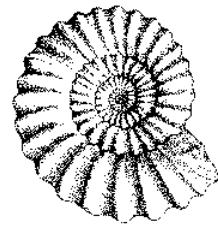
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## Membership

While we recognise the Society's events are currently only online, we would encourage those who are financially able, to re-join and continue their support. Thank you.

<https://bathgeolsoc.org.uk/membership.html>

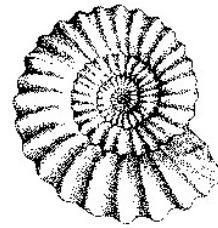
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# Bath Geological Society Newsletter

## End-October 2020

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During October the Society held the monthly lecture using Zoom video conferencing. The speaker was Jonathan Turner from Radioactive Waste Management. He gave a very interesting talk about the challenges of safely disposing of the radioactive waste generated in the UK over the last 70 years. Copies of his slides are available to view on the members' area of the website <https://bathgeolsoc.org.uk/members-area.html>

Our next virtual lecture will be held on **Thursday November 5th 2020**. Dr Ben Moon from Bristol University will be speaking to us about **Ichthyosaurs**. Members will be automatically registered and have been sent the meeting ID and password. Non-members are invited to attend but will need to register through Eventbrite to join the lecture. As always the lectures are free to members and we are asking for a £5 donations from non-members.

On **Saturday 7<sup>th</sup> November 2020** the Geologists' Association will be holding the **Festival of Geology** virtually; details will be available at <http://festivalofgeology.org.uk/> The Bath Geological Society is affiliated to the Geologists' Association and several of our members usually attend. This year Professor Maurice Tucker has produced a short video on William Smith in Bath and this can be viewed here <http://festivalofgeology.org.uk/bath-geological-society/>.

Cases of Covid-19 have increased dramatically during October and many parts of the UK are again returning to lockdown and stricter social distancing measures. The Committee continues to monitor the situation and we now expect to continue the programme of Zoom lectures for the remainder of the year and through to the spring of 2021. It is a stressful time for many people and I hope our regular newsletters and Zoom lectures can lift our spirits a little. If you have some geological news you would like to share we would love to hear from you. We hope you enjoy reading this Newsletter. Stay positive and stay safe.

Graham Hickman  
[chairman@bathgeolsoc.org.uk](mailto:chairman@bathgeolsoc.org.uk)

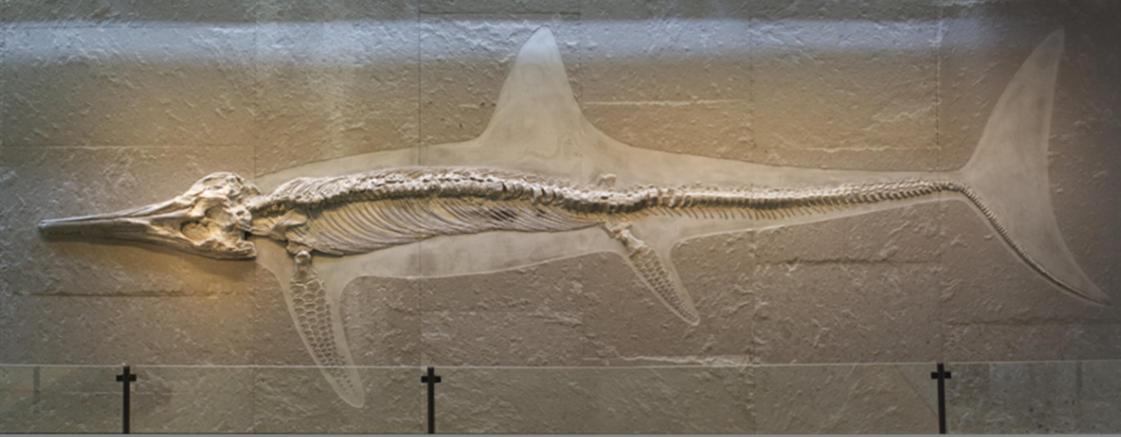
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### In this issue;

1. Mell Freeman shares some of her favourite finds.
2. Graham Hickman investigates the Warleigh Fault
3. Upcoming GA Festival of Geology on Nov 7<sup>th</sup> 2020

## Upcoming Zoom Lecture: November 5<sup>th</sup> 2020 at 7pm

Bath Geological Society Zoom Lecture  
Thursday 5<sup>th</sup> November 2020



Exploring Ichthyosaurs in the 21st Century  
Dr Ben Moon  
University of Bristol

Title: Exploring Ichthyosaurs in the 21st Century

By: Dr Ben Moon, University of Bristol

Thursday November 5<sup>th</sup> 2020 7pm

It has been over 200 years since Mary and Joseph Anning first discovered a remarkable new kind of animal on the Jurassic Coast. Now over 100 species have been described and named from all over the world and many spectacular finds revisited to give new insight into the diversity, evolution, and extinction of these remarkable reptiles. New specimens from the Early Triassic of China are expanding our knowledge of early ichthyosaur evolution and relationships, European finds illuminate a major bottleneck in their diversity, and global surveys show their final heyday and demise in the mid-Cretaceous. Moreover the place of ichthyosaurs within their ecosystems and how Mesozoic ocean ecosystems begun to be more like the present has been of particular recent interest. My research has covered ichthyosaur interrelationships, sensory anatomy, and evolutionary rates, part of a new wave of research into this old group. In this talk I'll present a summary state of the art of ichthyosauromorphology, as well as prospects for the next two centuries.

Lectures are FREE for Bath Geological Society members. We will send you joining instructions.

Email: [programme@bathgeolsoc.org.uk](mailto:programme@bathgeolsoc.org.uk)

£5 donation via Eventbrite requested from non-members and visitors.

[Get Tickets](#)

<https://www.eventbrite.co.uk/e/exploring-ichthyosaurs-in-the-21st-century-tickets-124692706241?>

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## Favourite Finds – Mellissa Freeman

Mellissa writes; I picked this up from the side of a dirt track in the middle of the Serengeti somewhere while on a jeep safari. I saw something green out of the corner of my eye and shouted “stop”! I think I frightened the driver a little. Jumped out and picked it up. I think it's quartz but am not sure. Any ideas?

Please send in your suggestions



Mellissa writes; This beauty came from one of the quarries at Ashton Keynes in Gloucestershire. One of the quarries used to open up to the general public for a kid's fossil hunt. The kiddies can turn up with a bucket and spade, taking home anything they find. I'm a big kid so went along and had a super day. I actually found this on the way out.

I have no idea what type of ammonite this is? Any ideas?



We asked Dr Michael Oates what he thought this was his reply;

‘It looked familiar and the locality is probably the reason. It has the preservation of Cornbrash ammonites from Shorncote Quarry (in the Water Park) and I’d suggest the lower part of that Formation, so upper Bathonian in age.

It’s definitely a Perisphinctid. The identity I reckon is Choffatia subbakeriae (also known as Perisphinctes subbakeriae) it is a really fine specimen. If it needs a home it would look quite good in Barrow Museum as well as filling a serious gap in representative Bathonian ammonites!

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## The Warleigh Fault – by Graham Hickman

The Variscan Orogeny was a late Carboniferous through Permian tectonic event resulting from the collision of Laurasia and Gondwanaland to form the supercontinent Pangea. It is responsible for adding Devon, Cornwall and part of South Wales to the UK. During this time Palaeozoic rocks were compressed with resulting east-west fold axes and thrust faults.

The Bath area sits at the northern edge of the Variscan front, the thrusts, folds and faults which resulted made the Bristol Somerset coal fields some of the most difficult deposits to mine. The overlying Mesozoic strata however show relatively little deformation, with gentle regional dip to the SE and a series of minor E-W faults. Further south, into the Wessex basin, the Palaeozoic basement structures affect the Mesozoic strata. Large faults seen as Pewsey and Mere were active during Mesozoic times and are believed to link to the underlying Variscan thrusts (**Figure 1**).

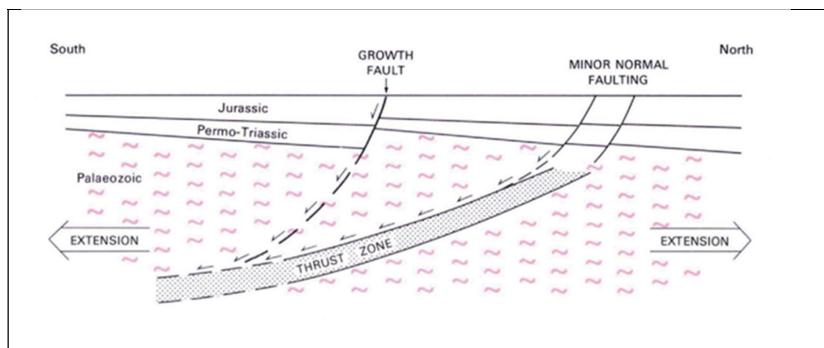


Figure 1.

Reactivation and reversal of a Variscan thrust zone to explain Mesozoic growth on the Vale of Pewsey Fault. (Chadwick et al. 1983).

Minor E-W faults are observed in the Mesozoic around Bath. One such fault is the Warleigh Fault near Browns Folly. An area familiar to many of the members of the Bath Geological Society. The BGS i-geology map (Figure 2), covers an area between Batheaston and Winsley, it shows the Warleigh Fault running across the Avon valley with a slightly more SW-NE orientation. At depth the Warleigh fault is believed to be an eastern extension of Farmborough Thrust. The thrust is a Variscan structure which has been mapped from coal mining activities in the Radstock syncline.

On the map the Warleigh Fault is shown using a dashed line. The use of a dashed line indicates that the fault position is uncertain due to the superficial deposits across the valley such as; mudslides and cambering.

Much is written about the Warleigh fault in the BGS explanation guide to Sheet 265, pages 20-21. I decided to investigate further.

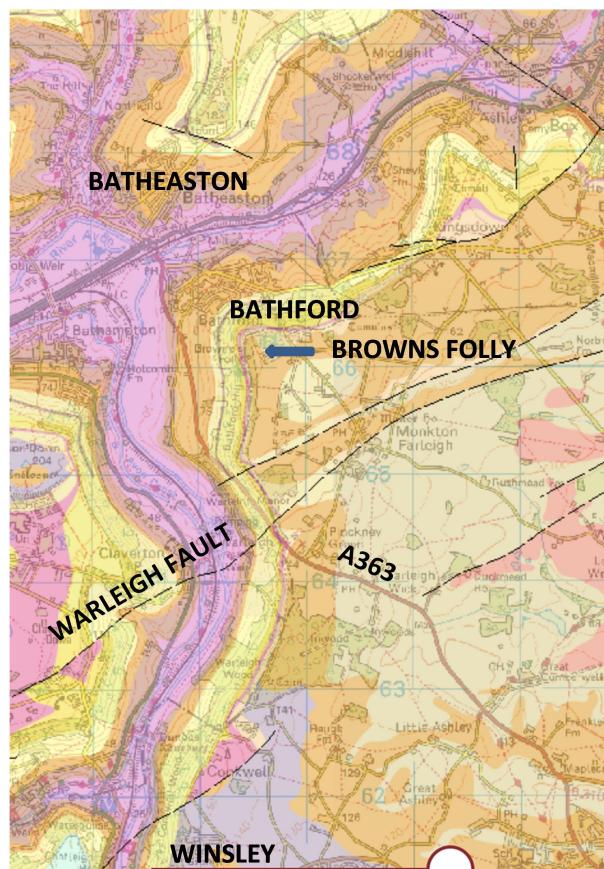


Figure 2 i-geology map courtesy of BGS

On the 1:10,000 scale geology map around Monkton Farley (Figure 3), parts of the faults have been drawn as solid lines rather than dashed lines. This indicates that there was evidence in the field to suggest the position of the fault could be drawn with more confidence; these areas have been highlighted in yellow and are mainly on the plateau areas where the superficial deposits are less. In addition to the Warleigh Fault it also shows the lesser Monkton Farley fault (to the north). Both faults down throw to the south.

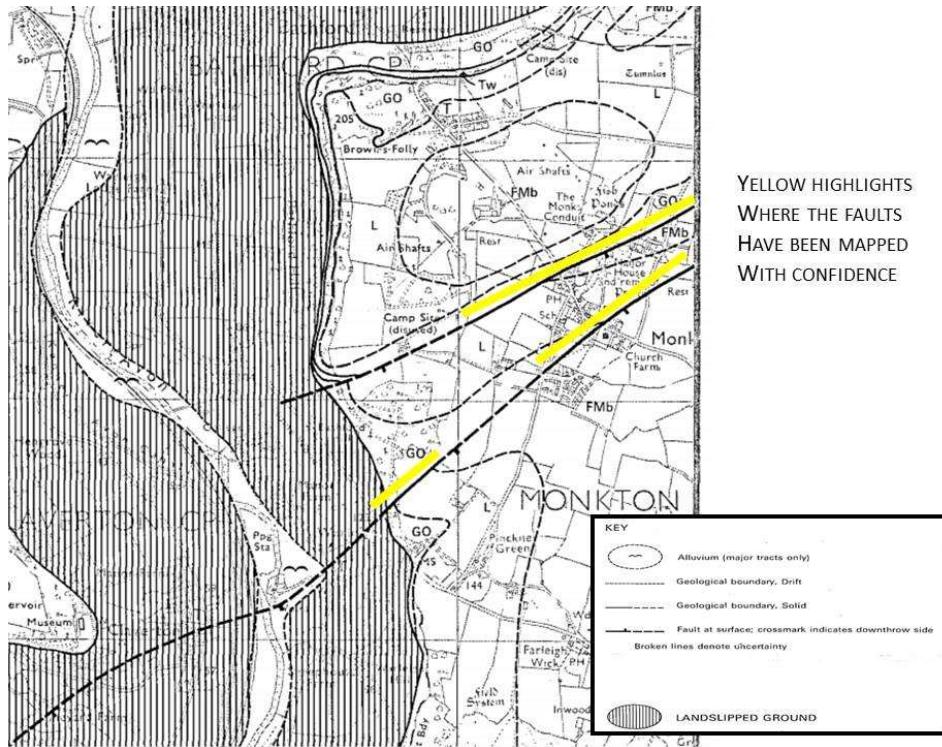


Figure 3

The BGS explanation guide to Sheet 265 describes how the fault can be seen a depth on seismic data. Using the UK onshore geophysical library I was able to locate a map (Figure 4.) showing seismic line (PPBW-87-003) which was shot from Bathford along the A363 (Sally-in-the-Woods) then along the B3105 near Bradford-on-Avon. The seismic line was acquired by Spectrum geophysical for the client Pendle Petroleum Limited in September 1987 for oil exploration purposes.

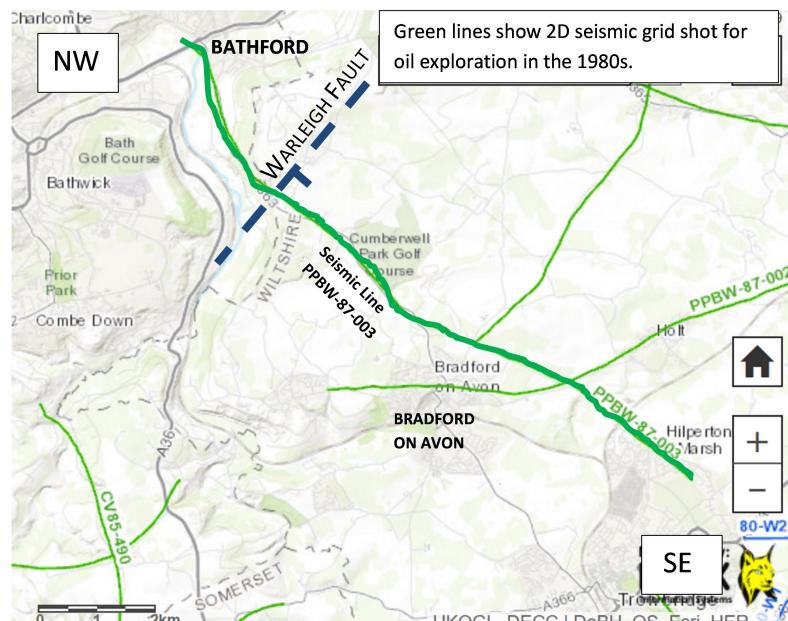
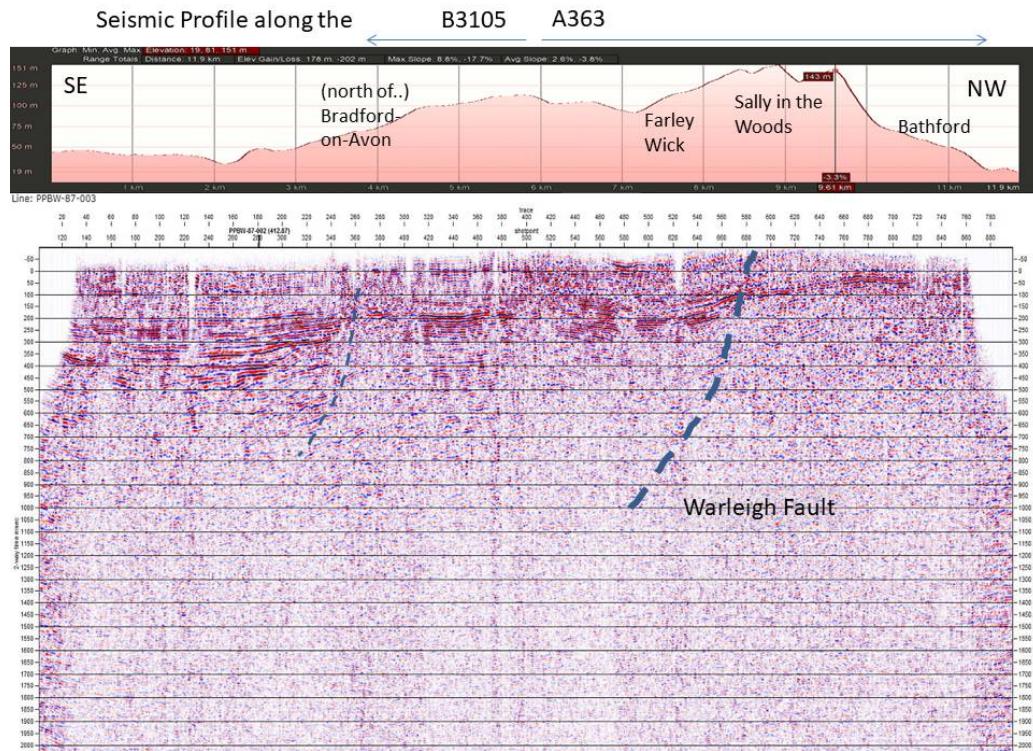


Figure 4.

Figure 5. Seismic Profile PPBW-87-003



The seismic line (Figure 5) has been displayed along with an elevation profile and annotation to assist with its location. There is a distinct change in the character of the seismic on either side of the Warleigh fault.

To the north a single event is seen at around +100ms TWT (Two way time). The seismic datum is 0=msl so +100ms TWT is probably around -125m below msl. Below the ground surface this would be 250m. This is probably the Mesozoic -Palaeozoic unconformity. On the south side of the Warleigh fault the reflections are deeper, at around +200ms TWT and there are additional events, this has been interpreted as an expanded Triassic section indicative of a growth fault. Further along the line, north of Bradford on Avon, another fault can be seen, this is the probably associated with the Atworth-Lacock fault.

These vintage seismic lines are widely spaced and of poor quality. However, they provide a valuable insight into the hidden geology below the Mesozoic strata and highlight the geological significance of features such as the Warleigh Fault.

#### References

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Chadwick, R.A, Kenoly, N, and Whittaker, A. 1983. Crustal structure beneath southern England from deep seismic reflection profiles. Journal of the Geological Society, 140, 893-911, Nov. 1983

## GA Festival of Geology – Saturday November 7<sup>th</sup> 2020 10am-5pm



On Saturday 7th November 2020 the Geologists' Association will be holding the Festival of Geology virtually; details will be available at <http://festivalofgeology.org.uk/>

The following FREE public lectures will be given virtually through the day followed by live Q&A;

1. **The day the Dinosaurs Died** by Prof. Philip Manning, Manchester University
2. **Above and Beyond: Drones are changing the way we monitor volcanoes** by Dr Emma Liu, University College London
3. **The geology of the Thames Tideway Tunnel** by Dr Tim Newman, Tideway London
4. **UV-B radiation was the terrestrial killer at the Devonian-Carboniferous boundary** by Prof. John Marshall University of Southampton

The Bath Geological Society are affiliated to the GA and have contributed a pre-recorded talk by Professor Maurice Tucker on William Smith in Bath. It can be viewed here <http://festivalofgeology.org.uk/bath-geological-society/>

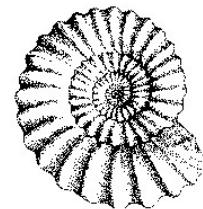
There will also be virtual events; exploring museums, virtual field trips, rock shops, contributions from local geology groups. Within the Discovery Room there will be themed activities for children, a mix of Rockwatch activities, live Earth science themed workshops from the GeoBus and Hidden Horizons plus videos, downloads and more!

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### Membership

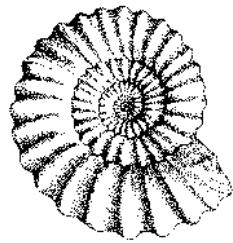
While we recognise the Society's events are currently only online, we would encourage those who are financially able, to re-join and continue their support. Thank you.

<https://bathgeolsoc.org.uk/membership.html>



# Bath Geological Society Newsletter

## End-November 2020



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During November the monthly lecture using Zoom was given by Dr Ben Moon from Bristol University. This was a very interesting and comprehensive lecture about Ichthyosaurs and covered how they evolved to how they eventually became extinct. Copies of his slides are available to view on the members' area of the website <https://bathgeolsoc.org.uk/members-area.html>

Our next virtual lecture will be held on Thursday December 3rd 2020. Professor Tim Elliott from Bristol University will talk about Meteorites, his talk is titled; Recipes for Making the Earth. Members will be automatically registered and have been sent the meeting ID and password. Non-members are invited to attend but will need to register through Eventbrite to join the lecture. As always the lectures are free to members and we are asking for a £5 donations from non-members.

On Thursday November 5<sup>th</sup> England went back into lockdown as cases of Covid-19 increased, it remains to be seen how quickly things will open up again in December for the lead up to Christmas. The Committee continues to monitor the situation and we now expect to continue the programme of Zoom lectures through to the spring of 2021. We have received positive feedback for the Zoom lectures and we are grateful to the speakers who have provided some excellent and interesting presentations.

It is a stressful and uncertain time for many people. I hope our regular newsletters and Zoom lectures can lift your spirits a little. The social chat after our Zoom has been quite uplifting and we are considering having a Zoom social 'mince pie and drink' later in December. If you have some geological news you would like to share we would love to hear from you. We hope you enjoy reading this Newsletter. Stay positive and stay safe.

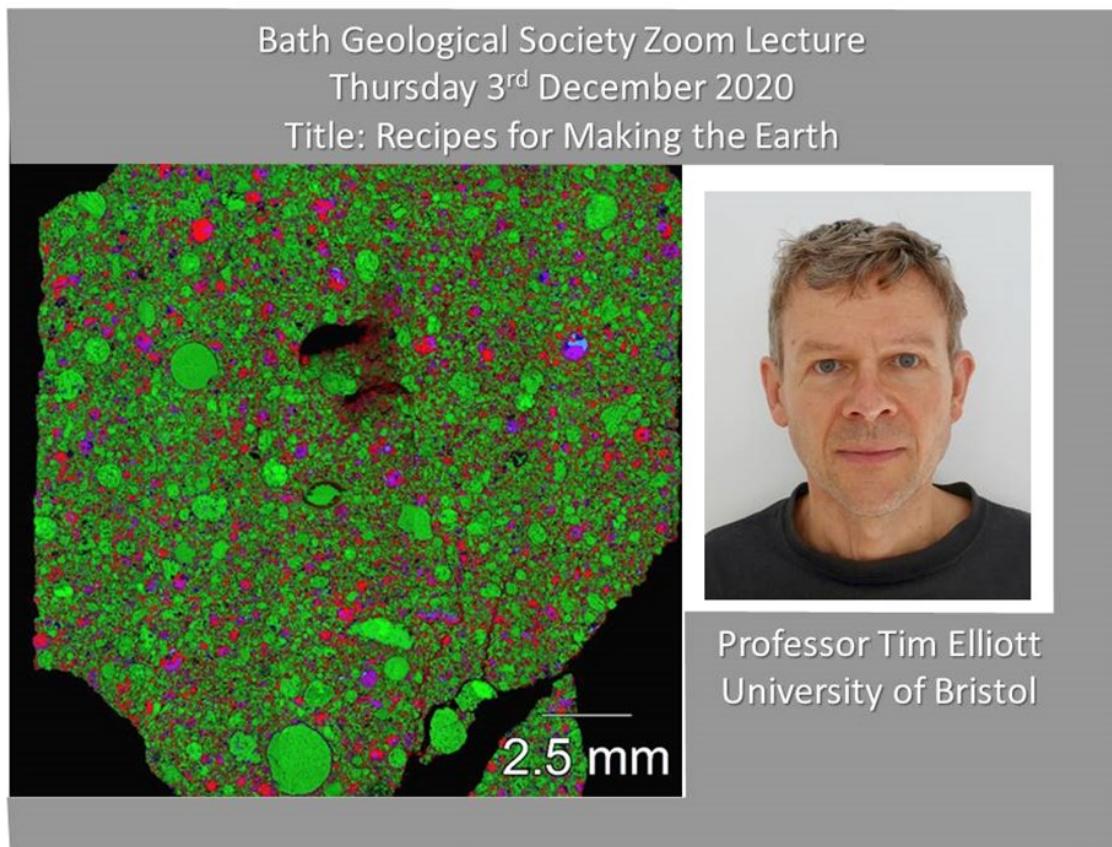
Graham Hickman  
[chairman@bathgeolsoc.org.uk](mailto:chairman@bathgeolsoc.org.uk)

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### In this issue:

1. Website Update by our Webmaster James McVeigh.
2. Recorded talks from the GA Festival of Geology until 31.Dec
3. Half a decade of change in just a few months – Graham Hickman
4. 2019 Excavation of the Strawberry Bank Lagerstätte
5. More of Mell's Rocks

**Upcoming Zoom Lecture: November 5<sup>th</sup> 2020 at 7pm**



**Bath Geological Society Zoom Lecture.**

**Title: Recipes for Making the Earth**

**By: Prof Tim Elliott, FRS, University of Bristol**

**Thursday December 3rd 2020 7pm**

**Abstract:** The main ingredients usually invoked to make planets are primitive meteorites, the chondrites. Although believed to be broadly representative of the solar disk from which planets grew, there are subtle differences in the compositions of different chondrite groups. An important question has therefore been what quantities of the different chondrites are needed to make the Earth. It transpires that one answer is obtained by considering elemental compositions and another using their isotopic characteristics. I argue that this dilemma is resolved if elemental abundances are modified by vapour loss as a natural consequence of the energetic process of collisional planetary accretion. So overall, a respectable Earth can be made from a starting composition of enstatite chondrite that has been wantonly over-cooked.

Lectures are FREE for Bath Geological Society members. We will send you joining instructions. Email: [programme@bathgeolsoc.org.uk](mailto:programme@bathgeolsoc.org.uk)

£5 donation via Eventbrite requested from non-members and visitors.

[Get Tickets](#)

<https://www.eventbrite.co.uk/e/recipes-for-making-the-earth-tickets-129993452917>

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## Bath Geological Society Website Update by James McVeigh



The screenshot shows the homepage of the Bath Geological Society website. At the top is a dark header bar with the society's logo and the text "Bath Geological Society". Below this is a white main content area. On the left side of the content area, there is a sidebar with the title "About the Bath Geological Society" and a sub-section titled "Who Are We?". The main content area contains a paragraph describing the society's membership and activities.

About the Bath Geological Society

Who Are We?

Bath Geological Society is an active and flourishing organisation with about 50 enthusiastic members whose ages range from 17 to 90. Our membership includes every type of geologist from recreational fossil-hunters to academic and professional geologists.

The modernisation of the society's website is something that had long been planned but had been hindered by limitations on where it was stored. Many years ago, the University of Bath had generously offered space on one of their servers for the website to be hosted free of charge. As you might imagine, security was tight and some of the constraints included an inability to assign our domain name [www.bathgeolsoc.org.uk](http://www.bathgeolsoc.org.uk) to the server and restrictions concerning what types of computer code we could run. In order to use our domain name, the society's webmaster (at the time) made use of something called an **iframe**.

### ***The iframe Legacy...***

An iframe is HTML code that allows a separate web page to be loaded within another. Our domain was assigned to a single near-empty file that ran an iframe, which in turn, loaded the bath.ac.uk website that held our society pages. As the file contained little more than the iframe, it appeared to users that they were visiting the website directly. This proved to be a clever method for the Society to use the University's server and thus save the society money on website hosting. However, one of the side effects of this technique is that whenever a link on the website was clicked, the new page was loaded within the iframe only; your browser still showed that you were on bathgeolsoc.org.uk, even if you were to navigate to Google.com. Some of the resulting problems include; only being able to bookmark the homepage, the inability to use direct links to promotional material within the website, browsers stored old copies of the cache rather than the latest version, both bathgeolsoc.org.uk and the true bath.ac.uk domain appeared in search engines causing confusion as the website appeared to be duplicated/split across multiple domains.

The iframe technique penalised our website in terms of search engine optimisation (SEO), as bathgeolsoc.org.uk consisted of a single file it could only rank for a single page on search engines. The true nature of the website could not be kept hidden from search engine bots and details of the iframe file were presented in the search engine listing rather than the website within the iframe. Overcoming these problems wouldn't be possible whilst we continued to use the University's servers. Additionally, much of the modern code we wanted to use for a new version of the site was blocked by the server's security system.

### ***New Server space opens door to new features...***

In late 2019 an alternative server space (from Microsoft) was discovered that is free, reliable, trustworthy and modern, while also allowing domain assignment. Using this new space, our website could have additional URLs such as <https://bathgeolsoc.org.uk/lectures/> instead of just the home page. Today, the website has 633 pages, each of which rank individually on Google and other search engines. The new server space also opened the door to implementing new features; added search and filtering functionality to the [lectures](#), [field trips](#)

and [journal archive](#) pages. The lecture and field trip pages also default to showing upcoming events only.

The screenshot shows the homepage of the Bath Geological Society. At the top, there is a navigation bar with links to Lectures, Field Trips, Journal, Membership, Local Geology, and About. Below the navigation bar, the text "Bath Geological Society Journal Archive" is displayed. At the bottom of the page, there is a search bar labeled "Search journal articles" and dropdown menus for "Year" and "Topic".

The main menu is now accessible on every page of the website, allowing visitors to browse the content much more easily. The website is now optimised to display correctly on smartphones and tablets in addition to desktop computers. New members can now join the society by completing the form on <https://bathgeolsoc.org.uk/membership.html> completing this form also adds them to our email list automatically. For existing members we now have a password protected member's area <https://bathgeolsoc.org.uk/members-area.html> providing access to the current journal, recent lecture slides and more.

For the Webmaster the new feature of “version control” is a huge benefit as it stores a full version history of every file and page, and with a growing website of over six hundred pages to manage, that is a great thing to have! I hope you can take some time to explore our website and search through the Journal archive for articles that might interest you.

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**Recorded talks from the GA Festival of Geology** are available online until 31<sup>st</sup> December. <https://festivalofgeology.org.uk/lectures-and-break-out-rooms/>

[Above and Beyond: Drones are changing the way we monitor volcanoes](#)  
by Dr Emma Liu, University College London

[The geology of the Thames Tideway Tunnel](#)  
by Dr Tim Newman, Tideway London

[UV-B radiation was the terrestrial killer at the Devonian-Carboniferous boundary](#)  
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[The day the Dinosaurs Died](#)  
by Prof. Philip Manning, Manchester University

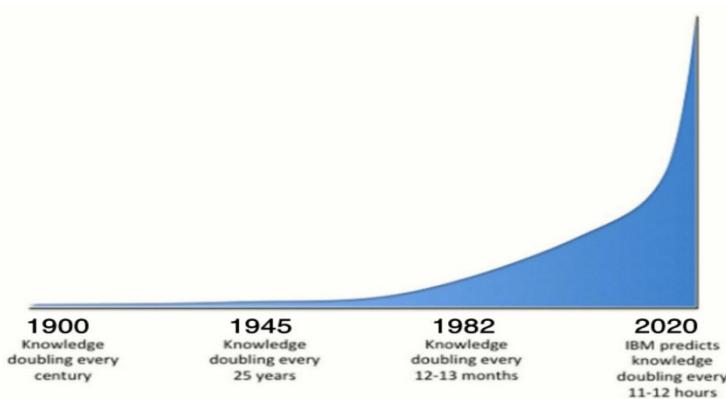


## Half a decade of change in a few months by Graham Hickman

The world is constantly changing; the weather and the seasons change at a rate we can track and feel comfortable with. Some changes are imperceptible and may take millions of years, such as the geological processes that we are unable to perceive during our short life-time.

During the COVID-19 pandemic many things in our world have been changing rapidly. We have been introduced to new terms; lockdown; social distancing, furlough, self-isolating, track and trace to name just a few. Our urban environments have been changing we have begun to see wider pavements, one-way systems and ‘pop-up’ bike lanes. Face masks and hand sanitizer are now required to go shopping and cash is being rejected in favour of card payment. Many of the changes which were already underway before the pandemic have now been accelerated, it is expected that 2020 will show a step-change in their universal acceptance.

Solving the coronavirus pandemic is one of the most urgent issues facing society today and huge efforts are being put in across the globe to develop vaccines, with accelerated trials and testing, compressing what usually takes years of research into a matter of months. This got me thinking about the “Knowledge Doubling Curve” a phrase originally introduced by R. Buckminster Fuller in 1982. (Diagram below).



He noted that human knowledge had doubled every century until 1900, but by the end of WW2 knowledge was doubling every 25 years. IBM later predicted that by 2020 with the ‘Internet of Things’ knowledge would double every 12 hours. It is easy to see with the additional learnings from Artificial Intelligence the runaway knowledge train.

It is worth pointing out several things; different types of knowledge grow at different rates, we are limited in our ability to absorb that knowledge and the usefulness of some knowledge diminished with time. As geologists when new knowledge become available we need to critically review, relearn and replace old terms. The advent and acceptance of plate tectonics as a unifying theory in the 1980s was one such knowledge shift with terms such as anticlinorium and geosyncline falling from use. Stratigraphic terminology changes over time as the BGS refines their methods for detailed stratigraphy and naming. Familiar names such as the ‘Bunter Sandstone’ have become the “Sherwood Sandstone Group”. Fossil names have also quietly changed over time as new researchers add additional species, regroup and classify the old ones.

In the context of the current pandemic while we are at home during lockdown, feeling like nothing is going on, we need to remember we are witnessing rapid changes to the world we are living in. In some areas it is fair to say that half a decade of change has happened in just a few months!

## 2019 Excavation of the Strawberry Bank Lagerstätte

In September 2019, with the financial assistance of the Geologist's Association, a team of geologists and palaeontologists rediscovered the highly fossiliferous site known as 'Strawberry Bank' in Somerset. In the 1840s Charles Moore collected exquisitely preserved fossil fish from this site, many of which are now in the collection at BRLSI. The site was however lost since the 1860s. The coordinated scientific dig took place over three days and involved specialists from the University of Bristol, Bristol City Museum, the National Museum of Wales and the University of Cardiff. Numerous samples were collected and future scientific publications resulting from new research can be expected. Details of the dig and initial finds can be found here: [Geologists' Association magazine Vol. 19, No.2 2020. pages 41-44](#)



Figure 2: Matt (left) discusses the sedimentology with Maurice Tucker.



Figure 3: Mike Benton (front), Maurice Tucker, Ben Moon, and Cindy Howells line up in the trench, and Andy King supervises

## Mell's Geode

This month Mellissa Freeman shares another photo from her collection. The photo is of a geode collected near Payson, Arizona. USA.

Geodes are formed when a hollow cavity in a rock formation become lined with crystals, usually as a result of percolating mineral rich fluids. If the crystals have not completely filled the cavity it will give a hollow sound if gently tapped and will feel lighter than a rock of similar size.

The quartz crystals lining the inside of the cavity are generally more resistive to weathering than the surrounding rocks in which they formed.



## Membership

While we recognise the Society's events are currently only online, we would encourage those who are financially able, to re-join and continue their support. Thank you. <https://bathgeolsoc.org.uk/membership.html>

