

Cymdeithas Daeareg Gogledd Cymru

North Wales Geology Association

NEWSLETTER



Issue 97

February 2018

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Front Cover Image:

Salt related subsidence around the Trent and Mersey Canal, July 1907 – the subject of our recent evening lecture by Cathrene Rowell of Keele University

Editor's Comment

The eagle eyed amongst you will have noticed that, unusually perhaps, Edition 97 has been published following Edition 98. *Mea culpa* I am afraid, as in my rush to get to 100 I inadvertently missed 97. We are now back on track, and the next edition will be 99 before the milestone of 100 is reached.

It is hoped that we can make that something of a special edition, and are targeting a close look at "The Cambrian" in all its mystery. In the meantime can I urge anyone with anything they are willing to commit to print to get in touch for Edition 99, which hopefully will include details of the summer excursions and should come out in April or May.

Articles correspondence etc to Newsletter Editor: Keith Nicholls keithnicholls@gmail.com

Chairman's Message

The Annual General Meeting of the Association has just passed, as you will no doubt be aware. Although it comes but once each year, it is a very useful opportunity to meet members and discuss matters that go beyond the business in hand at our normal evening meetings, where the timetable is devoted to the speaker. I suppose that it is inevitable, but the members who attend the AGM are a fairly consistent crowd and it would be really good to see a wider cross-section of the membership, just in case they would come up with some truly novel ideas about how the Association can serve its members better. Maybe a change of venue would help – if so we will look forward to your suggestions on a postcard or email. One suggestion, stemming from the popularity of the AGM format with a speaker on a Saturday (a practice instituted by past chairman Rob Crossley), would be to hold the regular meetings on a Saturday instead. Therefore we will be holding at least one lecture meeting on a Saturday instead of midweek during the forthcoming year, and we look forward to seeing some new faces. Similarly, we asked for ideas for speakers and at least a couple of really excellent suggestions came forward – so if you have an idea for a speaker, or can recommend someone who you have heard elsewhere, please share that with the nearest committee member, or Gary who is the Meetings Secretary. We'd also like to hear about any field trips which spring to mind, or even a joint meeting with a nearby and like-minded organisation.

Another matter that was discussed at the AGM was the future of the committee, or at least some of the members. Most of us have been in post for a number of years, and some new blood may lead to a more dynamic future. In particular, Keith our Newsletter Editor has hinted strongly that he intends to go out with a blaze of glory

with edition 100, so we are definitely looking to find someone to take up the reins from now, so that the new incumbent can work with Keith to learn what is expected and how it comes together before he relinquishes the role. Printing is not, and never has been, a part of the job, so don't worry about your printer not being up to it. I should point out that Keith spends much more of his time away from home these days, and finds increasing difficulty in keeping in touch with meetings and minutiae, though it appears that he has regular and highly unusual field excursions that some of us would relish.

Talk of newsletters reminds me that I received a surprising request by email from the National Library of Wales recently. The library asks if we can grant them archive copies of our newsletter so that they can be made publicly accessible – which is a bit of a laugh, because the library would not know of their existence had they not been accessible on the web already! Seriously, of course, it could all vanish on the instant if I decided to press “delete” or didn't pay my hosting fees, so their interest for archival purposes is sensible. And many, recent editions are not yet available online. They are read, because correspondence sometimes ensues.

The matter of new blood is a serious one for discussion, though smacking of pure self-interest as I have to point out that I have now been in post since at least 2003, though I have not yet found time to wade through back-numbers of AGM minutes to find out when I was (re-) elected to the chair. This is an extremely unhealthy situation, and while I may be trying to reduce my professional hours it is not a given that I intend to spend my increasingly valuable and limited spare time on your Association indefinitely.

An uncanny resonance between professional and personal life was

demonstrated recently when I booked a week's holiday in May near to the celebrated coastal resort of Ayr in southern Scotland. At around the same time there appeared on my desk at work a sample of 'dust' from an Ayrshire quarry plant which required analysis. Intrigued, I started to research its source and was reminded of the extent of Carboniferous to Permian magmatism in northern Britain. It does not seem entirely obvious that volcanoes were very active at the time when Lizzie (*Westlothiana lizziae*) first walked on the land, but volcanic and intrusive rocks are widespread at outcrop from The Farnes Islands to Dumbarton Rock and from Heads of Ayr to Elie Ness. A basalt bearing analcime and olivine is not the most common target for analysis by x-ray diffraction, and I hope that a hand specimen will result from a holiday visit later in the year. Excellent Carboniferous gabbro can be found not too far from the border of mid-Wales at Clee Hill and it makes a fine petrographic section, as do Essexite and Lugarite from southern Scotland.

With this issue will come a membership form for 2018, and we invite your renewal and look forward to your company at forthcoming meetings, whenever and wherever they may be held.

Jonathan Wilkins

Articles:

'Halkyn's Tropical Past, 350 million years in the making'.

Our Mountain holds a rare and mysterious power. Hidden just below the surface, this power can open a gateway into the earth's long-forgotten past. That power is rocks, or more specifically, the fossils within. Fossils hold the key to studying the earth's natural history in incredible detail. What could otherwise be a fairly nondescript rock, when it contains a fossil, can tell us so much about the time and environment at which that rock formed. From this, we can then determine our position on the earth's crust at that point in time.



Figure 1: A limestone bed particularly rich in crinoid fossils. When finely polished, this rock is known as Halkyn Marble, and due to popularity for building stone it is now very rare. Is your doorstep or fireplace made of this?

The limestone that underlies Halkyn Mountain formed during the Carboniferous Period, around 350 million years ago. At that time, North Wales was located near to the equator and mostly covered by a warm, tropical shallow sea. A large coral reef, located to the north of Halkyn, sheltered a shallow lagoonal sea from most ocean currents bar a few large storm events. The sea bed was mostly

muddy and soft with some rockier areas. This varied substrate provided good habitats for a variety of bottom dwelling, hard-bodied sea creatures.

We know all this from studying just a few fossil sites on the Common. The limestones on Halkyn are unusually rich in fossils, particularly crinoids or ‘Sea Lillies’, which anchored onto harder substrates, and brachiopods (a type of sea shell) which sat in soft, muddy substrates. These are often very well preserved in the rocks and it is because of this that we can gain so much information. For example, we can determine the prevailing current direction at that time, from the orientation at which the fossils now lie on the rock bed surfaces, the angle of the slope of the seabed, and even the chemistry and temperature of the ancient ocean water. We can gain information on past climates and therefore paint a picture of climate change over a vast period of time, helping us to understand how climate change could affect our planet today.

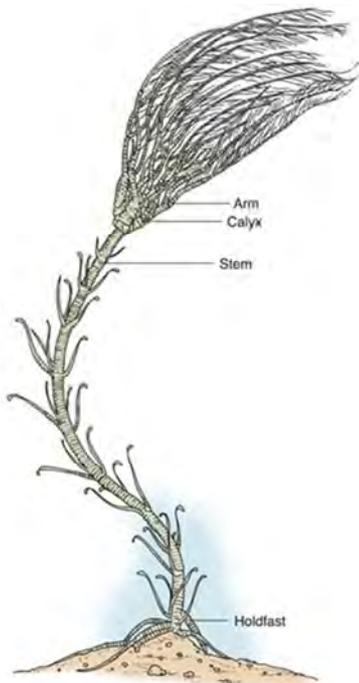


Figure 2: An artist's reconstruction of what Carboniferous crinoids looked like when alive.

Halkyn Mountain is part of a large Site of Special Scientific Interest notified for its

rare plants and minerals. The fossils found on Halkyn are also important in understanding the geology but are in danger of being damaged by indiscriminate hammering and collecting. The important geology on Halkyn Mountain should be conserved for future generations to learn from and be inspired, as I was inspired some 5 years ago when I began to study geology after my interest was sparked on the mountain. Nobody can argue that collecting a fossil can spark a life-long passion but important fossils sites are often finite and can be easily damaged. Therefore, on protected areas such as Halkyn collect only loose material and remember to leave plenty for others. If it is part of a project where more collecting is required, contact Natural Resources Wales to discuss the work. Further guidance for responsible collecting can be found on the Geological Society of London website - <https://www.geolsoc.org.uk/FieldResources>.



Figure 3: A hidden gem.

A partly exposed brachiopod hiding in the Halkyn limestone. It's been waiting for 350 million years to give us its secrets.

Illegal fly tipping, off-road activity, and rock collection/hammering are the main threats our fossils are exposed to. These activities not only have a detrimental impact on the geology, but can also damage our precious flora and fauna. It is also important to note that much of Halkyn Common is protected by UK and European law and that some activities require permission from Natural Resources

Wales. Activities may also require permission from the landowner.



Figure 4: Several species of brachiopod fossil from the Common, displaying numerous forms of habitation. The Carboniferous seas provided a diverse habitat for these creatures to thrive in.

The local communities are the eyes and ears of this mountain and should you spot any suspicious activities that threaten our natural features, please contact either Rachael Watson, the mountain warden at rachaelwatson@wildlifetrustswales.org or Natural Resources Wales 'Report it' line on 0300 065 3000. The non-emergency police line 101 can also respond to illegal activities such as fly tipping and off-road driving.

Any queries about the mountain, or if you would like more information on the geology, get in touch with me at tom.hughes@mytegfam.com.

Tom Hughes

Local resident & NEWRIGS member.

Editor's Note:

The field trip to Halkyn Mountain last summer was fascinating, and it is intended to go back there this year with the particular intention of trying to understand the genesis of the banded cherts. Plenty of opportunity when we are there to collect of course, but we should follow Tom's advice with respect to limiting our activity to loose material. Fortunately there is plenty of that about!

Job Opportunity

We're hiring! As an InSAR scientist you will join our team of highly respected InSAR specialists who are dedicated to helping clients solve real-world ground stability challenges across the world. From oil fields to pipelines, mines and mud volcanoes, we will provide you with opportunities to work on some of the industry's most exciting projects. Are you ready to unleash your potential? Read more and apply via the link:

<https://www.cgg.com/en/Join-Us/Professionals/Job-Search?jobID=NPANJ20170623AT>

Alternatively come and meet me personally. I work closely with Keith Nicholls, your Newsletter Editor, and he can put you in touch.

Adam Thomas CGG

Discussion:

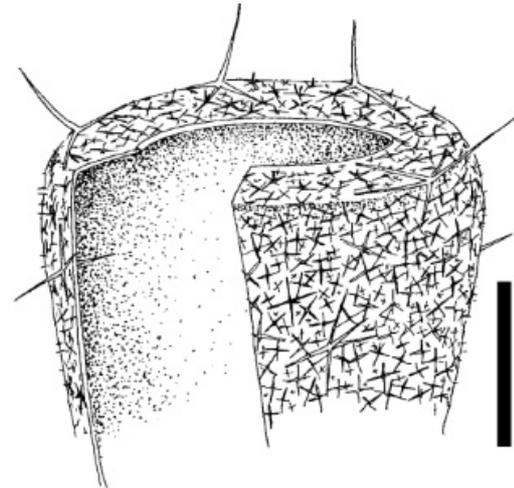
Penrhyn Quarry

In the last Newsletter Keith Nicholls raised the query "Why shallowing? What depth evidence is there from the slates?"

Richard Birch comments:

The evidence is that the most common of the trilobites from the green slate has very well-developed eyes. The evidence is also mounting that during periods when the environment of the green slate horizon could support life, it was in-situ and not transported. Since eyes are ineffective at depths exceeding 200 metres, ergo the depth of the green slate horizon could not have been deeper. In fact, it may well have gotten even more shallow - strands of what appear to be algae also occur, and photosynthesis is limited to depths of about 30 metres.

Furthermore, the reduction spots in the purple slate are often formed around a grain of material of organic origin. In the Llanberis slate museum there is a remarkable specimen apparently quite common, of something colloquially referred to as a 'grey thumb'. I cannot be positive, but it looks very much like a sponge to me. I have found similar well-preserved sponges in the green slate - they may even turn out to be chancellorids - identifiable by the spicules scattered on the rim of the pyritised body. The attached 'grey thumb' shows a crown-like formation with a small stalk at the base and a number of thin spicules extending from the opening at the apex.



reconstruction of *Asthenospongia cambria* sp. scale bar = 5 mm.

Figure 2: Sponge reconstruction

Individually, there is still conjecture about any one of these ecological phenomena (indeed, several of the trilobite species from the green slate are in fact quite blind) but collectively they do provide some indication that the Llanberis slate was not actually formed at great depth, and was getting progressively more shallow over the million or so years that it was deposited.

Keith Nicholls responds:

I am not convinced by the argument – could it be that the trilobites with eyes were pelagic...those without were benthic? The cartoon below paints the picture:



Figure 1: “Grey Thumb”

I also attach a picture from one of Joe Botting's many excellent papers on sponges, showing a not dissimilar organism. Sponges can live at great depth, but are more common in more shallow seas, and if these are indeed sponges, they could not have been transported, they would not have survived the process.

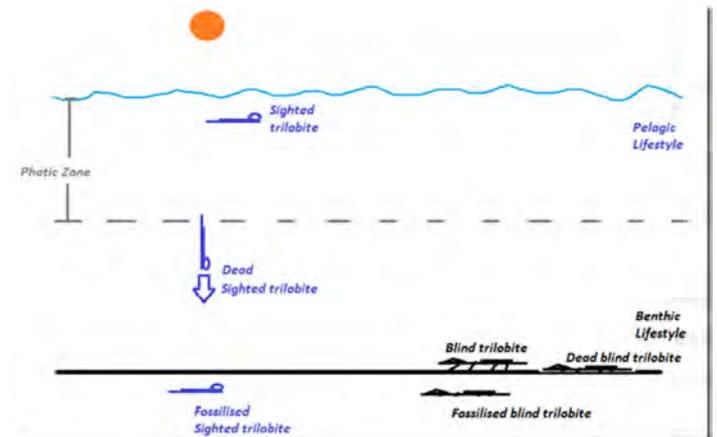


Figure 3: Fossilization process model

Richard Birch responds:

As to your skit to explain the shallowing or otherwise... not convinced! I have trilobites with eyes, caught in the act of moulting. These were not pelagic species either, and the presence of a soft-bodied fauna indicates that the sediment is not derived. I will, however, meet you half-way: the green slate is not a uniform horizon, and it was subject to frequent currents (all bradoriids are aligned in the same orientation - that is no accident) and probably micro-turbidites. You can't see them as you can in the purple slate though, because they're the same colour. You can only infer them from the changes in fauna (notably the bioturbation). So it was fairly deep, but shallow enough to support at least some organisms with eyes. The water above the sediment was probably oxic too, with only the sediment itself being anoxic - again partly due to the lack of bioturbation introducing oxygen into it. But we're getting into deep water here, if you'll forgive the *bon mot*.

Reports:

NWGA Evening Meetings

Member's Evening, 6th December 2017

The Member's Evening was, as is usual, very well attended, and seemingly enjoyed immensely by all present. Pencychnant was at its welcoming, open hearth warming best, Julian was as always, a perfect host, and the talks all seemed well received.

This year we were treated to an extremely well-produced short film by Richard Birch on the Evolution of Fishes and two talks by firstly yours truly on "*The geology of Deeside, with particular reference to the Shotton Steel Works Site*" and secondly Jonathan Wilkins on "*Slates and their quarrying*".

My presentation drew heavily on a talk I gave back in 2013 and hopefully illustrated the significance of history, social and economic development as well as natural geological processes, on the development of an areas superficial geology and the need for those involved in the interpretation of site investigation data to "*know one's own estate*".

Jonathan's talk outlined his ongoing research based on the mineralogy of the slates and in particular those green "reduction" spots where there is all sorts of chemistry going on (it's certainly not all about the oxidation state of the iron).

Both these talks were follow ups to this summer's field season, with our visit to Rock Quarry and the views over the estuary from there having triggered the my talk on Deeside, and our visit to Penrhyn Quarry described in the previous newsletter, and discussed earlier herein provided the source material for Jonathan's study.

Richard's film though was an exceptional presentation, quite the David Attenborough!

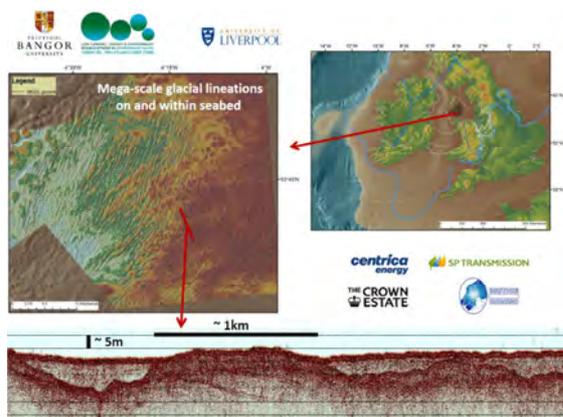
KHN

Abstract:

“Epic seafloor off North Wales shows rapid ice retreat during the last ice age. The fate of West-Antarctic ice?”

Dr. Katrien Van Landeghem, School of Ocean Sciences, Bangor University

A spectacular 2100 km² seafloor dataset collected on behalf of Celtic Array Ltd between Anglesey and the Isle of Man reveals the geomorphology and subsurface geology of a large submerged glacial landscape. With this data, we investigated how the Irish Sea Ice Stream advanced and retreated about 20,000 years ago (during the last ice age). This ice stream was the largest in its type to drain the interior of the former British Irish Ice Sheet, and this study thus provides a conceptual model of how large ice streams retreat and cause the instability (even collapse) of large ice sheets.



Why is that so interesting or important? Some ice streams in West Antarctic Ice Sheet are currently also unstable and there are concerns that their retreat can cause an onset of rapid collapse of parts of this massive ice sheet. That in turn would cause a huge global sea level rise (in the order of meters), and warrants our greatest attention.

Dates for Your Diary:

NWGA:

Winter / Spring Evening Meetings

Wednesday 28th March

“Epic seafloor off North Wales shows rapid ice retreat during the last ice age. The fate of West-Antarctic ice?”

Dr. Katrien Van Landeghem, School of Ocean Sciences, Bangor University
See Abstract earlier in this Newsletter

All meetings 7:00PM for 7:30PM start, at Pencychnant, Conwy, unless otherwise noted.

Other Groups' Meetings

Mid Wales Geology Club

Sunday 9th September

The Hirnantian Type Area – the Hirnant Valley, Bala

To be led by Keith Nicholls

NWGA Members are welcome – contact Keith for joining instructions

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