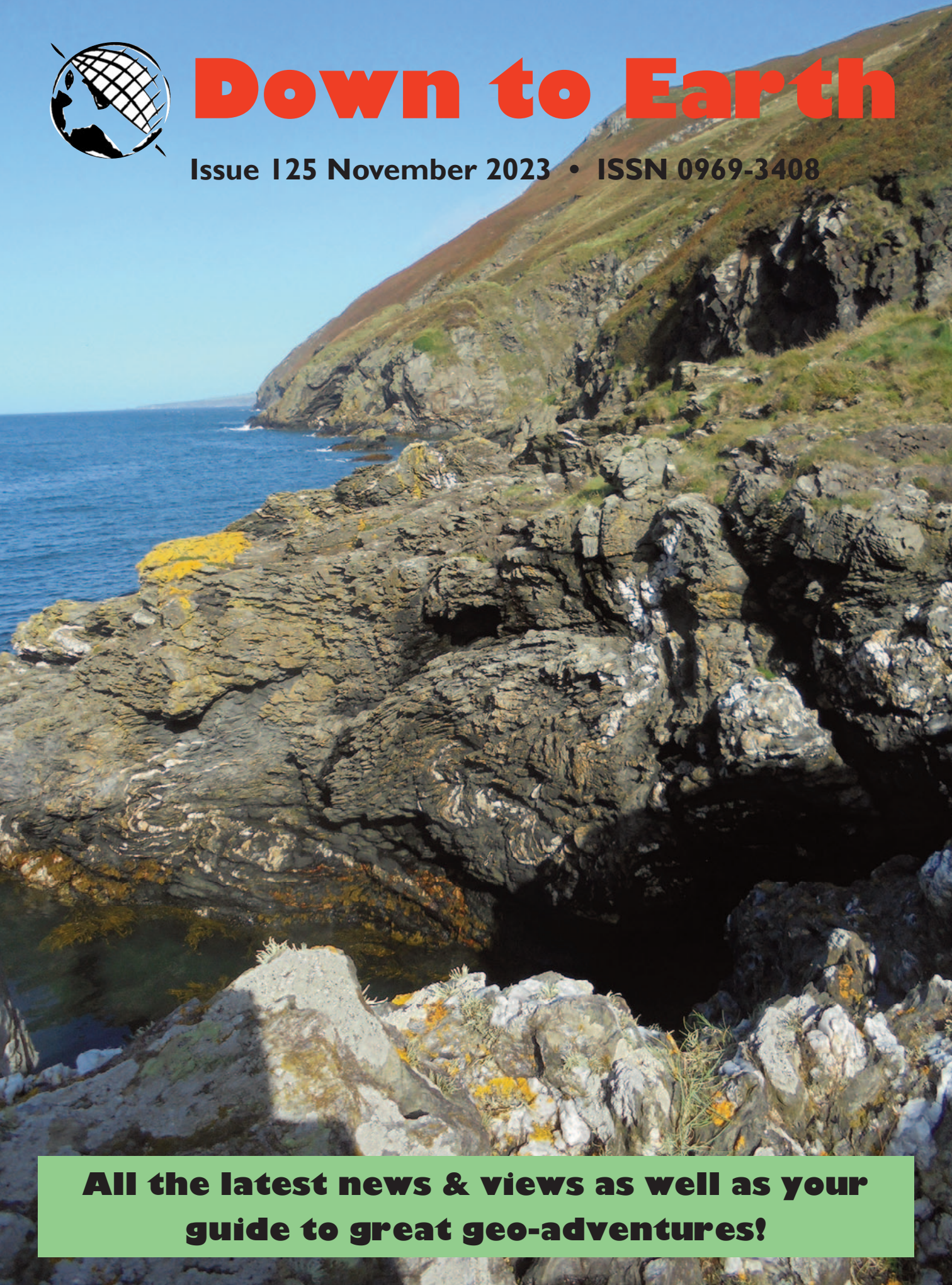




Down to Earth

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New Red Sandstone cliffs at Bridgnorth the base for
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(Image: Wikipedia)

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We welcome your contributions, which should be with us no later than January 15th 2024 for the February issue.

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cover story

Some of the best geology, we often find, is discovered by going off the beaten track and so it proved here.

This is Fleshwick Bay near Port Erin in the Isle of Man. It shows folded Manx Group slates and phyllites with numerous quartz veins.

(Image: Chris Darmon)



editorial

Is climate change beginning to have a lasting impact on tourism?

When was the last time that you went abroad on holiday? For some of you it will be in the last few months, for others it will be not since before COVID. If it's the latter then you may have decided that your days of a flight to somewhere like the south of Spain or the Canaries are behind you for good. If so, then you are joining the many who are contributing to long term, or even permanent changes in the patterns of tourism.

Every year for a number of years before COVID we ran a February trip to either one of the Canary islands, or the Portuguese island of Madeira. But for the past two years trips to Fuerteventura and Tenerife have both failed to attract enough people to run them. Yet earlier this year we had record numbers for a trip to Iceland and next year our trip to Norway is running.

So many factors are at play at the moment. At home we have the cost of living, especially the high prices of energy and food. We have more and more freak weather events that are impacting on the lives of people with so many experiencing life changing and life threatening events. These act to reduce people's confidence, to some to the extent that they dare not go away and leave their property.

Abroad, there have been incidents of extreme temperatures and wildfires. The latter have certainly had a big impact on tourism in places like Tenerife. Who would think of booking a holiday to somewhere where you might be unable to access half of the island?

Then there are the people, who for sound reasons often connected with climate change, have decided to reduce their own carbon footprint and cut down or even stop flying. I say 'good on you, you are making a personal sacrifice for the good of us all'.

As demand falls, even for previously popular holiday resorts, the airlines do predictable things. Prices go up and the level of service falls. Previously it was easy to get flights from UK airports to any of the Canary islands now it's not so easy, especially in the Winter months. Recently, I was searching for flights to Bergen in Norway and whilst it was still possible to get a direct flight the choice of UK airports was limited and you could only fly on certain days.

Turning to the UK, the current economic situation is impacting heavily on the tourism industry. Hotels are being forced to cutback on their service, with some now closing at least one day each week. Many others are changing their style of service by reducing the range of meals on offer or the length of time that they open for breakfast or evening dinner.

Who would be a hotelier in these challenging times? For everyone in the industry, including ourselves, planning and running trips is getting ever more difficult. But, that said, we and our partners - the hotels and restaurants that we use - are confident that we will continue to provide you with great experiences. Funnily enough, group travel is one of the success stories of UK tourism with bus and coach trips back to the levels they were before COVID.

Have a good Christmas & New Year!

Chris Darmon, Editor

Burgess Shale, the rock that keeps on giving...

For more than hundred years the name of Charles Doolittle Walcott curator of the Smithsonian Museum in Washington has been inextricably linked to an outcrop of the Burgess Shales. Here, in Lower Cambrian shales, Charles found a veritable treasure trove of exquisite fossils, especially a hoard of fantastic and weird arthropods

Ever since that day in August 1909, scientists have wondered at the significance of the fossils, that have given us a unique window into the early Cambrian world. What nobody appears to have asked, until now, is ‘are there certain types of clay that increase the chances of soft-bodied fossil preservation?’ Instead they have focussed their attention on the organisms themselves.

The researchers have published their findings in the online journal *Trends in Ecology and Evolution*. Among the team of eminent authors is the famous Yale Professor Derek E Briggs, who has worked on early fossils for many years. The starting point for their work is the disconnect between estimates for animal antiquity based on molecular clocks that point towards an age of around 800 Ma and the fossil recorded that takes us to roughly 574 Ma.

This mismatch has traditional been explained by the early animals being too small, soft or fragile to be fossilised. But perhaps it has more to do with the mineralogy the shales in which these fossils are being potentially hosted.

This new research has looked at the mineralogy of the Burgess Shales which preserves soft tissue of various kinds, and compared it with other shales from the late Proterozoic. They concluded that Burgess Shale type deposits are rare. Those that were dated at more than 789 Ma did not contain any fossil remains, so they conclude that this marks the maximum age for soft animal preservation.



This is the site of Walcott's famous Burgess Shale Quarry in the Canadian Rockies. (Image: Burgess Shale Geoscience Foundation)

It's clear there's a lot about the background to the Burgess Shales that we are not fully conversant with at the moment. Fossilisation, particularly of soft parts, is a complex process involving chemical interaction between the host rock and the soft tissue.



An example of the amazing fauna from the Burgess Shales - an unusual arthropod.

(Image: Royal Ontario Museum)

The concluding remarks in the paper set the scene really well: “The antiquity of animals remains one of the most fundamental yet elusive questions in biology. Although the fossil record and molecular clocks often yield conflicting estimates for the origin of animals, a clearer understanding of fossilisation conditions, particularly of Burgess Shale type preservation, may hold the key to reconciling these disparate data. Integration of soft maximum bounds constrained by taphonomic data into molecular clocks offers the prospect of a more robust chronology for early animal evolution.”

The authors clearly see this as the starting point for a lot more research that might ultimately reconcile the different datasets. What is clear is that Charles Doolittle Walcott would be delighted that his chance find in 1909, continues to give in spadefuls to the scientific community.

You can read the full paper here:

[https://www.cell.com/trends/ecology-evolution/fulltext/S0169-5347\(23\)00137-4](https://www.cell.com/trends/ecology-evolution/fulltext/S0169-5347(23)00137-4)

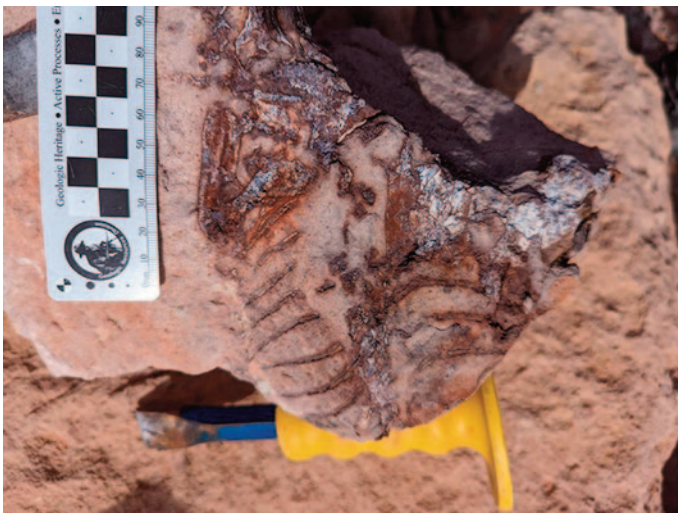
Rare early mammal remains found in Lake Powell, Utah State, USA...

Whilst the US state of Utah is commonly home to Jurassic dinosaurs, the same cannot be said for mammal remains of the same age. Now, thanks in part to the lake being at a low level, Lake Powell has revealed something very special indeed.

The following comes from phys.org who sourced it from the National Park Service:

“While documenting fossil tracksites along a stretch of Lake Powell, a Glen Canyon National Recreation Area (Glen Canyon NRA) field crew discovered the first tritylodontid bonebed found in the Navajo Sandstone in Utah. These extremely rare fossils are one of the more important fossil vertebrate discoveries in the United States this year.

The discovery included body fossils like bones and teeth, which are rare in the geologic formation known as the Navajo Sandstone within the Glen Canyon Group. This new discovery will shed light on the fossil history exposed on the changing shorelines of Lake Powell.



A partially articulated skeleton of a tritylodont found in the Navajo sandstone of Lake Powell in Utah.
(Image: Vincent Santucci/National Park Service)

In March 2023, paleontologists were documenting fossil tracksites when they discovered a rare fossil horizon that was full of the impressions of bones and bone fragments of tritylodontid mammaliaforms, or early herbivorous mammal-relatives from the Early Jurassic (approximately 180 million years ago).

The site had been submerged by Lake Powell's fluctuating water levels and was only found because the paleontologists were in the right place at the right time before annual snowmelt filled the lake. Field teams were only able to access the location for a very short window of time (approximately 120 days) to recover the fossils. Additionally, another rare bone bed was discovered nearby in the slightly older Kayenta Formation.

The crew collected several hundred pounds of rocks encasing the fossil bones and skeletons at the site. These will be scanned with X-ray computerized tomography (CT) at the University of Utah South Jordan Health Center, mechanically prepared and studied at St. George Dinosaur Discovery Site at Johnson Farm (SGDS) by the lab and collections crew volunteers, with help from Petrified Forest National Park and the Smithsonian Institution.



Glen Canyon National Recreation Area
(Image: US National Park Service)

The fossils will become part of the Glen Canyon NRA museum collections to be housed at the Prehistoric Museum in Price, Utah. Studying these fossils will help paleontologists learn more about how early mammal relatives survived the mass extinction at the end of the Triassic Period and diversified through the Jurassic Period.

Andrew Milner, site paleontologist and curator at SGDS, is the lead author of an article describing a related site published in the open access journal *Geology of the Intermountain West*.

Alpine rocks shed light on the dynamics of the Earth's interior...

Over the last couple of years we've brought you a number of plate tectonics stories that, taken together, have shed new light on the dynamics of the Earth's interior. A number have suggested that movement occurs much deeper in the Earth, even down in the deep mantle.



Lucie Tajčmanová from Heidelberg University, examines the Alpine whiteschist from Dora Maira Massif in the Western Alps.
(Image: Sebastian Cionoiu, Heidelberg University)



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Now an international team of geoscientists, led by Goethe University in Frankfurt, have carried out computer modelling that brings into question even more conventional plate tectonics theory.

The starting point for their work was the Alpine White Schist. This rock from the Dora Maira Massif of the Western Alps has been buried deep in the Earth and has now returned to the surface. During the process it has been metamorphosed by ultra high pressure (UHP). quartz (SiO_2) becomes coesite, or the UHP polymorph of quartz. This mineral is denser than. normal Quartz and scientists can, using lithostatic pressure, correlate pressure with depth.

Until now the conventional wisdom had it that UHP rocks formed at a depth of around 120 km and returned to the surface, at a later date, when essentially the plate material returned to the surface. It was assumed that the process was long and that the pressure reduced at an ambient rate. The new research points to wholly different conclusions. Thibault Duretz, is head of the Geodynamic Modelling Working Group at the Department of Geosciences at Frankfurt's Goethe University:

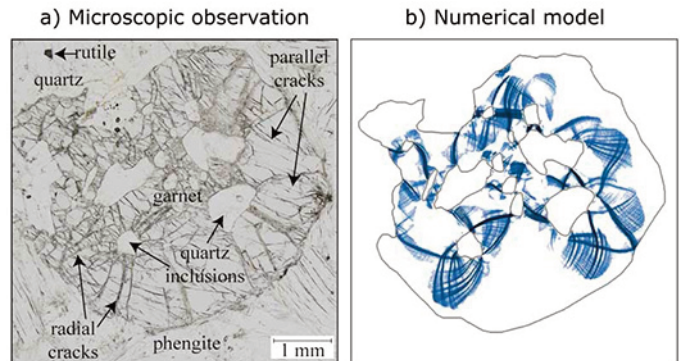
“Whiteschists are rocks that formed as a result of the UHP metamorphosis of a hydrothermally altered granite during the formation of the Alps,” explains Duretz. “What is special about them is the large amount of coesite. The coesite crystals in the whiteschist are several hundred micrometers in size, which makes them ideal for our experiments.” The piece of whiteschist from the Dora Maira Massif contained pink garnets in a silvery-white matrix composed of quartz and other minerals. “The rock has special chemical and thus mineralogical properties,” says Duretz. Together with the team, he analysed it by first cutting a very thin slice about 50 micrometers thick and then gluing it onto glass. In this way, it was possible to identify the minerals under a microscope. The next step was computer modelling of specific, particularly interesting areas.



Preparation of the whiteschist involved making a thin section before computer modelling could begin.

These areas were silica particles surrounded by the grains of pink garnet, in which two SiO_2 polymorphs had formed. One of these was coesite, which had formed under very high pressure (4.3 gigapascals). The other silica polymorph was quartz, which lay like a ring around the coesite. It had formed under much lower pressure (1.1 gigapascals). The whiteschist had evidently first been exposed to very high and then much lower pressure. But crucially, there had been a sharp decrease in pressure or decompression. The most important discovery was that spoke-shaped cracks radiated from the SiO_2 inclusions in all directions: the result of the phase transition from coesite to quartz. The effect of this transition was a large change in volume, and it caused extensive geological stresses in the rock. These

made the garnet surrounding the SiO_2 inclusions fracture. “Such radial cracks can only form if the host mineral, the garnet, stays very strong,” explains Duretz. “At such temperatures, garnet only stays very strong if the pressure drops very quickly.” On a geological timescale, “very quickly” means in thousands to hundreds of thousands of years. In this “short” period, the pressure must have dropped from 4.3 to 1.1 gigapascals. The garnet would otherwise have crept viscously to compensate for the change in volume in the SiO_2 inclusions, instead of forming cracks.



Fine structure of the whiteschist sample: One of the pink garnet grains (left), embedded in a matrix of quartz, rutile and phengite with SiO_2 inclusions (quartz inclusions), from which cracks originate. Numerical models (right) predicts the generation of garnet failure. (Images: Thibaut Duretz, Goethe University)

So what conclusion can we draw? According to Duretz, the previous assumption that UHP rock reaches a depth of 120 kilometers seems less probable in view of this rapid decompression because the ascent from such a depth would take place over a long period of time, which does not equate with the high decompression rate, he says. “We rather presume that our whiteschist lay at a depth of only 60 to 80 kilometers,” says the geoscientist. And the processes underway in Earth’s interior could also be quite different than assumed in the past. That rock units move continuously upwards over great distances, from a depth of 120 kilometers to the surface, also seems less probable than previously thought. “Our hypothesis is that rapid tectonic processes took place instead, which led to minimal vertical plate displacements.” We can imagine it like this, he says: The plates suddenly jerked upwards a little bit in Earth’s interior – and as a result the pressure surrounding the UHP rock decreased in a relatively short time.

You can read the full paper here:

Garnet microstructures suggest ultra-fast decompression of ultra-high-pressure rocks. *Nature Communications* (2023)
<https://doi.org/10.1038/s41467-023-41310-w>

Geology beneath the waves: developing maps and models of the sea floor - BGS webinar...

Over 70 per cent of the Earth’s surface lies beneath the waves of our seas and oceans. Most of this hidden world remains uncharted; however, scientific research, offshore development, conservation and marine management are all driving an increasing demand for offshore environmental data. This special webinar focuses on some of the cutting-edge geological sea floor mapping and modelling research that is currently being undertaken at BGS, which is both generating and using these state-of-the-art datasets.

This online event is on November 23rd. For details go to:
<https://www.bgs.ac.uk/news/geology-beneath-the-waves/>



Not all that gleams is black gold

Last year a Down to Earth reader found a nice peice of Jet whilst on a field trip to Scarborough.

Mark Wilkinson from the University of Edinburgh responded with this article, that we have finally managed to include in this issue. Apologies for the delay.

Thanks Mark, now enjoy the read...



This is the original piece of jet that was found on the beach at Scarborough. (Image: Chris Darmon)

A recent news article about the finding of a piece of Whitby jet included a comment about the identification – how do you distinguish jet from other fine-grained black sedimentary rocks, and what are these anyway? It turns out that there are a surprising range of black sedimentary rocks, with a sometimes confusing nomenclature. All have one feature in common – they are rich in organic carbon, i.e. in carbon-containing compounds that have been derived from living organisms. Consequently, many are used as fuels, or as the sources of fuels. Although the term ‘black gold’ is sometimes used to describe oil (for obvious reasons if you have been looking at the profits of oil companies recently), here we take a look at other black sedimentary rocks, illustrated with examples from Scotland.

Jet

But he said from Scotland, and jet comes from Whitby, surely? It is true that in the UK jet is mostly associated with the area around the picturesque seaside town of Whitby in North Yorkshire, but there are other sources. Jet is a type of coal formed from the wood of the tree genus *Araucaria*, represented today as the Monkey Puzzle tree. Each piece of jet is an individual piece of wood, so even with large trees, and the Jurassic *Araucaria* seems to have been larger than the modern one, there are limits to how big a single piece of jet can be. According to Helen Muller in her book called “Jet”, the largest piece ever found was 1.93m long but only 140 by 38mm in the other dimensions. This seems to be odd to me – the modern Monkey Puzzle tree has a trunk that massively exceeds these dimensions, with large examples easily over 10m in height. So the jet that we find cannot be from tree trunks,

but must just be side branches, which are obviously smaller. Presumably the trunks don’t convert to jet, even when deposited in low-oxygen conditions that prevent the wood decaying away.

The process of wood becoming jet during burial of the enclosing sediments is known as “jetonisation”. This might be my personal candidate for the worst geological term ever. It is anyway just a special case of coal maturation, which goes by the slightly more mellifluous “coalification”.

Jet is tricky to distinguish from other fine-grained black sedimentary rocks, so much so that Helen Muller’s book has an entire section on how to distinguish the ‘simulants’, as she calls them. If someone sells you a simulant as jet, then other words might spring to mind? Jet is truly black, deep and velvety which is possibly sufficient if you are familiar enough with it. It also feels warm to the touch, but so do many of the substitutes. The difficulty of distinguishing true jet has encouraged many of an entrepreneurial nature to offer a wide range of substitutes, including black shale, cannel coal, vulcanite (a type of rubber), and epoxy resin. If you wish to see the real thing, then the independent museum in Whitby, which specialises in all things Victorian, has sufficient objects carved from jet to sate even the most enthusiastic – this is highly recommended. If you would rather see jet jewellery being worn (and the simulants presumably), then you could try Whitby’s annual Goth Weekend, a celebration of everything black.

And the Scottish connection? Fossil *Araucaria* wood can be found wherever logs of the tree could float and then sink into waters that lacked oxygen, enabling burial before the wood decayed too badly. Such conditions existed on what is now the Isle of Skye, when the Late Jurassic Staffin shale was being deposited, and on the present-day north east coast of Scotland around Helmsdale at about the same time. I have a single piece of Helmsdale jet (two fragments are labelled A on the figure), removed from an eroding cliff but in-situ so I’m pretty confident of its identification. The original surfaces of the jet are covered by a thin (< 1mm) layer of white mineral, which I assume is calcite. Helen Muller illustrates such a covering on a piece of Whitby jet, describing it as a ‘skin of spar’ but doesn’t say anything about its origin, quite possibly because nothing is known. The piece of jet from Helmsdale was around 120mm wide but only 15mm thick. I’m not sure of the length as one end was eroded away and the other end was embedded in black shale. The shape certainly suggested a single log, flattened by the weight of the overlying sediment. It is the only piece I have seen in a few decades of leading fieldtrips up there, so it is not common. Needless to say, *Araucaria* trees were not restricted to the UK, and jet has been exploited in Germany, Spain, and the USA amongst other places.

Torbanite

Torban Hill lies some 20 miles west of Edinburgh, and is apparently too insignificant to bother naming on modern OS maps. Which is unfortunate, given that either the hill, or the nearby farm and house of the same name, lent their name to one of the most commercially important rocks of central Scotland. Around 1850 a young engineer,

James Young, discovered that it was possible to distil a light oil from a type of coal now known as torbanite. Since most oil at that time was derived by killing whales, this was a significant breakthrough. A distillery was built to process the torbanite, which was kept in such a state of secrecy that there are no known photographs or even plans of the site.

Torbanite is formed not of plant material, unlike the much more common bituminous coal which was commonly burned in people's houses even in my lifetime, but of what is often described in text books as lacustrine algae. Now, algae are plants, but the flora that accumulated to create torbanite are now known to be bacteria as they lack cell nuclei and other organelles. So torbanite is a bacterial coal – very many bacteria must be required to form a coal seam. The bacteria lived and died in shallow lakes, the bottom-waters of which must have been anoxic (low oxygen), which prevented the decay of the bacteria. Just to be confusing, many 'algal' coals do include at least some plant material, and there is a continuous gradation between 'algal' and bituminous coals which are formed from plant material.

An alternative supply of torbanite was located at Boghead Colliery, which gave an alternative name for the coal. Other names include cannel coal as it burns with a flame much like a candle (cannel is the Scot's word for candle); or parrot coal as it apparently crackles like a parrot when ignited. If anyone would like to donate sufficient parrot coal for a fire, I'd like to try this! Historically however, supplies of torbanite (by any name) proved to be limited, leaving an industry with no raw materials after only 10 years.

The Cockburn Museum in the University of Edinburgh hosts a slightly bizarre sculpture made of polished torbanite. It is mounted on a wooden base, and the attached plaque informs us that it was presented to Dr Henry Cadell of Grange (near Bo'ness in West Lothian). Cadell was a geologist who performed pioneering work on folding and the Moine Thrust. The torbanite fluoresces slightly in UV light, revealing a parallel lamination which is otherwise invisible. We do not have an unpolished torbanite sample to test for luminescence, but none of the other black rocks featured here luminesce. So it is possible that the luminescence is caused by a polish which is impregnating the surface of the sculpture, rather than the rock itself.

Oil Shale



Scottish oil shale and associated rocks and fossils - see article for the key to the letters.

As the supply of torbanite dwindled, it was discovered that oil shale generated light oils upon distillation almost as well as torbanite – and was available in huge quantities in central Scotland. Oil shale is rich in organic-carbon derived from bacteria, as with torbanite, but the organic matter is less pure being mixed with the minerals typically

found in shales. It formed the basis of an industry that lasted from the 1862 until 1962 and provided employment for thousands. The oil shale was worked underground, though the miners suffered from horrendous health problems, presumably associated with inhaling dust and volatile organic compounds. A fascinating (if occasionally disturbing) display can be seen at the Museum of the Scottish Shale Oil industry which is hosted by the Almond Valley Heritage Centre, near Livingston.



Sculpture of polished torbanite, in the Cockburn Museum, University of Edinburgh.

The oil shale occurs as seams that can be traced for 10's of kilometres, and are generally a few decimetres thick. They were deposited on the floor of a lake, now known as Lake Cadell after Dr Henry Cadell, as above. There are exposures of oil shale on the shore of the Firth of Forth, almost below the older of the Forth Road bridges (B in the photograph). The shales are recognisable by their low density if you hold a piece; by the brown colour of a scratch; and by being carvable with a knife into shavings – much like stale cheese (most shales just powder, try cutting a sliver). Because the shales are so rubbery, they are more resistant to erosion than the less organic-rich shales that they are interbedded with, and so form reefs on the shoreline where they extend into the sea.

When the shale was heated to extract the oil, the mineral part of the shale was left as waste. This was tipped to form 'bings' as they are locally known. Much of the shale waste has been used for building roads for example, but the survivors are a conspicuous feature of the landscape and some are now protected. The waste rock is a pale orange colour, and the piece shown in the photograph (labelled C) includes a piece of the tree-bark fossil lepidodendron, presumably from a branch that had floated into the lake and sank to the bottom where it was preserved.

There are still large reserves of oil shale in Scotland – an estimate by the British Geological Survey suggested 65 – 1000 million tonnes of shale, equivalent to millions of barrels of oil . The carbon-footprint associated with mining the shales and distilling the oil would be huge, and certainly not something that should be considered given the state of the Earth's climate. In the past, the production of oil from the shale consumed so much coal (for heating the shale) that the oil shale companies operated their own coalmines.

Black Shale

In the same way that torbanite grades into oil shale, so oil shale grades into black shale, as the mineral component increases and the organic content decreases. Black shales are frequently laminated, as the low-oxygen conditions in which they are deposited prevented burrowing organisms from disturbing the sediment after deposition. Black shales can be formed in lakes, but the majority are marine with the organic carbon derived from marine plankton. Although the ocean floors are largely oxygenated at the present day, partly due to convection driven by cold water forming at the polar ice caps, in the past large areas of the sea floor were anoxic. In the late Jurassic ocean floor anoxia was widespread, and contributed to the deposition of the Kimmeridge Clay Formation. This can be examined at Kimmeridge Bay on the south coast of England, and in both northwest and northeast Scotland, as above. The UK oil industry is sourced largely by oil from the Kimmeridge Clay, so it is of high importance economically. Black shales are the usual target from 'fracking' for shale oil and gas, so not free from controversy in their usage. The Jurassic exposures near Helmsdale mostly lack a bottom-dwelling fauna, as expected for low-oxygen conditions, though a bivalve called *Buchia concentrica* has been interpreted as a bottom dweller and must have been tolerant of low-oxygen conditions. Black shales sometimes preserve exceptional fossils. At Wardie in Edinburgh coprolites from fishes are common, "D" in the photograph. The fishes themselves are a lot less common, but were collected in large numbers by Stan Wood in the second half of the 20th century.

One puzzling thing that I encountered on fieldwork involved a loose block of black shale on a beach close to Helmsdale. We were visiting an exposure of marine sandstone at a locality called Strathsteven, and found the block on the pebble beach, well above the high tide mark. The block had not been present on previous visits, and was too large to have been easily moved by people at around 1m across and perhaps 30cm thick. It did not match an exposed lithology from anywhere close, begging the obvious problem – how did it arrive there? The shale was pitch black (I'm tempted to say jet black, but that's probably a term to avoid here) and contained pyrite. We hammered a few bits off, which smelled strongly of oil (E in the photograph). Other visitors to the exposure probably did the same, as on our next visit there were only a few scattered fragments left. The only sensible suggestion for its arrival was that there must be a bed of the shale submerged offshore and the block had been washed up in a winter storm. That probably wouldn't have been the right day for a spot of paddling!

Humic Coal

Finally, the most well-known and widely used of the black sediments – the photograph (F) shows a piece of coal found washed up on the shore of the Firth of Forth near Edinburgh, quite possibly having been lost from a ship at some point in history. Many textbooks show a reconstruction of the Carboniferous coal forests, usually with huge tree ferns, an enormous dragonfly or two and a volcano erupting in the distance. Which is fine except that the coal seams that I have personally inspected show mm-scale lamination, and a notable lack of obvious tree-sized features. The seat-earths below the coals, which are the fossil soils that the proto-coal grew upon, generally have mm-scale roots, but lack the size of roots that would hold up a tree. So while there clearly were forests in the areas in which the coals formed, as tree fossils are common enough in the associated sediments, the coals themselves resemble peat more than forest deposits. Heat associated with burial results in progressive alteration to lignite, then bituminous coal, then anthracite, and finally what is basically graphite. The latter is normally only found where the coal seams are in contact with igneous intrusions, and where these have been encountered

underground, the condensed volatiles from the coal have sometimes been found as oil or bitumen.

It is tricky to appreciate now, but the origin of coal was highly controversial in the early years of geology. James Hutton was a proponent of coal being of vegetable origin, and realised that heating was the crucial factor in turning the vegetable precursor into coal. Most authors seem to have agreed that at least some coal more-or-less resembled vegetable matter, though some authors suggested adding 'bitumen' of mineral origin. The real problem was the coals with no obvious structure resembling vegetable matter – torbanite for example, and anthracite. Some authors insisted that these were of mineral origin. John Playfair describes the controversy in his 1802 book outlining Hutton's ideas and he described one of Hutton's hand-specimens from the Isle of Skye which was found underneath a basaltic sill. The end of the sample from nearest the sill had been heated and had lost all its organic structure, while the cooler end retained an identifiable organic origin. The specimen was used by Hutton to try to convince others of the organic origins of all coal. Sadly, Hutton's rock collection was given into the 'safe'-keeping of the Natural History Museum of the University of Edinburgh, whose curator was a committed opponent of Hutton's theories, and by the 1830's the collection had been dispersed or disposed of. There isn't even a surviving list of the specimens. Somewhere, there may be a piece of coal from the Isle of Skye, sitting unrecognised in a drawer. Or being coal, perhaps it went on the fire?

Sources

Northern Mine Research Society

<https://www.nmrs.org.uk/mines-map/oil/scottishoilshale/>

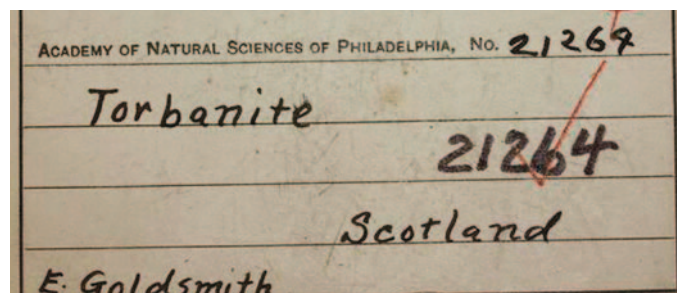
Oil shale: <https://shaletrail.co.uk/whats-shale/swamps-and-volcanoes/>

Henry Cadell: https://en.wikipedia.org/wiki/Henry_Cadell

John Playfair, 1802, Illustrations of the Huttonian Theory of the Earth.

Tailpiece

This antique label and specimen of torbanite turned up on an internet site from 2013 - Editor.



Minerals - opening up the Earth's chemistry cupboard - Part 3

In this his third and final examination of Minerals, Paddy takes us on a whistle stop tour of how to identify minerals and then a look at collecting them.

As always, it's good practical advice, especially suited to beginners;

Take it away Paddy...

"The mineral world is a much more supple and mobile world than could be imagined by the science of the ancients."

Pierre Teilhard de Chardin SJ (1881-1955)

How to identify minerals (continued from Part 2)...

For the simple tests described here to identify minerals all you will essentially need are: a steel pen-knife, a copper coin and a kitchen tile (the unglazed back of the tile). In addition, a spring balance and a hand-lens would also be very useful.

The properties of minerals arise from such factors as the chemical elements they are composed of and how the atoms and ions of these elements are arranged and bonded. Because of these properties, we can apply certain tests to minerals to ascertain their identity. Most of the common minerals amateurs are likely to find in Ireland and Britain can be, to a greater degree, recognised using the simple tests outlined here.

Professional mineralogists, however, have at their disposal various chemicals and usually sophisticated equipment, such as an X-Ray Diffractometer, to unequivocally identify minerals because some minerals, such as the clays, cannot be distinguished employing the basic tests described here. But, for the amateur, these fundamental tests should suffice.

The main tests which can be undertaken by the amateur can be described under: colour, shape, hardness, streak, lustre and density.

Colour

When a mineral is first observed, it is its colour and shape that are first obvious. Always use a fresh surface to discern colour because, if the mineral was subjected to weathering, its natural colour can be obscured. Also, some minerals can occur in a variety of colours. A good example is quartz. Pure quartz is a 'glassy' colour but it can contain small amounts of titanium, which give it a purplish colour. Such forms of quartz are called amethyst. And, if the quartz was irradiated (by radioactive elements in the host rock), it could be a 'smoky' or black colour. So, unfortunately, colour is not always a safe criterion for diagnosis. In metallic minerals, however, the colour is usually consistent and so, in such cases, can be very useful in their identification.



A sample of Amethyst, a mineral with a strong colour.



An example of 'smoky' quartz, which was found in Mourne Granite.

Streak

This is also an important diagnostic test. The streak is simply the colour of the powdered mineral and is obtained by rubbing the mineral on the back of a ceramic tile – for example a kitchen tile. Streak tests are particularly useful for the metallic minerals. Note that the colour of the powdered mineral can be different from its ordinary colour – for example pyrite is brassy-coloured but its streak is greenish black, and hematite can be black in colour but its streak is red/brown (known as cherry red). Streak tests are not so useful for silicate and non-metallic minerals, because their streaks are, almost invariably, white.

Remember that some minerals will not give a streak because they may be harder than the piece of porcelain, so they actually scratch the tile.

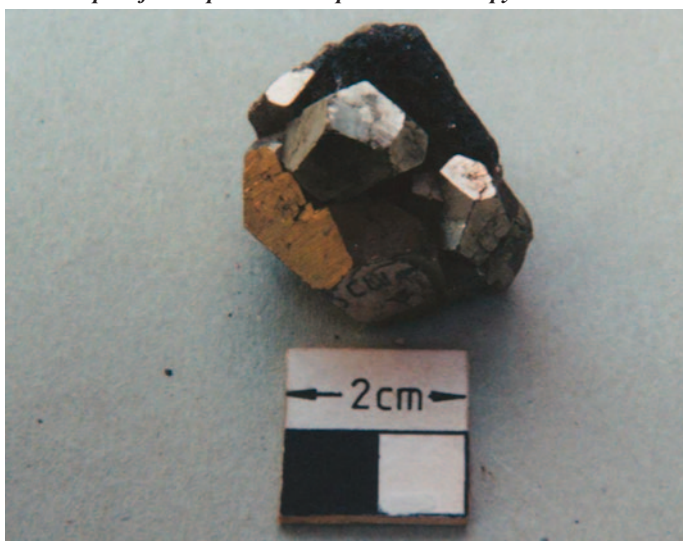
Shape

Minerals exist in a wide variety of shapes. Mineralogists divide crystal shapes into seven main systems (types). The simplest is the cubic system – minerals with a basic cubic shape. An example would be halite. If you sprinkle household salt (halite) onto dark paper, and look

at the individual grains using a hand-lens, you will see most of them are in the shape of cubes. Pyrite also has a cubic shape, but note that it can occur with the corners 'cut off'. So, the crystal system is not always immediately obvious because, within each one of the systems, a range of variations is possible.



An example of a simple cubic shape - this is iron pyrites.



This example shows the cubic corners 'cut off'.

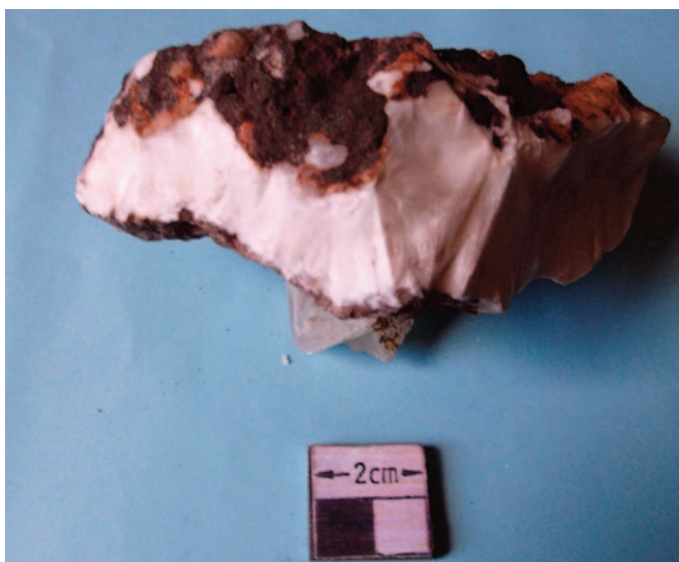
For the amateur, the overall shape (often called 'habit') is easier to recognise. The main types are: botryoidal, tabular, fibrous, bladed, foliated, dendritic and massive.



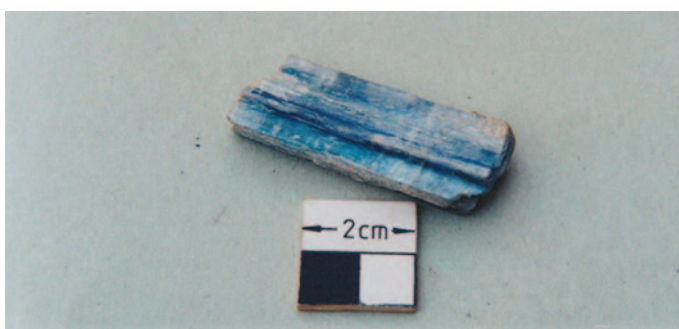
Chalcedony – an example of botryoidal shape, that is an aggregate of spheroidal masses.



This is Orthoclase or Alkali feldspar – an example of tabular shape, that is having a broad flat (table-top) surface.



Natrolite (a zeolite) – an example of a fibrous mineral, that is exhibiting fibre (hair)-like shapes.



Kyanite – an example of a bladed shape, that is occurring as a small knife-blade.

Hardness

This is one of the most useful diagnostic simple tests. The hardness of a mineral depends on the strength of the bonds between the atoms or ions and how closely they are packed – the stronger the bonds and the closer the packing, the harder the mineral. How resistant a mineral is to scratching is called its hardness. Mohs' scale lists well-known minerals and their index of hardness. A mineral with a high number in the scale will scratch on those with a lower number. But, you do not need these minerals to perform scratch tests; common items will do.



Muscovite mica – an example of a foliated mineral, that is consisting of flat layers, like the pages of a book. It's also soft enough to scratch with a finger nail.

Let's take a practical example. Say you found a mineral and you were not sure if it was quartz, calcite or gypsum. If you could scratch it with a steel pen-knife, it would not be quartz and if you could scratch it with a copper coin, it could be calcite or gypsum. But if you could leave a scratch on it with your finger-nail, it would not be calcite, but gypsum.

When executing the scratch test it is imperative you blow-off any residual powder and check, with your finger-nail or hand-lens, for a groove. Performing the test with a knife blade, for example, can leave a metallic streak from the blade (not a 'groove') if the steel blade is softer than the mineral.



The Mohs' Scale of Hardness - the index minerals.
(Image: USGS)

Lustre

Lustre is the way light is reflected by mineral surfaces. The two main types are metallic and non-metallic. A metallic lustre is shiny in appearance and minerals exhibiting this are opaque – that is light does not pass through them. The various types of non-metallic lustre are: vitreous (like glass), pearly (like pearls), resinous (like resin), adamantine (like diamonds), silky (like silk) and dull (no reflection)



A piece of quartz. It has a vitreous - that is glassy – lustre.

Density

The density of a substance is simply its mass divided by its volume and its units are grams per cubic centimetre (g/cc). So, if we weigh a mineral and determine its volume we can calculate its density. The terms 'relative density' and 'specific gravity' are also used.. These are numerically equal to density, but they have no units (because the way these terms are defined). Calcite, for example, has a density of 2.7 g/cc but its relative density and specific gravity are written as 2.7 – that is, without units. Although there is a simple experiment to calculate the density of a mineral, using a spring balance, it is often only necessary to estimate whether a mineral 'feels relatively heavy' for its size – and this skill develops with experience.

Collecting minerals

Minerals are not an infinite resource and so discretion must be exercised when collecting. Only collect from loose material, not from exposures in situ. Some exceptions to this would be say in a working quarry, where minerals on rock faces would be destroyed by the quarrying processes or a beach area, where erosion would eventually remove the minerals exposed. A golden rule is: if in doubt don't collect. Photographing the specimen in situ is an adequate alternative.



Is it a plant? No this is the manganese mineral Pyrolusite. It's an example of dendritic shape, that is showing tree-like branching (dendron [Greek], meaning 'tree').

There are some areas where collecting ANY geological specimens is strictly prohibited but, where collecting is allowed, observe the 'Countryside Code' at all times.

- Enjoy the countryside and respect its life and work.

- Know where you are allowed to go. Do not enter private land.
- Guard against all risk of fire.
- Keep your dogs under close control.
- Keep to public paths across farmland.
- Use gates and stiles to cross fences, hedges and walls. If you have to open a gate, ensure you close it securely after you.
- Leave livestock, crops and machinery alone.
- Take your litter home.
- Help to keep all water clean.
- Protect wildlife, plants and trees.
- Take special care on country roads.
- Make no unnecessary noise.
- Don't take any unnecessary risks – minerals, precious as they may be, are not worth danger to life or limb, which are infinitely more precious.
- Avoid walking beneath high rock faces in case stones fall.



One form of galena – an example of massive shape, that is lacking any distinguishing shape.

When visiting a working quarry (and only with permission) ensure that you inform the site manager who may require you to wear safety gear, such as a helmet, for your protection. Informing the manager could also be beneficial in that he could direct you to areas in the quarry which are most likely to yield minerals. If it is appropriate to collect minerals, or other geological samples, endeavour to cause as little damage as possible to rock outcrops.

When collecting samples, record details of the exact place and level at which each was found and the name of the host rock. Wrap each

specimen carefully in newspaper and when you bring them home it may be necessary to clean the samples meticulously with soap and water, using a tooth brush, to remove extraneous material like clay. Washing is not suitable for fragile or water soluble specimens.

When the minerals are accurately identified, label each with its name, chemical name, chemical formula, the name and age of the host rock, date when found and details of the locality at which it was found.



An example of a mineral label, with all the relevant data recorded. (Image: Courtesy of MINDAT)

(Remember the old maxim: a specimen is only as good as its label.) Then display the minerals, say on shelves, or store them carefully. If you cannot identify a sample, bring it along to the geology department of the nearest museum, where staff will be glad to assist.

Never throw mineral (or any geological) samples away when you no longer want them. Give them to other collectors, museums or schools. For those new to the subject, it is advisable to join an amateur geological society because they conduct regular visits to places of geological interest and are led by experienced geologists.

The Editor comments: Thank you Paddy for this excellent series of articles. We hope that a number of people will have found the information enjoyable, but most of all, helpful.

An unusual present idea...

'The Cream of the Crop 2023'

As part of their work for Geo Supplies, your editorial team, Chris Darmon and Colin Schofield go to some very interesting places around the British Isles. Whilst they are in these places they often pick up rock specimens, most of which go to students and institutions both here and even around the world.

However there are also some rare or unusual rocks that don't form part of our regular stock and it is these that we've gathered together into a limited edition collection that we are offering as our 'Cream of the Crop 2023'.

The set comprises 12 carefully chosen igneous rocks from around the British Isles. They include The Foxdale granite from the Isle of Man, the Lundy Granite, Diorite from Guernsey, the Ailsa Craig Riebekite and Cumbraeite from Great Cumbrae. Each set comes boxed with notes and costs £49.95 including postage.

Purchase online at: www.geosupplies.co.uk or ring us on: 0114 245 5746.



The downhill slide - a Permian storegga style event in North East England

We can always rely on Andy Lane, formerly of Sunderland University for a really good tale, based in his home area.

This is no exception...

Around 8,200 years ago, the vast Storegga submarine landslide event sent huge amounts of sediment pouring down a part of Norway's west facing continental slope. The resultant tsunami waves were far reaching, swamping parts of Scotland's east coast and contributing to the submergence of Dogger Land in the North Sea.

Some 250 million years earlier a similar but much more modest event affected sediments in the Upper Permian of north-east England. The evidence for this was painstakingly collected by D B Smith from outcrop and borehole logs and published in his 1994 Geological Survey memoir for sheet No 21, the Geology of the country around Sunderland. Today, only two of the outcrops remain, but they still point to an intriguing story.

The lower part of the Permian sequence in the region can be summarised as follows:-

Ford Formation— a reef and lagoon environment, the reef forming at the eastern rim of the shelf with the lagoon to the west cross the shelf. (see below)

Raisby Formation — shallow shelf dolomitic limestone deposited on a broad coastal shelf.

Marl Slate Formation — laminated organic rich dolomitic siltstone (first flooding of the desert by the Zechstein Sea) basal Upper Permian.

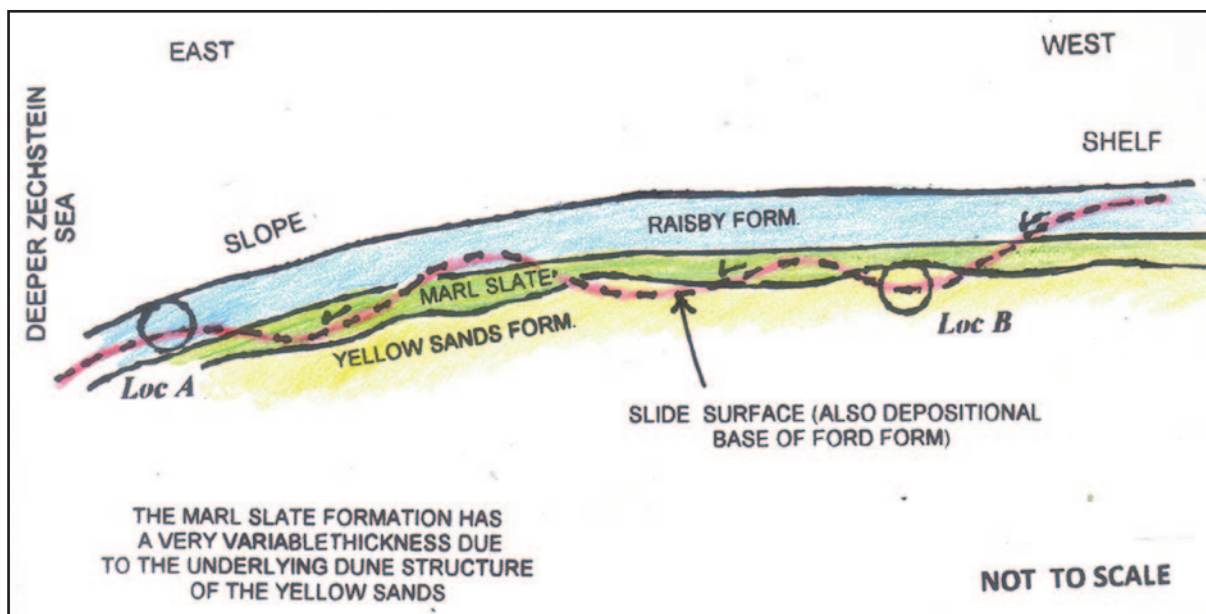
Yellow Sands Formation —large scale dune bedded sandstone formed in a desert environment (topmost Lower Permian.)

The slide surface can affect the Raisby, Marl Slate and Yellow Sands formations. It must be a highly irregular surface, cutting out slices of these formations, but overall it follows the slope east down from the shelf to the deeper waters of the Zechstein Sea. The Ford Formation can rest on all of these formations courtesy of the slide surface, depending on location.

The Sketch Cross Section is an attempt to show these relationships (but probably exaggerates the irregularity of the slide surface). The reef grew on the edge of the shelf just above the slope east down into deeper water (close to B on the sketch section). A complication is found east of the reef where there was only minimal sedimentation during the time of the Ford Formation, so effectively the collapsed and altered rocks of the topmost Permian lie on the slide. A strike length of around 10 km is suggested but this may be too small because erosion has removed so much of the Permian.

So, what can we still see of this structure? Sadly not a lot! The two photo's A and B have been taken at the only locations known by the writer to still be accessible.

Photo A shows the north side of Trow Point which bounds a long sandy beach on the coast of South Tyneside. A well bedded section of the Raisby Formation is covered by highly disturbed material from the same formation. The contact is quite sharp and is presumably the actual slide surface. This location (now close to sea level) lay some way down the slope beyond the foot of the reef, so there is very little sedimentation, just an algal layer up to 0.5 m thick. The bulk of the rock above the Raisby sequence (not shown on A) is collapsed and altered Concretionary limestone — that's another story!



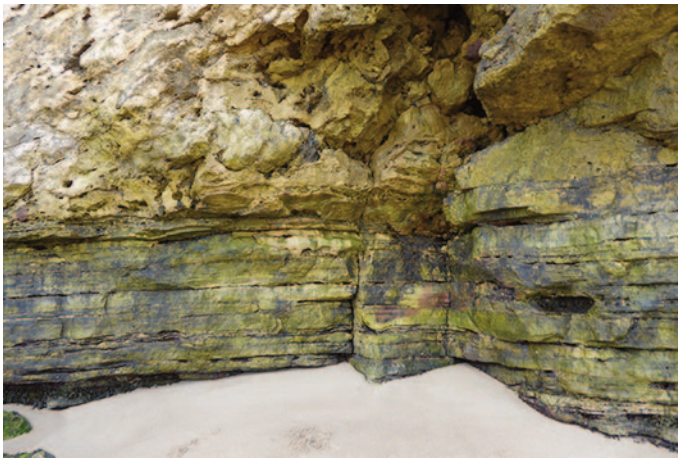


Photo A. Rock succession at the north side of Trow Point.

Photo B comes from Claxheugh Rock. It lies above the south bank of the River Wear at South Hylton, and is about 4.5 km inland from the Port of Sunderland. It is topographically some 25 m higher than A. It is an imposing cliff-line, topped by thick massive reef rock of the Ford Formation. Along the length of the cliff the base of the reef rock causes an overhang, and below that is a very steep slope down to river level, with vegetation covering the underlying sands. The photo, taken at the east end of the cliff, shows the dull grey reef rock resting directly on the Yellow Sands, the contact being the surface of the slide.

Moving west along the hollow caused by the overhang, a segment of soft grey rock comes between the reef and the sands. This rock may belong to the Marl Slate. Still further west, bedded dolomitic limestone of the Raisby Formation appears, before the section becomes completely grown over after about 300m. It must be said that a traverse under the length of the overhang is tricky at best and likely to be lethal in wet weather!

If these rock identifications are correct, then it seems that the slide is irregular “along strike” as well as “down dip” as shown in the sketch section. To the east of Photo B, the section is terminated by the Hylton Fault, and uplifted Coal Measures take over.

What Photo B shows is a bit of a problem. The reef facies of the Ford Formation, sitting close to the top of the slope is understood to have grown from a shell bank (or coquina) suggesting a significant time interval after the slide event and before the reef developed. This is the case at Hylton Road just to the north and at Tunstall Hills about 4 km



Photo B. Rock succession at Claxheugh Rock.

to the south of Claxheugh, where a long gone exposure of the shell bank was renowned for its fossils. But at Claxheugh the photo (B) shows a very sharp contact, with no signs of bioturbation, shell debris or re-working of the sands.

It is such a puzzling situation that previous workers have understandably suggested tectonic activity such as thrusting as a cause. Any tectonic activity at this time though would more likely than not have been extensional due to the development of the Zechstein basin. So, might the slide have been intermittent in its activity, with some local movement much later well into the life of the reef? Pure speculation of course!

Smith's 1994 Memoir includes the only in depth study of the slide, and includes reference to previous workers publications. Since then, there has been mention of the slide in various regional guides (including editions of the Yorkshire Geological Society's “*Northumbrian Rocks and Landscape*” which takes you to Trow Point). But no further investigative work, such as defining its limits and geometry has been carried out on this enigmatic structure. It has fallen victim to the landfill plague that has lost us so much valuable exposure nationwide.

Does anybody fancy a challenge?.



rockstars

Another famous rock...

Harwich Stone

This part of England is particularly short of stone that is hard enough to constitute being used as a building stone. The Harwich Stone (or Harwich Cementstone) is an exception.

The Harwich Stone is a distinctive ash bands that comes from the base of the Eocene, London Clay. The ash probably comes from explosive volcanic eruptions in Scotland, some 50 million years ago. It has been used in several local churches, such as here at Lawford.



Author: Chris Darmon



If you haven't joined one of our residential field trips before, what can you expect?

- *Our residential field trips are suitable for adults of all levels of interest and geological knowledge.*
- *Our trips are friendly and informal and usually comprise 15-20 people. Overseas trips are usually larger.*
- *We usually make use of comfortable small hotels and guest houses and all meals are included.*
- *You have the services of Chris Darmon and Colin Schofield as field leaders. Both are highly experienced and knowledgeable field geologists.*
- *For most trips we have our own minibus but on some trips we may also have the use of an additional car.*
- *Dates shown in this listing are the start and finish dates.*
- *Where prices are quoted, they are per person in a shared twin/double room.*

If you still have any questions or queries, don't hesitate to email us at: downtoearth@geosupplies.co.uk or tel: 0114 245 5746

Our 2024 programme...

With 2024 now fast approaching, we are taking a lot of bookings so you will not be surprised to hear that a number of trips are already filling up fast - especially the limited numbers of single rooms.

Take our advice and make your bookings NOW! Remember that you can only get a booking form direct from us, they are not available on our website.

Email: downtoearth@geosupplies.co.uk or ring: 0114 245 5746

On a negative note, following the recent news of more fires on the Canarian island of Tenerife booking for our trip in February have dried up and we have taken the difficult decision to cancel our planned trip.

Northwest Highlands of Scotland (8-nights) - April 10-18 £1495

We spend the whole of the trip based at the iconic Inchnadamph Hotel in Assynt. This is where the pioneers Peach and Horne were based when they surveyed the rocks and structures of the area. There's no better place from which to explore this great area. We take in the ancient Lewisian Gneisses, the Torridonian Sandstones, the sediments of the Cambrian and Ordovician and the Moine Schists. There are so many classic localities on our extensive itinerary that takes in sites right across the Geopark.

View the brochure at our website - get the booking form from us! This trip is close to being full



This is the magnificent Quinag in Winter

Norway, land of fjords (9-nights) - April 24-May 3 £1995

At long last we are set to return to southern Norway following our last visit in 2019. This trip begins with the fjords of the Bergen area and then moves to the tiny resort of Flam, set at the bottom of a fjord and reached by a world famous railway. We take a fabulous train trip to Oslo and then spend 5-nights as guest of the Geo Norvegica Geopark to the south of Oslo. There we see a huge range of different rocks from Proterozoic gneisses to fossiliferous Palaeozoic sediments to the home of Larvikite the famous decorative facia stone.

View the brochure at our website - get the booking form from us! We have enough people booked to run this trip already.



One of the highlights of the trip is a geological excursion on the Scenic Telemark Canal aboard a vintage boat. (Image: TripAdvisor)

Edinburgh and the Borders (7-nights) - June 10-17 £1095

The historic capital city of Edinburgh and its environs represent one of the cradles of geology. Back in the 1780s, James Hutton and other members of Scottish Enlightenment, toured the area on Horseback and by boat making amazing geological discoveries.

From our comfortable hotel base in Dunbar we'll take in Hutton's Section, Hutton's Rock, Arthur's Seat volcano and the amazing Siccar Point - and they are just for starters! We'll also take in sites on the Firth of Forth and over in Fife as well as the Southern Uplands.

View the brochure at our website - get the booking form from us! This trip is approaching being full, early booking is advised.



The famous Siccar Point the 'holy grail' of geological time. (Image: Colin MacFadyen)

Welcome to our real world!



The Gower area of South Wales (7-nights) - June 23-30 £1195

This is an exciting new area for us with excellent geology covering mainly the Devonian and Carboniferous with amazing structures and fossils. We'll be going down the Big Pit coalmine and hopefully seeing some reptilian footprints! This is a great area that we will be covering for the first time.

Brochure available online - booking form from us. We can accommodate more people in twin and double rooms.



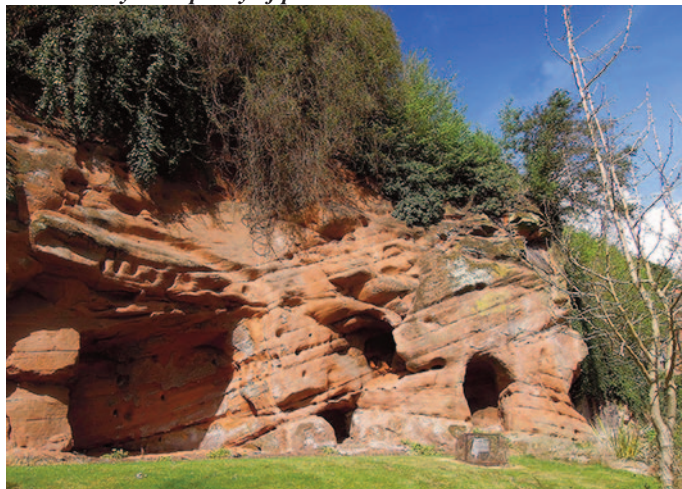
The Seabank Hotel - our comfortable base in Porthcawl, from where we can access all our field localities.

The Welsh Borderland (5-nights) - July 7-12 £895

The English county of Shropshire and the adjacent parts of Wales provide us with some of the most varied geology in the entire UK. We will be sampling rocks from the Precambrian right through to the Triassic with just about everything in between! There will be igneous plutonic and volcanic rocks, sediments galore and maybe even the odd metamorphic rock! There are fossils and minerals too - indeed something for everybody.

If you've never been on a geological field trip before then this is definitely one for you, as well as for the seasoned attender! Based at a comfortable guesthouse in the historic town of Bridgnorth, we'll be travelling around the area, including a trip on the Severn Valley railway.

Brochure online - get the booking form from us. We currently have plenty of places available.



Permian rocks at Bridgnorth (Image: Wikipedia)

Summer School, Stirling (7-nights) - August 10-17 £1295

This will be the first time that we have taken our famous Summer School north of the border to Scotland. What better place could we have chosen than Stirling with its highly rated university set in a historic town with an ancient castle sat on top of a massive sill?

With all the usual elements that go together to make a great Summer School experience we'll bring you great geology with trips and study sessions combined with an enjoyable social experience.

Accommodation is in en-suite single and shared rooms in modern student flats.

Brochure available online, booking form from us!



*Onion skin weathering of dolerite in Stirling
(Image: Open University Geological Society)*

The Llyn Peninsula (5-nights) - August 31-September 5 £995

The Llyn Peninsula of North Wales is a very special place, where Welsh is the first language of most of its inhabitants and we enjoy local hospitality at its very best at the Nanhoran Hotel in Nefyn. Some of the geology is similar to that seen on Anglesey, but with lots of added extras! We see elements of an ophiolite complex, some excellent Cambrian sediments along with rare intrusives such as diorites. A highlight of this trip is a steam train ride on the Welsh Highland railway that takes in some of the magnificent scenery of Snowdonia, viewed at a slow pace from the comfort of your train seat. See the scenery of North Wales from a wholly different perspective

See the brochure online - get the booking form from us.



*The Llyn Mèlange with its amazing blocks.
(Image: Geology Wales)*

The Channel Island of Jersey (7-nights) - September 21-28 £1250
With Guernsey visited in October of this year, it seems only logical to follow it up with Jersey in 2024. Jersey is the more popular of the two large Channel Isles and although close to Guernsey on the map, its geology is quite different. There are lots of late Precambrian volcanic rocks from the Brioverian, as well as later intrusive rocks. These combine to give us lots of interesting coastal sections.

To complete the geology, there are some excellent Quaternary sediments that give us an insight into the more recent history of the island.

Take a look at the brochure online and get the booking form from us. This trip is filling up fast!

The Fort William area (10-nights) - October 4-14 £1595

This is one of the undoubted highlights of the entire year. We've gone to the max to bring you a comprehensive 10-night itinerary based in this iconic Highland locality, at the comfortable Croit Anna Hotel.

We'll be taking in the local geology of Glen Nevis, the volcanics of Glencoe the slates of Ballachulish and also more distant places such as Mallaig and Ardnamurchan. The trip will also include an excursion by boat on Loch Linnhe and a steam train trip to Mallaig aboard the famous Jacobite train which crosses Glenfinnan viaduct. Don't let the Autumn date of this trip put you off!

See the brochure online - get the booking form from us.



*Fabulous geology of the Lochaber Geopark.
(Image: Lochaber Geopark)*

The Yorkshire Dales (5-nights) - October 21-26 £895

Amazingly, we've never managed to base one of our trips in the Yorkshire Dales National Park. We had planned this trip for 2020, but it never happened due to Covid. Our base for the week is the small village of Gargrave, just to the west of Skipton. From here we'll take in some of the highlights of the National Park, including the ancient rocks of Ingleton and Horton in Ribblesdale, the magnificent Carboniferous limestone with its show caves and the younger rocks of the Yoredales and the Coal Measures. It's the perfect way to end our field season.

The brochure for this trip is now available, booking forms from us! There's plenty of availability on this trip.

If you would like some help or advice before making a booking, we'd be delighted to talk with you - either pick up the phone or email us. All prices quoted above are per person in a shared room.

*To get a booking form, email us at:
downtoearth@geosupplies.co.uk or ring us on: 0114 245 5746*

Zoom courses for this Autumn...

If you act quickly you can still join us on one of the following three Zoom courses. Join us for a friendly and informative experience!

Simply Minerals! Is a 6-week course that will cover all the major aspects of minerals, both those that form rocks and the much rarer ones that provide us with metallic ores and bulk chemicals. We'll be helping you to identify your finds and showing you how to study your minerals. Simply Minerals! is aimed at beginners primarily, but everyone will get something from it. We'll be including a complimentary set of specimens and some written materials.

The course will begin on Tuesday, November 7th. and end on Tuesday December 12th. Zoom sessions are at 14.00.

Simply Minerals! costs £60.00 per person or £80.00 per couple.

Mass extinction! This is a 6-week course that examines some of the most important extinction events that have impacted on life on Earth. We begin with the late-Precambrian extinction and then go on through extinctions at the end of the Permian, end Triassic, Cretaceous-Tertiary and end with what is happening right now. Naturally we'll be looking at the cause or causes of each event and the impact they had on the fossil record. Importantly we hope to show you that these events were not all bad - there were positive outcomes too!

The course begins on Monday, November 6th. and ends on Monday, December 11th. Zoom sessions are at 14.00 and 19.00.

Mass extinction! costs £50.00 per person or £70.00 per couple.

Steps towards the rock face This is a 12-week course that provides a complete introduction to the subject of geology. There are Units covering minerals, igneous, sedimentary and metamorphic rocks, fossils, how the Earth works, geological time and economic geology. By the end of this course you can expect to have a basic knowledge upon which you can build if you wish. It will be presented using lively materials, backed up by the use of video material on each Zoom session.

The course begins on Thursday, November 9th. and breaks for Christmas on Thursday, December 14th. Zoom sessions are at 19.00 It restarts in January.

Steps towards the rock face costs £80.00 per person or £110.00 per couple sharing a computer screen.

Wednesday evenings at 7.00...

A series of hour long evening talks with background notes. Enrol for them all, or just the odd one or two, it's up to you!

Wednesday evening at 7.00pm via live Zoom. Cost: £10.00 each and are suitable for anyone with an interest in geology.

Winter Series

December 6	"The Northwest Highlands Controversy"
December 13	"Charles Darwin the Geologist"
December 20	"Diamonds really are forever"

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*Or you can enrol via our online shop at: www.geosupplies.co.uk
Details of further Zoom session, both during the day and in the evenings, commencing in January will follow in the December issue of Down to Earth extra.*



in-house

A look at some of the new and exciting happenings in the world of Down to Earth & Geo Supplies - by Chris Darmon

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4/2023

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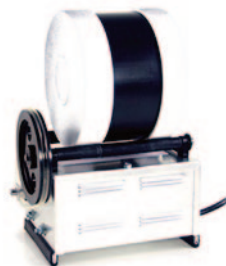
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Storm Babet causes major flooding and coastal landslips...

It's not often that your *Down to Earth* editorial team are able to give a first hand report of natural events, but we were both in North Norfolk during the recent storm Babet.

At numerous locations including East Runton and Happisburg in North Norfolk we were able to see first hand evidence of cliff falls that had occurred during the storm. We were even able to see small cliff falls within metres of where we were standing. Worryingly, there are more and more places where either existing coastal defences are no longer being maintained or where whole communities are being left to fend for themselves. Local residents are clearly alarmed by what they are seeing and experiencing at an increasing rate and intensity.

Away from Norfolk that have been many reports of landslips both on the coast and also inland, some of them affecting railway lines and other infrastructure. Local councils have been inundated and the Environment Agency has struggled to cope in many places.



The coast at Happisburg, North Norfolk on October 22, just days after Storm Babet wreaked havoc.
(Image: Chris Darmon)

The National Trust reports damage amounting many thousands of pounds and has launched an appeal for help. It has reported damage to some of its properties and also infrastructure such as roads across a wide area of England and Wales.

Meanwhile up in Scotland a major road has reopened after a closure caused by fresh landslips...

Heavy rainfall in the west of Scotland caused the closure of the A83 road to Campbelltown in early October with slips reported at several locations.

The civil engineering contractor Bear is charged with maintaining the road on behalf of the Scottish Government and was already working on a significant section of the road before the recent storms.

They are warning that parts of the road remain in a precarious state and that closures and diversions will continue to apply on and off. Pictures show some of the conditions that they have recently had to contend with.



This is the main working site on the A83, at a place called Rest and be Thankful, where recent heavy rainfall has led to further landslips despite the work going on to alleviate them in the long term.
(Image: Bear plc)

Storm Babet's successor, Ciaran hits on November 2nd and wreaks more havoc...

The latest Atlantic storm codenamed Ciaran, impacted the south of England on November 2nd as this issue of *Down to Earth* was being completed.

Wind speeds in excess of 100 mph were recorded in the Channel Isles with reports of numerous trees being toppled and roofs damaged. The winds were accompanied by huge seas and torrential rain. At one point the Environment Agency had more than 20 flood alerts across Devon alone, with scores more across the wider region.

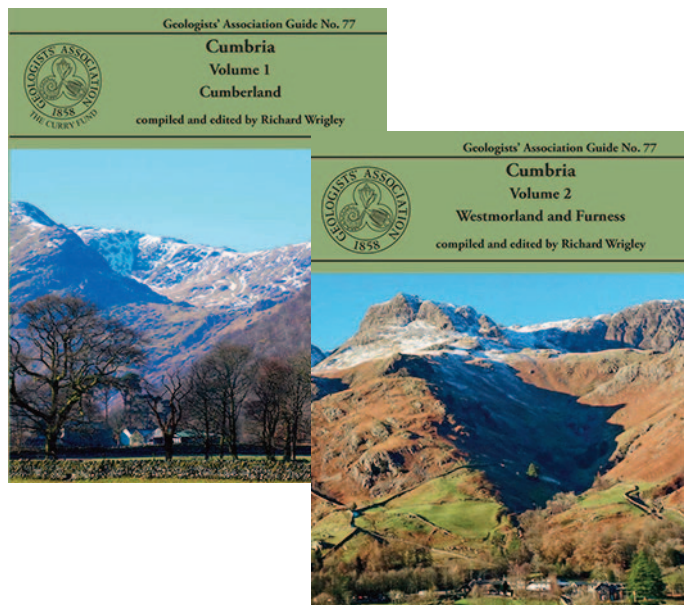


Flood alerts across Devon and Cornwall on November 2nd.
(Image: The Environment Agency)

As for the transport network there has been widespread damage to road and rail routes with many railway lines being completely closed with people being warned not to travel on trains or in their cars.

The Geologists' Association releases, not one, but two Guides to the Cumbrian Lake District...

It's a fact that the popular GA Guides have been getting heavier in recent years (making them harder to carry around in your pocket). With their latest Guide No 77, being published in two volumes, each of more than 200 pages.



You might ask "Where does GA Guide 77 cover?" The answer is the Lake District or more accurately Cumbria, with Volume 1 covering Cumberland, or the heart of the Lake District and Volume 2 covering Westmorland and Furness in the southern part of the area.

These are guides aimed primarily at the geologist, or at least those with some geological knowledge, but everyone will get something out of the many itineraries that are described.

whilst it's good to see some 'old favourites' amongst the itineraries, there are also a number of new localities that people can explore now with the help and advice of these guidebooks.

Ffos-y-Fran coal mine closes this month...

This month sees the curtain coming down on coal mining in South Wales with the final closure of the giant Ffos-y-Fran opencast mine near Merthyr Tydfil.

Down to Earth readers will be familiar with the story over the past couple of years with the mine operators continuing to mine coal in defiance of planning regulations. Now that a formal closure order has been issued, the mine will shut for the final time during November.

Merthyr (South Wales) Ltd, which runs Ffos-y-Fran in Merthyr Tydfil, has submitted a notification to the Welsh Government confirming a closure date of November 30th.

After that date no new coal will be dug and the long and complex task of restoring the site is set to begin. The mine's 180 workers have been producing more than two thirds of the coal mined in the UK over recent years.

Over the last couple of months it will have produced more than 200,000 tonnes of coal, mainly supplied to the steel industry, but also



A vision of the future - this is how the entire Ffos-y-Fran site will look when it has been back filled and landscaped.
(Image: Wikipedia)

some to the heritage railways around the country. As for the future, these customers will be forced to import coal, currently from South America.

After closure, and once the stockpiles have been used up, supplies of UK coal will all but dry up. As for the future, coal may start to flow from the West Cumbrian mine at Whitehaven, assuming that the project goes ahead as currently envisaged.

Hugh Miller books in line for prestigious award...

Hugh Miller was an amazing Scotsman, he was one of the country's most influential early geologists. Now the National Museums Scotland, has published a facsimile edition of his classic book on the Old Red Sandstone first published in 1841.

Ross-shire-born polymath Hugh Miller (1802-56), self-educated stonemason, geologist and writer, was famous in his lifetime across the English-speaking world. On one level, *The Old Red Sandstone*, is a description of the geology of Cromarty, Ross-shire, with diversions into its scenery, history and folklore, but it is also an autobiographical memoir and work of literature. On its first publication it became enormously popular.



This edition is published in two volumes, shrink-wrapped. Volume 2 reprints the original, and now rare, first edition in facsimile with notes and glossary. Volume 1 explores how Miller wrote his book and why it was so important.

Kate Blackadder, the Museums' Marketing Manager informs us that the book has just been shortlisted in the Research category for the Scottish National Book Awards organised by the Saltire Society.

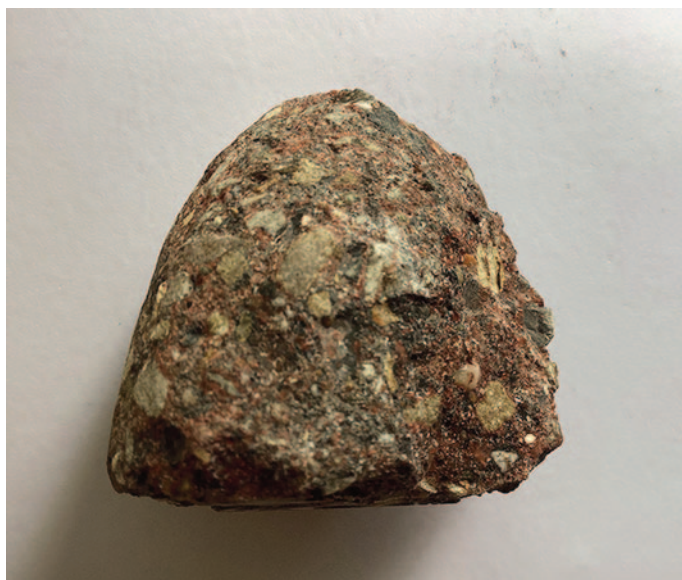


A random specimen found on a beach, and how a microscope slide helped to identify it.

In our regular feature entitled 'Ask the Audience', we invite you, our readers to share your knowledge. Happily most of the problems that you pose, we eventually get answers to.

However Down to Earth reader, Richard Mann from Norfolk goes one further. He makes microscopic thin sections and here he shares his investigations into a beach rock that he found.

Over to you Richard...



I was looking at some back issues of **Down to Earth** where I found someone asking about a rock found on a beach. I had a very similar looking seashore cobble which had been found by a friend on the Yorkshire coast, although mine was about twice the size.

The sample contained similar angular to sub-rounded to larger rounded clasts cemented and supported in purplish-red calcareous matrix. The clasts were predominantly calcareous sometimes pure microcrystalline and others being fragments of broken fossils (crinoid/spiral/bivalve) bearing limestone. There was also a trace of altered tuff or impure siltstone and some partly worn microscopic shell fossils. All of this was suspended within the reddened iron stained calcareous matrix, which was possibly dolomitic.

Owing to the suspended almost intact micro shell and there being a calcareous cement layer between the clasts and matrix leads me to believe that it is unlikely to be man-made.

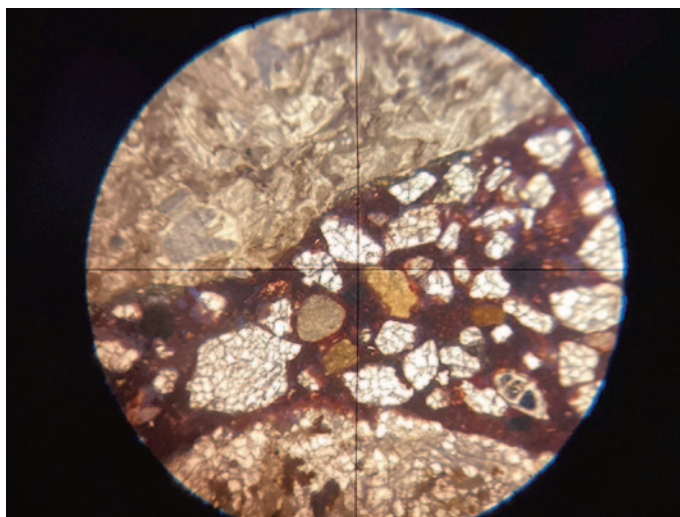
Taking the study of this rock to the next level requires what are effectively the skills of a detective. First on the list is to find the 'mother lode' - the original rock.

So where and how did the samples derive to their present locations? Not having seen a 'Brockram' nor one of Permian age, I can only

hazard this as a guess. But is there anyone out there who has further informed knowledge.

So where does this leave me? One favoured suggestion is the basal breccia of the Permian Brockram deposit from River Eden area of Cumbria, or perhaps even the Southeast Scottish borders. Who knows?

Happy Hunting once again!



The Editor comments: Having just returned from a field trip to the Norfolk coast, I can only sympathise with Richard on this one. Many is the time that I've been handed a mystery rock specimen found on a beach and been stumped to give an instant identification.

My starting point, as always, has to be is it sedimentary, igneous or metamorphic? Even then, that isn't always as straightforward as you might think, particularly if it's a dark, fine grained rock. Assuming that I've assigned the class of rock correctly, I can then move on.

My next step is to mentally check with brain to see if it's a rock that I've seen before (much like Richard did here). I'm lucky I've seen a lot of rocks before in a lot of places. The problem is that the brain hasn't always remembered them in the correct 'drawer'!

In places like East Anglia the situation is further complicated by two factors. First, is our old friend glaciation, who has gathered up rocks from here, there and everywhere! This means, of course, that there may well be rocks from places like Scandinavia that I've never seen before. Secondly, in recent years, rocks have been brought in from elsewhere in the UK and abroad for the purpose of defending the coast from constant erosion.

Richard's study highlights the need from careful examination, either with a hand lens, or in this case, the making of a thin section and then peering down the microscope. Well done Richard!



ask the audience

Just a quick reminder that we've almost run out of your requests for help! Remember that we're here for when you see something and don't know what's going on - see below for more about how to contact us.

Please keep the questions (and answers) coming in!

Email: downtoearth@geosupplies.co.uk

Some new queries for you to get your teeth into...

We begin this issue with an item from Sylvia Woodhead, in Cumbria. Sylvia says:

"I recently received an email from David Benham, a member of the Westmorland Geological Society. He sent a picture of what he was calling a 'fossil' in a large cobble from the limestone shore at Conishead, near Ulverston, Cumbria about SD 309751.

He had never seen anything like it, and neither have the Westmorland Geological Society members I have asked. There seems to be a core of dark chert surrounded by a sort of reddish sandstone and looking like a sectioned boiled egg. David further notes that the picture may show a concretion formation around an impurity, formed long after limestone formation.

He thought it reminded him a bit of flint filled echinoids he had found in chalk although that doesn't explain the sandy looking surround, and echinoids are not generally found in Carboniferous Limestone. It looks artificial to me.



Now it's over to you, can you throw any light on the structure, with any ideas as to what it is and how it formed?

Next we turn to a couple of mysteries that I've snapped on field trips during 2023.

I've been lucky enough this year to visit a number of locations that are either completely new to me, or are places that I've only visited once before. We begin with one of the Channel Island of Herm.



This was taken in Belvoir Bay on the east coast of the island. It shows fractured Herm granodiorite, but what are the ring like structures?

My second picture shows the Carstone of the Lower Cretaceous at Hunstanton in Norfolk. This ferruginous gritty, coarse sandstone shows this amazing box-like structure.

I've always associated such 'boxes' with joint patterns and the process of lithification. But is this entirely correct? When did it occur and how? I've seen it elsewhere, but it is rare and I've never seen examples as good as here.



As always, we look forward to your comments!

The Editor says...

I am always pleased to hear from you, our readers, but in order to make things easier for us, please can you note the following guidance, if you want us to respond to you...

- Please note we are not able to offer an identification service as part of this feature.
- We much prefer to hear from you by email and that includes your words and pictures.
- Please only use the following email address as others can get clogged up with very different material:-

Email: downtoearth@geosupplies.co.uk

Dear Chris

Response to Editorial DtoE extra September 2023

I was very dismayed to read the Editorial that appeared in the latest **Down to Earth extra**. Its blatant political bias and the very prejudiced statements on the assumed personal opinions of certain groups will, I expect, disturb many other readers than just myself. You should not politicise science in this way: too much of this has been going on in recent years, and I had hoped that your publication would stay above this simplistic sneering. The 'climate catastrophe' to which you refer is a total media fabrication, and the ULEZ moves are unlikely to achieve any impact on all but local pollution problems, for which adequate legislation already exists. As a group of people with a more than adequate understanding of geology, it is insulting to pontificate about a few tenths of a degree, when we are well aware of the recent history of temperature variations since the last ice-age and more extensively, the changes in CO2 concentration over longer geological time frames.

I have had a subscription to DtoE for many years, and thoroughly enjoy the professional and clear way that you present often complex scientific material. This is the strength of DtoE, so please leave the half-baked socio-political propaganda to others: there are enough around. However if more similarly polemic items appear, I shall not be renewing my subscription.

James Dent

Good afternoon Chris

Regarding Julia Daniels

I was just browsing August's **Down to Earth** magazine and came across a great looking advert for our AGS Mineral, Gem & Fossil Show later in the year! That is very good of you, I can't imagine where you found it as I've only just started handing them out at fossil shows and digitally for inclusion in the GA magazine and a couple of lesser local magazines. Whatever, thank you VERY MUCH, it is really appreciated!

On a sadder note, Julia Daniels our ex General Secretary who I suspect you must have had many dealings with over the years has passed away unfortunately. She had been a member for 52 years, unbelievably and most of that time involved with the committee in one post or the other. A great, lovely lady, such a shame.

Richard Furminger
Amateur Geological Society

Dear Chris Darmon

Re the editorial in the latest **Down to Earth**, surely one reason for the demise of Geology teaching is the demise of North Sea oil and its exploration. Twenty years ago working in the oil industry had lots of glamour. Luckily **Down to Earth** still maintains a good review of books on geology but straight books on such as sedimentology are no longer in the ascendancy.

Mike Vickers

Dear Chris

More on Paramoudra flints

In **DtoE 124** you refer to Russel Yeoman's web site about flint. This seems to champion the idea that flint forms on the sea bed. While this idea can be found in the older literature, it is not current thinking. The 1960's to 1980's saw a revolution in the understanding of the chemical processes in shallow buried sediments, driven by the study of modern sedimentary environments and deep-sea drilling, where changes in sediments can be traced as they are progressively buried. These studies have the advantage over studying just ancient rock that the porewaters can be collected and analysed, and geochemical processes worked out.

The definitive paper on the formation of flints and paramoudras is probably that of C.J. Clayton from 1986. Unfortunately, it is in an obscure book (**The Scientific Study of Flint and Chert: Eds. Sieveking and Hart**), and doesn't seem to have made it into the digital age. However, it has been cited by 174 other scientific papers. In summary, flint in the Chalk formed from the dissolving skeletons of sponges and silicious microfossils at about 5 – 10m below the seabed, where the porewaters changed from oxic (oxygen-bearing) to anoxic. The material that formed at this depth was a poorly crystalline form of silicon, that transformed to the flint that we find during deeper burial.

Mark Wilkinson, University of Edinburgh

Hi Chris!

YouTube channel material

I thought you might be interested to see this YouTube channel: <https://www.youtube.com/@myroncook/videos>. Geologist Myron Cook takes you round places of geological interest in Wyoming and Utah and explains their geological significance. In his latest video (<https://www.youtube.com/watch?v=3JraT49a1tw>) he shows some very interesting circular structures in the desert and then takes you through examining them and how you might start hypothesising on their origins before describing very clearly the mechanisms that actually produced them. His explanations are really good!

Andrew Johnson

Hi Chris

Disaster planning - volcanic eruption on Cumbrae

I don't know whether you've seen this, but if not, it might give you a chuckle. As it happens I was over on Cumbrae on Saturday on an Edinburgh Geological Society field trip - all sandstones and dykes. They could take a lesson and consider a dyke or two coming their way! As we saw two parallel Palaeocene dykes, the De'il's dyke and close by it the Lion Rock, which I think is the dyke that is named the Cleveland Dyke across in Yorks. I remember you saying how fast that propagated. But I don't think their geology is up to it! I guess it's the paper that got the orientation of the volcano wrong in relation to Millport.

Fran Humphrey



In this new brainteaser, we ask the Question...

Who, what & where?



Before we introduce our new brainteaser, let's put the old one to bed shall we. I'm delighted to tell you that we had a total of three responses to our Devon puzzle.

Regulars, Richard Mann and Julia Madelin were joined by newcomer, Pete Webb from Matlock.

Pete sent in a helpful annotated version of the original image with a red line to mark the unconformity.

He identified the top as "Series 2: horizontally bedded Quaternary" marine clastics.

Beneath his unconformity he had:

"Series 1: Upper Devonian to Lower Carboniferous shallow marine clastics of the Pilton Mudstone Formation, folded on E-W axes during the Variscan Orogeny, then eroded and now dipping at about 45° to the left (probably SSW)."

Turning to Julia, here's part of what she had to say:

"We know that the wave cut platform is the Devonian Pilton shales, presumably laid down flat and hardening over a huge period of time. Of course we can have no idea of what would have been deposited on top. By the late Carboniferous/or even early Permian (maybe 60 million years later) the Variscan Orogeny took place with massive compression and folding of the strata in place. The shales were likely well on their way to becoming slaty, and were rucked up in that compression so there is now a pronounced dip in the layering.

The rest of the photo brings us up to the Quaternary - maybe only 1.5 million years before the present. So there is a huge unconformity as we can have no idea of when the Pilton beds were exposed and eroded by the sea into the splendid wave cut platform we see today."

Finally, we turn to Richard Mann, who said:

"The coastal area in the vicinity of Barnstable provides many geological headaches and complex exposures. The image shows a much weaker sequence of cross bedded, horizontally laminated and calcareous massive siltstone and sandstones unconformably overlying steeply dipping, Upper Devonian/Carboniferous rock strata folded/faulted during the Variscan orogenic period. These have been wave-cut and washed over by marine/glacial outflow. The upper weaker strata suggest gentle marine deposition and a rise in sea level resulting from melting ice. The evidence for the glacial action has been noted in nearby exposures where exotic glacial erratic boulders are found bound within the softer 'Sand Rock' immediately overlying the Devonian/Carboniferous formation (wave-cut platform), of Ipswichian Glaciation age."

As this is the final one in this series, I'd like to award all three of you a prize! Join us on one of the Winter Virtual Day Schools!

Our new brainteaser - it's not a competition with prizes! We'd like you to study these three images and answer the Question: Who, What & Where?

In each issue we'll be finding you a new set of images that have got an obvious geological connection.

We tried it out at last year's Summer School and people were able to have some fun with it.

*We'd still like to hear from you with your thoughts - email us at:
downtoearth@geosupplies.co.uk*

Please contact us before January 15th.





Book Choice

Title: The Old Red Sandstone or New Walks in an Old Field
 Author: Hugh Miller
 Publisher: National Museums Scotland
 ISBN: 978 1 910682 25 8
 Format: Softback
 Cost: £30.00 the pair
 Level: Adult & general interest
 My rating: ****



Museums, and particularly the national museums of the four nations that make up the United Kingdom hold some amazing book treasures. At some stage many face the conundrum of what to do about them. Do you let a rare first edition continue to be just that, rare, or do you republish it as a facsimile edition and let a new audience appreciate it as the originals would have done?

This was the case with this amazing work of the pioneer Scottish geologist Hugh Miller. Miller was born in Cromarty, a self educated geologist, writer and thinker. He was a man of science, but also a man of great Christian faith, who sought to reconcile his field observations with his traditional views on creation. In particular he recognised that his field geology pointed to an ancient Earth which was opposed to the creation story. This problem dogged him for much of his adult life.

For the time, Miller was pretty prolific in his writing. Amongst the most well known titles are: *The Old Red Sandstone* (1841), *Footprints of the Creator* (1850), *The Testimony of the Rocks* (1857), and *Sketch-book of Popular Geology* (1859).

In recent years, *The Testimony of the Rocks* has been republished as a facsimile edition by St Matthew Publishing Ltd (2001), but it was his *Old Red Sandstone* that had the biggest impact when it was first published in 1841. Nowadays we'd call it a bestseller and, unusually for the time, it led on to much debate, something which Miller himself fostered in his later works.

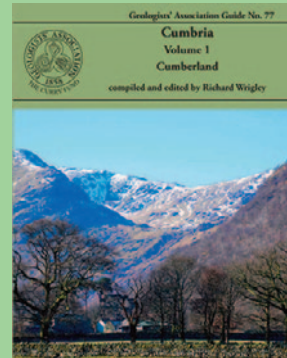
The present work, the first new edition for a hundred years, Michael A Taylor and Ralph O'Connor provide extensive notes and a critical study in Volume 1 and the text is reprinted in full, as a facsimile which comprises Volume 2.

I suppose the first question to be answered is how to read the two volumes. My suggestion is that you start with the Critical Study in Volume 1, ending at the point where the book itself is published. You then go to Volume 2, reading the book itself. You then return to the Critical Study and pick it up at the point where he learns of the readers' response to the book.

Presented in this way, Michael Taylor and Ralph O'Connor have made *The Old Red Sandstone*, a book for 2023, just as much as it was a book for 1841. At one level, *The Old Red Sandstone*, is still a description of the geology of Cromarty, Ross-shire, with diversions into its scenery, history and folklore, but it is also an autobiographical memoir and work of literature. Now, thanks to the publication of this new edition, it can once again be enjoyed by everyone, though I doubt it will have quite the same impact as it did in 1841.

Book Choice

Title: GA Guide No. 77
 Volume 1 Cumbria
 Editor: Richard Wrigley
 ISBN: 978 1 9996757 4 5
 Format: Wiroback
 Cost: £23.00
 Level: Adult general interest
 My rating: ****



The English Lake District is one of those areas that seems to absorb geological guidebooks in much the same way that absorbs some of the enormous rainfall that drops onto its surface. Accordingly, the Geological Association had the area as one of its key targets for a geological guide from the outset. It became GA Guide No. 2 written by Frank Moseley. Published in 1990, it's still in print.

It has become obvious in recent years that, the area needed a new guide, not to replicate what was already in Moseley's classic guide, but to bring in new locations. But how do you tackle such an enormous task? It quickly became obvious that to do the area justice, required not one, but two volumes. Volume 1 covers Cumbria, what you'd describe as the Central and Northern Part of the Lakes.

This time around the GA has entrusted the guides to Richard Wrigley, a former exploration geologist, who is lecture secretary of the Westmorland Geological Society. He has steered a group of mainly local people who have each contributed their own itineraries. I must say that Richard has done a good job as Editor, ensuring that the individual components fit together into a cohesive whole.

This Volume begins with a geological introduction that takes us through the stratigraphic units, the tectonics and the economic geology. There's good coverage of the glaciation and also the de-glaciation of the area. This latter is important because that's what we see some of the best evidence for in the field. This area has had more than its fair share of recent changes to the stratigraphical names and that is well covered.

As for the itineraries, Volume 1 includes The Skiddaw Group around Bassenthwaite, Seathwaite in Borrowdale, the Carboniferous of the Caldew Valley, the Carboniferous of Coombe Crag Gorge, Pennine Coal Measures of Whitehaven and Lowca, Permian and Triassic Rocks of West Cumbria, Quaternary of Upper Borrowdale, slope failures in the Upper Buttermere Valley, the Holocene of the Ravenglass Estuary and the Building Stones of Keswick. The final itinerary is a compilation of local geological sites across the region.

In many ways these two new guides to the Lake District complement what is already out there. In this guide, the inclusion of the building stones of the popular town of Keswick is a particularly welcome move as is the local geological sites. This latter is a nod in the direction in which I believe geological fieldwork is now going. Less people might be committing themselves to full day or week long excursions, but many more are wanting to 'dip their toes in the water' by taking on single outcrops such as are seen in old quarries. This volume is a welcome addition to your library of Lake District guides.

Book Choice

Title: GA Guide No. 77
Volume 2 Westmorland
Editor: Richard Wrigley
ISBN: 978 1 9996757 5 2
Format: Wiroback
Cost: £23.00
Level: Adult general interest
My rating: ****



In this Volume 2 of the Geologists' Association coverage of the Lake District we turn our attention to the southern part of the area that covers the former county of Westmorland and the area known as Furness.

As with Volume 1, Richard Wrigley has done a grand job of bringing together a team of mainly local people who have contributed some excellent local itineraries to make up this splendid book.

The book begins with the assumption that you've also purchased the first Volume (which will probably mainly be true) as there's a much shorter introduction to the geology without the details of the stratigraphic units and the structures. On the positive side, this leaves more room for the subsequent itineraries, of which there are total of twelve.

This time around we are invited to take in: the volcanic rocks of Side Pike, the Langdale Caldera, the Windermere Supergroup on the southwest Lake District, a transect of the Dent Fault Zone at Taythes Gill, the Windermere Supergroup around Broughton in Furness and Gawthwaite, the Shap granite, Carboniferous rocks of Trowbarrow Quarry, Carboniferous of the Upper Eden Valley, Carboniferous Limestone of Kendal Fell, the North Pennine Orefield around Nenthead, the Permian Rocks of the Vale of Eden and the finally, the Building Stones of Kendal.

It's particularly pleasing to see the itineraries in the Eden Valley and also the North Pennine Orefield. We often forget that with the passage of time, sites that were accessible thirty or more years ago may not be so now. This is certainly the case with some old quarries which may lie on private ground, where the present owner does not welcome geologists.

I conclude my remarks on both Volumes with some general comments about the presentation of the material. Both guides use the wiroback binding system which works better on thinner guides with less pages. This and the fact that the guides are printed on gloss paper means that they will fare badly in the field, particularly in wet weather.

The quality of the full colour photographs, maps and diagrams is excellent throughout. This is also the case when it comes to the clear directions given on the routes. The older GA guides are not in the same league! Well done to Richard Wrigley and his volunteer team!

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Title: She Sold Seashells & Dragons
Author: Wolfgang Grulke
Publisher: At One Communications
ISBN: 978 1 916 0394 5 2
Format: Hardback
Cost: £12.00
Level: Adult general interest
My rating: ****



You might be forgiven for thinking that the nineteenth century celebrated Lyme Regis fossil collector had been done to death, so to speak, with numerous books and even a film about her life.

Well you'd be wrong as this book by Wolfgang Grulke takes on the subject and gives it some novel twists. The Author is someone with his mind firmly in the future as he's the founder of the FutureWorld think tank. He's also an award winning author in the natural world. He lives in Dorset and has a large personal fossil collection.

With the aid of AI technology he's re-imagined Mary Anning and her world with historic images sat alongside images of the coast and buildings in Lyme Regis in the here and now. In this way he brings Mary Anning to life. We are invited effectively to join her on her journeys of discovery.

Books such as this often fall down by being poorly researched or not working with people who know the subject as local experts. Wolfgang Grulke has clearly worked hard with Dr Paul Davis, Curator of the Lyme Regis Museum to ensure that this has been meticulously researched. It tells you something of the sanding of the author that Sir David Attenborough was willing to endorse the book.

This would make an excellent Christmas present for anyone interested in Mary Anning, or indeed Dorset Geology and palaeontology.

Title: Introducing Sedimentology
Second Edition
Author: Stuart Jones
Publisher: Dunedin
ISBN: 978 1 78046 102 1
Format: Softback
Cost: £16.00
Level: Adult general interest
My rating: ****



This is the latest in Dunedin's classic series to be updated as a second edition. The author notes that in the years since the first edition appeared in 2015. There have been advances in both sedimentology and the intrinsically linked subject of stratigraphy and these are reflected in re-writes of some areas.

New photographs and diagrams have been added, including material from the NASA Perseverance Rover's visit to Mars, which have taken the study of sediments to a whole new planet - quite literally.

As with the first edition, this is a benchmark text for the subject.



diary of events

lectures/zoom meetings

November

- 7 "Volcanoes of Montserrat" Jenny Barclay
Organiser: Essex Rock & Min. Soc. Details: <http://www.erms.org/> (Shenfield)
- 8 "Thames gravels" by Philip Gibbard (Zoom)
Organiser: Harrow & Hillingdon Geol. Soc. Details: www.hhgs.org.uk
- 8 "Novel approaches to improving understanding of the stratigraphical record" by Peter Burgess Organiser: Cumberland Geol. Soc.
Details: <https://www.cumberland-geol-soc.org.uk/events/>
- 8 "The lie of the land" by Martin Whiteley
Organiser: Shropshire Geol. Soc.
Details: <http://www.shropshiregeology.org.uk/SGS/SGSintro.html>
- 9 "The Wealden iron industry" by Jeremy Hodgkinson
Organiser: Mole Valley Geological Society. Details: www.mvgs.org.uk
- 9 "The structure of the Weald" by Andy Gale (Zoom)
Organiser: West Sussex Geol. Soc. Details: <http://www.wsgs.org>
- 9 "Geothermal resources" by Cat Hirst
Organiser: Herts. Geol. Soc. Details: <https://www.hertsgeolsoc.org.uk/talks/>
- 9 "From cradle to grave: delivering sustainable extraction of construction raw materials" by Ruth Allington
Organiser: North Staffs. GA Group Details: <https://nsgga.org/>
- 10 "Asteroids and comets - an introduction" by Mike Millar
Organiser: Farnham Geol. Soc. Details: www.farnhamgeosoc.org.uk/meetings/
- 11 "Extent, style and timing of former glaciation in the Gaick, Scotland" by Benjamin Chandler
Organiser: East Midlands Geol. Soc. Details: www.emgs.org.uk
- 11 "Volcanology" by Katie Preece
Organiser: South Wales GA Group. Details: <http://swga.org.uk/>
- 13 "Paramoudra: the origins of flint at West Runton" by Russell Yeomans
Organiser: Cambs. Geol. Soc. Details: <http://www.cambsgeology.org/events>
- 14 "Minerals of the English Midlands" by Roy Starkey (Zoom)
Organiser: Amateur Geol. Soc. Details: www.amgeosoc.wordpress.com
- 14 "What fossil footprints can tell us about extinct animals" by Peter Folkingham Organiser: Liverpool Geol. Soc.
Details: <https://liverpoolgeologicalsociety.org/indoor-meetings>
- 15 "The Carboniferous of the Pennines" by Colin Waters
Organiser: Westmorland Geol. Soc.
Details: <https://www.westmorlandgeolsoc.co.uk/winterlectures>
- 16 "The Ashdon Meteorite" by Gerald Lucy & Ros and Ian Mercer
Organiser: Essex Rock & Min. Soc. Details: <http://www.erms.org/> (Stanway)
- 16 "Northern chalks and their associated flints" by Paul Hildreth
Organiser: Warwickshire Geocons. Group Details: <http://www.wgco.org.uk/>
- 17 "Forensic palaeontology" by Haydon Bailey (Zoom)
Organiser: West Sussex Geol. Soc. Details: <http://www.wsgs.org>
- 17 "Meltwater, meteors & volcanoes" by James Baldini (Zoom)
Organiser: North Eastern Geol. Soc. Details: <https://www.negs.org.uk/>
- 19 Members' Evening. Organiser: Mid-Wales Geology Club
Details: <https://www.midwalesgeology.org.uk/>
- 20 "Origins of starfish and their relatives" by Aaron Hunter
Organiser: Black Country Geol. Soc. Details: honsec@bcgs.info
- 21 "Geology of Northeast Scotland" by James Downer
Organiser: Kent Geologists' Group Details: www.kgg.org.uk/ (Zoom)
- 22 "Hotspots of the Pacific" by Ros & Ian Mercer
Organiser: Essex Rock & Min. Soc. Details: <http://www.erms.org/> (Zoom)
- 27 "Geological perspectives on climate change" by Stuart Robinson
Organiser: Teme Valley Geol. Soc. Details: <https://geo-village.eu/>
- 28 Practical microfossils session with Maggie Williams
Organiser: Liverpool Geol. Soc.
Details: <https://liverpoolgeologicalsociety.org/indoor-meetings>
- 30 "The pyroclastic density current problem" by Naomi Walding
Details: Hull Geol. Soc. Details: <http://www.hullgeolsoc.co.uk/>

December

- 1 "The extinction of a giant apex predator: implications on a food web structure" by Amy Shipley. Organiser: Geologists' Association

Please be aware that a number of clubs/societies are currently operating with a mix of live events and Zoom meetings. Please check with the organisers what model they are working to on each occasion.

- Details: <https://geologistsassociation.org.uk/lectures/> (Zoom)
- 1 "Scotland's Carboniferous Firth of Forth coast" by John Taylor (Zoom)
Organiser: Sussex Min. & Lap. Soc. Details: <https://www.smls.online/>
- 4 "Experimental taphonomy: unravelling the Burgess Shale" by Nic Minter
Organiser: Reading Geol. Soc. Details: rgs.secretary@btinternet.com
- 5 Christmas Quiz & mince pies
Organiser: Essex Rock & Min. Soc. Details: <http://www.erms.org/> (Shenfield)
- 6 "The Yorkshire chalk" by Mike Horne (Zoom)
Organiser: Brighton & Hove Geol. Soc. Details: [s://www.bhgs.org/](http://www.bhgs.org/)
- 7 AGM & Conversazione
Organiser: Leeds GA. Details: <https://leedsga.org.uk/events/category/lectures/>
- 7 "The NW Highlands Controversy: geology and social climbing in Victorian times" by Peter Gutteridge
Organiser: Bath Geol. Soc. Details: <https://bathgeolsoc.org.uk/lectures/>
- 7 "William Smith's fossils reunited" by Jill Darrell & Di Clements
Organiser: North Staffs. GA Group Details: <https://nsgga.org/>
- 8 Hands on lapidary demonstration by James Langdon
Organiser: West Sussex Geol. Soc. Details: <http://www.wsgs.org>
- 8 Short talks by members
Organiser: North Eastern Geol. Soc. Details: <https://www.negs.org.uk/>
- 8 "The Ecton copper mines" by Richard Shaw
Organiser: East Midlands Geol. Soc. Details: www.emgs.org.uk
- 9 "The geology of Antarctica" by James Cresswell
Organiser: South Wales GA Group. Details: <http://swga.org.uk/>
- 9 "The Clachtoll megacast: the forensic reconstruction of a 1.2 billion year old catastrophe" by Natalie Farrell
Organiser: Manchester Geol. Ass. Details: lectures@mangeolassoc.org.uk
- 11 "Introduction to the geology of the chalk springs & chalk streams of Cambridgeshire" by Steve Boreham
Organiser: Cambs. Geol. Soc. Details: <http://www.cambsgeology.org/events>
- 11 Members' Evening & Christmas Social
Organiser: Black Country Geol. Soc. Details: honsec@bcgs.info
- 12 "Cornish Lithium exploration" by Zoe Richardson (Zoom)
Organiser: Amateur Geol. Soc. Details: www.amgeosoc.wordpress.com
- 13 Members' Evening
Organiser: Cumberland Geol. Soc.
Details: <https://www.cumberland-geol-soc.org.uk/events/>
- 13 Lecture - title tbc by Jon Noad (Zoom)
Organiser: Harrow & Hillingdon Geol. Soc. Details: www.hhgs.org.uk
- 13 "Critical raw materials for the energy transition" by Kathryn Goodenough
Organiser: Shropshire Geol. Soc. (Zoom)
Details: <http://www.shropshiregeology.org.uk/SGS/SGSintro.html>
- 14 "Dinosaurs, new visions of a lost world" by Mike Benton
Organiser: Herts. Geol. Soc. Details: <https://www.hertsgeolsoc.org.uk/talks/>
- 21 Christmas Quiz & mince pies
Organiser: Essex Rock & Min. Soc. Details: <http://www.erms.org/> (Stanway)
- 13 "Critical raw materials for the energy transition" by Kathryn Goodenough
Organiser: Shropshire Geol. Soc.
Details: <http://www.shropshiregeology.org.uk/SGS/SGSintro.html> (Zoom)
- 19 "The geology of Christmas" by Anne Padfield (Zoom)
Organiser: Kent Geologists' Group Details: www.kgg.org.uk/

January

- 8 AGM & Members' Evening
Organiser: Reading Geol. Soc. Details: rgs.secretary@btinternet.com
- 9 "Essex Rocks" by Ros & Ian Mercer. (Zoom)
Organiser: Amateur Geol. Soc. Details: www.amgeosoc.wordpress.com
- 10 "Outcrops to paintbox: mineral pigments in artists' paintings" by Ruth Siddall
Organiser: Cumberland Geol. Soc.
Details: <https://www.cumberland-geol-soc.org.uk/events/>
- 10 "The North sea during the last interglacial" by Amy McGuire (Zoom)
Organiser: Brighton & Hove Geol. Soc. Details: [s://www.bhgs.org/](http://www.bhgs.org/)
- 10 "Worms and wonders: Silurian 3D soft-bodied fossils" by Mark Sutton (Zoom)
Organiser: Manchester Geol. Ass. Details: lectures@mangeolassoc.org.uk
- 10 "Fluvial geomorphology" by Philip Marren
Organiser: Shropshire Geol. Soc.
Details: <http://www.shropshiregeology.org.uk/SGS/SGSintro.html>

11 “The Peak District” by Martin Whiteley (Zoom)
 Organiser: West Sussex Geol. Soc. Details: <http://www.wsgs.org>
 12 “Fluvial geomorphology” by Phillip Marren
 Organiser: Shropshire Geol. Soc.
 Details: <http://www.shropshiregeology.org.uk/SGS/SGSintro.html>
 13 “Holiday geology” members’ contributions
 Organiser: South Wales GA Group. Details: <http://swga.org.uk/>
 14 “The Northwest Highlands Controversy - how one man’s ego held back science” by Reg Nicholls
 Organiser: Cambs. Geol. Soc. Details: <http://www.cambsgeology.org/events>
 15 “A recipe for disaster” by Ekbal Hussein
 Organiser: Black Country Geol. Soc. Details: honsec@bcgs.info
 16 “Gas seepage in the fjords of West Spitsbergen and its geological controls” by Nil Rodes
 Organiser: Bath Geol. Soc. Details: <https://bathgeolsoc.org.uk/lectures/>
 17 “Palaeogene mammals evolution” by Steve Brusatte (Zoom)
 Organiser: Westmorland Geol. Soc.
 Details: <https://www.westmorlandgeolsoc.co.uk/winterlectures>
 19 “The Soehnle Limestone” by Chris Duffin
 Organiser: West Sussex Geol. Soc. Details: <http://www.wsgs.org>
 19 “Gold geology in 2024” by Neil Phillips (Zoom)
 Organiser: North Eastern Geol. Soc. Details: <https://www.negs.org.uk/>
 23 “The diamond deposits of Namibia” by Jeff Harris
 Organiser: Liverpool Geol. Soc.
 Details: <https://liverpoolgeologicalsociety.org/indoor-meetings>
 24 “Deformed dirt: research on the deformation caused by glaciers and ice sheets” by Emrys Phillips (Zoom)
 Organiser: Manchester Geol. Ass. Details: lectures@mangeolassoc.org.uk
 27 “Castle Bank: Wales’ answer to the Burgess Shale” by Joe Botting & Lucy Muir
 Organiser: South Wales GA Group. Details: <http://swga.org.uk/>

February

5 “Maps, mountains & madness: Charles Lapworth & the Highland Controversy” by Paul Smith
 Organiser: Reading Geol. Soc. Details: rgs.secretary@btinternet.com
 6 “Crystal detectives: tracing magmatic processes through time” by Katy Chamberlain. Organiser: Liverpool Geol. Soc.
 Details: <https://liverpoolgeologicalsociety.org/indoor-meetings>
 7 “Exceptional fossils: the surprising, the significant and the strange” by Peter Sheldon
 Organiser: Brighton & Hove Geol. Soc. Details: <http://www.bhgs.org/>
 7 “Tipping positive change to avoid climate tipping points” by Tim Lenton
 Organiser: Cumberland Geol. Soc.
 Details: <https://www.cumberland-geol-soc.org.uk/events/>
 10 “The legacy of coal mining” by Jeremy Hucker
 Organiser: South Wales GA Group. Details: <http://swga.org.uk/>
 12 “Ediacaran fossils in Namibia” by Alex Liu
 Organiser: Cambs. Geol. Soc. Details: <http://www.cambsgeology.org/events>
 14 “Darwin and the Ice Age in Shrewsbury” by Mike Streetly
 Organiser: Shropshire Geol. Soc.
 Details: <http://www.shropshiregeology.org.uk/SGS/SGSintro.html>
 16 “Fluid flow in orogenic belts” by Catriona Menzies (Zoom)
 Organiser: North Eastern Geol. Soc. Details: <https://www.negs.org.uk/>
 17 “The Gavellachs” by David Tyler + Presidential Address
 Organiser: Manchester Geol. Ass. Details: lectures@mangeolassoc.org.uk
 19 “A very British summer in the Late Triassic” by Stuart Burley
 Organiser: Black Country Geol. Soc. Details: honsec@bcgs.info
 20 “Iceland” by Hazel Clark. Organiser: Liverpool Geol. Soc.
 Details: <https://liverpoolgeologicalsociety.org/indoor-meetings>
 21 Presidents’ Address by Hugh Tuffen. Organiser: Westmorland Geol. Soc.
 Details: <https://www.westmorlandgeolsoc.co.uk/winterlectures>
 27 “Nuclear waste disposal” by Josh Griffiths & Nick Smith
 Organiser: Liverpool Geol. Soc.
 Details: <https://liverpoolgeologicalsociety.org/indoor-meetings>

day field trips & visits

Please ensure that you contact the organisers in advance of any field trip advertised. Please don’t just turn up. In some instances field trips may be limited to members only - please enquire.

November

11 Geoconservation day at Portway Hill, Rowley Regis
 Organiser: Black Country Geol. Soc. Details: honsec@bcgs.info

December

7 Visit to The Natural History Museum with Richard Howard
 Organiser: Reading Geol. Soc. Details: rgs.secretary@btinternet.com
 9 Geoconservation day at Saltwells National Nature Reserve
 Organiser: Black Country Geol. Soc. Details: honsec@bcgs.info

January

13 Geoconservation day at Portway Hill. Rowley Regis
 Organiser: Black Country Geol. Soc. Details: honsec@bcgs.info
 24 Visit to South Oxfordshire & Buckinghamshire with Ross Garden
 Organiser: Reading Geol. Soc. Details: rgs.secretary@btinternet.com

February

10 Geoconservation day at Wrens Nest National Nature Reserve
 Organiser: Black Country Geol. Soc. Details: honsec@bcgs.info

residential field trips

2024

April

10-18 The Northwest Highlands of Scotland with Chris Darmon & Colin Schofield
 Organiser: Down to Earth. Details: downtoearth@geosupplies.co.uk
 24-May 3 Southern Norway with Chris Darmon & Colin Schofield
 Organiser: Down to Earth. Details: downtoearth@geosupplies.co.uk

May

16-19. Purbeck & Portland with Ross Garden
 Organiser: Reading Geol. Soc. Details: rgs.secretary@btinternet.com

June

10-17 Edinburgh and the Scottish Borders with Chris Darmon & Colin Schofield
 Organiser: Down to Earth. Details: downtoearth@geosupplies.co.uk
 23-30 The Gower Coast of Wales with Chris Darmon & Colin Schofield
 Organiser: Down to Earth. Details: downtoearth@geosupplies.co.uk

July

7-12 The Welsh Borderland with Chris Darmon & Colin Schofield
 Organiser: Down to Earth. Details: downtoearth@geosupplies.co.uk

August

10-17 Annual Summer School at Stirling with the team
 Organiser: Down to Earth. Details: downtoearth@geosupplies.co.uk
 31- Sept. 5 the Llyn Peninsula with Chris Darmon & Colin Schofield
 Organiser: Down to Earth. Details: downtoearth@geosupplies.co.uk

September

9-12 Shropshire with Albert Benghiat
 Organiser: Reading Geol. Soc. Details: rgs.secretary@btinternet.com
 21-28 The Island of Jersey with Chris Darmon & Colin Schofield
 Organiser: Down to Earth. Details: downtoearth@geosupplies.co.uk

October

4-14 The Fort William area with Chris Darmon & Colin Schofield
 Organiser: Down to Earth. Details: downtoearth@geosupplies.co.uk
 21-26 The Yorkshire Dales with Chris Darmon & Colin Schofield
 Organiser: Down to Earth. Details: downtoearth@geosupplies.co.uk

fairs, shows & special events

November

16 Sussex Mineral & Fossil Show, 10.00 - 4.30 Haywards Heath
 Organiser: Sussex Min. & Lap Soc. Details: <https://www.smls.online/>
 25 Mineral, Gem & Fossil Show at Trinity Church, Nether St., N12 7NN
 Organiser: Amateur Geol. Soc. Details: www.amgeosoc.wordpress.com



West Runton, where better to start...

We begin this eclectic mix of tailpieces with the oldest inhabitant of Norfolk, *Mammuthus trogontherii*, who's variously described as a mammoth and an elephant. He's a steppe mammoth but elephant is also correct.



He was unearthed at West Runton on the North Norfolk coast following a storm in 1990. The majority of the skeleton was recovered during a 3-month dig in 1995.

The age of the specimen is probably between 600,000 and 700,000, from a period of time known as the Cromerian.

The bones are now mainly displayed at the Castle Museum in Norwich following extensive preparation work. The model, which has been placed at West Runton quite recently, has inaccurate tusks - for safety reasons!

If you go down to the Dorset coast today, what will you find?

A story carried by *The Times* newspaper on October 9th. revealed that large quantities of drugs had been washed up in bags along the Dorset coast.

Apparently some time between October 2nd and the 9th, holdalls full of cocaine were turning up on the popular Dorset coast around Durdle Door and also on the Isle of Wight. Reports were coming in to the police from local fishermen.

The police were particularly keen to speak to a 'litter picker' in his 60s who may be able to help with their enquiries in regard to the drugs. So far so good, for The Times, but they weren't finished yet. They went on to state: "The Jurassic Coast is more typically associated with people finding trilobites and other fossils rather than washed-up drug consignments."

So the next time you go down to the Dorset Coast you could find washed-up drugs, or you may find an even rarer trilobite!



Part of the drug haul found along the coast of Dorset and the Isle of Wight. (Image: National Crime Agency)

It pays to advertise, with a great strapline...



As seen on the Channel Island of Sark

We all know that rock, particularly bedrock, can be said to form the foundations of a place, but this strapline is particularly pertinent. It was seen on the Channel Island of Sark, an island that only has a few km of surfaced tracks and only tractors, with no cars.

Ronez is a Channel Island quarrying company with operations in both Guernsey and Jersey. Nowadays its the principle supplier of concrete with its own ship for importation of the products.

The company website, gives us an insight into quarrying on the islands:

"The origins of Ronez Limited lie in the history of Jersey where there may be evidence of commercial quarrying as far back as 1651. There is reference to Clos de Carieres in the parish of St John where almost two centuries later the Ronez quarry was established when the Jersey Granite Company commenced operations there in 1869. A successor to this company was acquired in 1911 by the Croft Granite, Brick, and Concrete Company of Leicestershire.

In Guernsey there was originally a quarry at St Germain at the Castel in 1639. In 1840 John Mowlem, founder of the famous civil engineering firm, renewed the paving of Blackfriars Bridge with setts of Guernsey granite. The repaving of London Bridge and the Strand followed, and the granite for the Thames Embankment, 1862-74, also came from Guernsey. By the end of the 19th century Mowlem's Guernsey operation had a steam crusher, and all the paraphernalia of weighbridges, storage yards, workshops, stables, blondins and offices. In addition to the quarries owned, Ronez also had some they leased."

Yes, it seems that Ronez are fully entitled to the strapline, "part of the islands foundations"!"

A journey into the interior of the Earth...

With the cancellation of our field trip to Tenerife next February we won't be able to visit what is the fifth largest volcanic tube in the world, say our Tenerifian guide *Isabel Mora*. She has sent us details of *Cueva del Viento*, or the *Cave of the Wind*.

Against an impressive picture, it describes itself in these glowing terms:

"Cueva del Viento is a volcanic cavity located in the district of Icod de los Vinos which bears the same name. It was formed 27,000 years ago in basaltic lavas from the first eruptive phase of the Pico Viejo volcano, next to Mount Teide (Tenerife, Canary Islands).



This lava tube, the name of which comes from the powerful draughts that flow through it, is the fifth longest in the world (18 kilometres mapped to date), behind the four that are found on the largest island of the Hawaii archipelago (United States). It is a huge labyrinthine network of underground passages, with many unexplored branches that will undoubtedly add to its overall length in the future."

Carisbrooke Castle, we asked, you answered...

In the last issue we carried a picture of Carisbrooke Castle on the Isle of Wight and I asked about the stone with which it is built.

Down to Earth reader *Shirley Welch* came back with this response:

I've just been looking at the English Heritage site for Carisbrooke Castle and this is the only paragraph which mentions the stone used.

"Tomalin also draws attention to the phasing of the Lower Enclosure and particularly to the type of stone and mortar used in its construction. Binstead stone, which appears in the lowest part of the wall, was a favoured Roman building material. Quarr stone appears in the upper part of the wall build, after a 'soil-band' appears in the wall. Quarr stone rarely occurs in Saxon building work before the Late Saxon building. This suggests that the upper work was built after a period of abandonment which is indicated by the soil band."

The Editor comments: Thanks for this Shirley, I've followed up on Binstead Stone and found this on the *Stone in Archaeology* website:

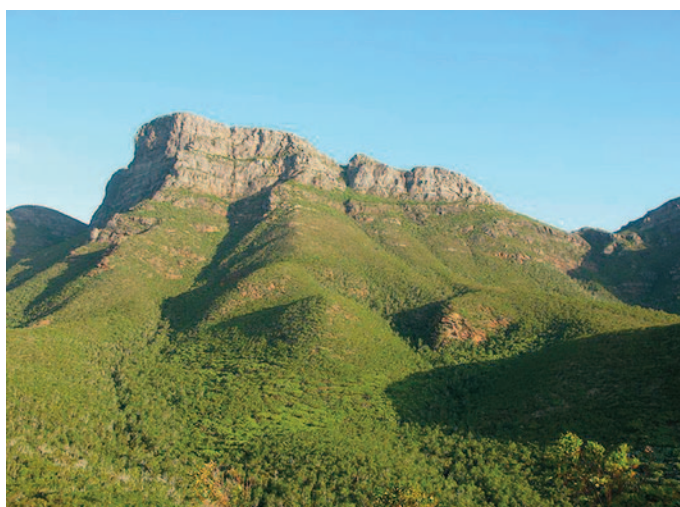
It's part of the Bembridge Limestone Group of the Palaeocene and is found on the Isle of Wight.

It's described in these terms "a cream/white or buff/grey coloured limestone which can turn a dark russet colour on exposure due to its iron content. A hard, coarse, bioclastic, freshwater limestone which is poorly sorted with a hackly fracture. The fragments of fossil shell known as Galba Longiscata (a late Eocene pond-snail) are crushed and not very recognisable."

So far as I know, it's no longer quarried anywhere on a commercial basis, so any repairs would have to be done using some other stone.

Oops, yes Stirling Ranges, but not in Scotland...

We've all seen illustrations which purport to be somewhere and you know that they are actually somewhere else, but my first attempt at an image to illustrate our Stirling Summer School next August went spectacularly wrong!

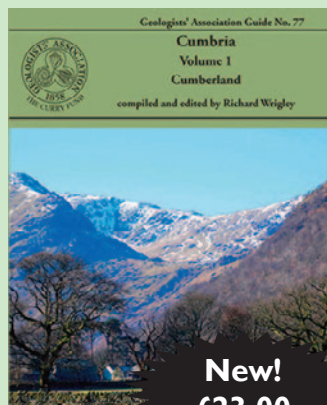


Thanks to all of you who pointed out that the Stirling Ranges are actually in Western Australia! To be more precise: "Stirling Range National Park is a national park in the Great Southern region of Western Australia, approximately 337 kilometres south-east of Perth." *The fine image and these words come from Wikipedia.*

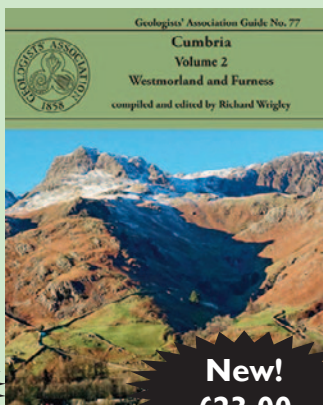


Featured books November to January

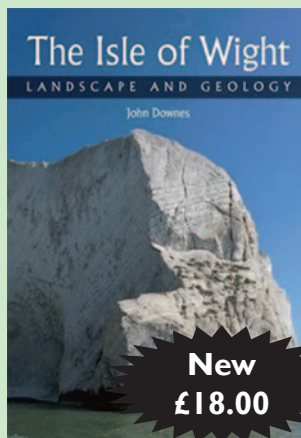
In each issue we are pleased to be able to introduce you to a range of featured books. Where they are being offered at reduced prices, these will be current to the end of January 2024 provided that stocks are available. Please note, all prices include UK postage.



New!
£23.00



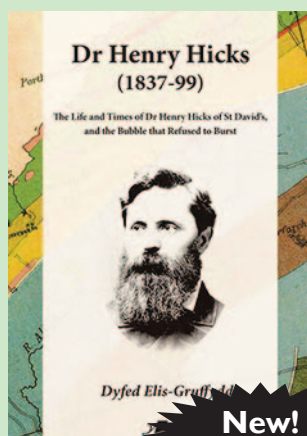
New!
£23.00



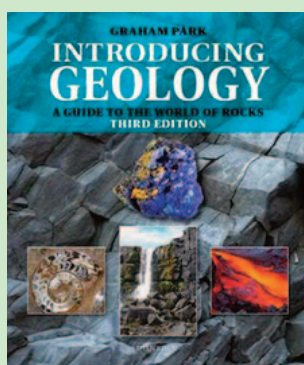
New
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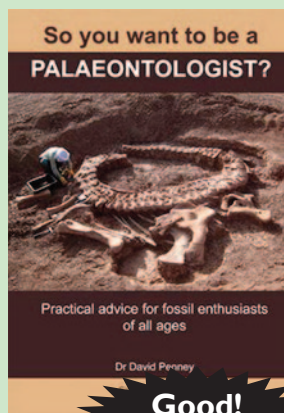
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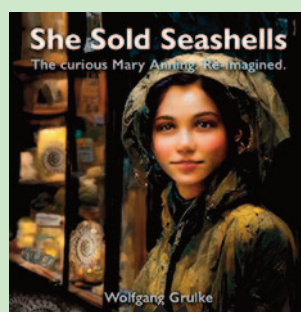
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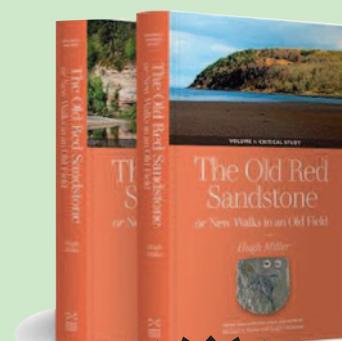
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