Cymdeithas Daeareg Gogledd Cymru

North Wales Geology Association

NEWSLETTER

Issue 87 April 2015

Inside this issue:

Front Cover Images:

Photo of part of the Darwin Wall at Ogwen Cottage. Your editor thinks he sees three granites (Coedana Granite at bottom right?) and at least two rhyolites, one of which is markedly porphyritic (feldsparphyric?).

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OPUS

Chairman's Message

"*The voice of reason*"

You could not make it up!

US Senator and arch climate-change denial lobbyist Jim Imhofe (who is famous for throwing a snowball in the Senate as 'proof' that the declaration of the warmest year on record was a hoax) has this to say: "God is still up there. The arrogance of people to think that we, human beings, would be able to change what he is doing in the climate to me is outrageous." And this man is being funded by donations including some from BP staff, including chief executive Bob Dudley, whose company's position is "To abate carbon emissions further will require additional significant steps by policymakers beyond the steps already assumed."

Fortunately, a choking fit brought on by reading this over my lunch-time sandwich has been ameliorated by a couple of good days in the field, including one that has turned into an excursion for the Association later this year. I continue to be amazed by what can be found in the richly diverse rocks on our doorstep.

Closer to home, the repairs to the major structure of the Promenade in Deganwy have been completed, following the destruction of the southern extent during the severe storms and high tides of December 2013. The principal reason for the failure was the undermining of a rather shallow seaward wall which had minimal foundations due to the occurrence at that level of a series of very large glacial erratic boulders, which defeated the will or technology of the builders in (I think) the 1920s. The recent work caused them to be raised and then mixed with very large, imported limestone boulders to form a temporary defensive wall somewhat below the high-tide level, with excavated till spread before them. The till was interesting, being grey and filled with rounded clasts of mudstone that identified it as being of Welsh (Conwy Valley glacier?) origin and associated with the local and highly-eroded remains of drumlins. The sea did a good job of winnowing the material and a new spread of coarse sand and fine shingle appeared very rapidly, but the remediation involved re-profiling the upper shore and the remaining till was reclaimed and placed before the new wall. Significantly, the deficit in the upper shore level was addressed by placing the original erratics near to the high tide line and filling the upper shore with imported cobbles from Glan Llyn, which is a shame because we now suffer as Llandudno does with anthropogenic erratics making the provenance of local materials even harder to decode. However, I must say that the scheme has shown remarkable sensitivity and adherence to the original works, most particularly by omitting any form of wave-return wall which would have been intrusive and unwelcome. I fear that the sandy beach we first found in the 1980s has gone for good and I suspect that the loss is related to the orginal construction of the promenade on the site of moderately extensive sand dunes, whose buffer capacity maintained beach levels before the inevitable de-coupling resulted in continuous loss due to longshore processes. It would be an interesting exercise to research the history of the shore and local construction activity.

There was a curious resonance in a news article that I read last month in the Galway Tribune regarding the fact that a storm in late February had done severe damage to the promenade in the town of Spiddal, on the northern shore of Galway Bay some miles from the western outskirts of Galway City. Local residents were greatly upset by the damage and were working voluntarily to clear debris away from the

locality so that they could enjoy what was left, and draw attention to the repairs required. Both events may indeed reflect the possibility of increased storminess (climate change) or sea level rise (isostatic processes and climate change) or just the continuing attrition of historic infrastructure. But the reason that I was reading the Galway Tribune has to do with the presentation that I made to the Association in November 2013 where I tried to articulate something that I had observed in South Connemara - invasion of the post-glacial landscape by the sea - but could find no description of in the published record. Having done a lot of reading and engaged in fruitful discussion of the granite bedrock geology, I decided to take the plunge and publish something myself. The article duly materialised just before Christmas 2014 in Earth Science Ireland, a colourful publication dedicated to keeping the spirit of geology alive in the whole of Ireland and accessible to all students of geology at high-school or college level, and anybody else who is interested (www.earthscienceireland.org). And there it may have rested were it not for a sharp-eyed councillor from Galway City Council who read the article and just mentioned in session that there was a research topic of some interest to the City and County of Galway which might have resonance in future planning. At which the reporter present from the Galway Tribune pricked up her ears, contacted the editor of ESI and me in turn for an interview on the topic. Which, in the run-up to St.Patrick's Day and a possible news-famine, became the front-page story of the week's edition under the headline "CONNEMARA IS SLIPPING INTO THE SEA" and prompted approaches from local radio, national Internet radio and even RTE Radio 1 for interviews on-air (though only iRadio came to fruition). The editor of ESI was delighted - geology on the front page of newspapers! I was forced to point out that during an average lifetime the water might rise only to the top of a person's wellies, but the thing that got everybody fired-up was that I had made this discovery while on holiday.

And there is the message: the NWGA is all about engagement with the landscape and I think it is most important in what we do that attention is drawn to the stories which are written in the rocks and how to read them.

Jonathan Wilkins

Articles:

The Davy Lamp's Other Use

The Davy Lamp, whose bicentenary of design we celebrate this year, had a vitally important use in providing safe lighting in coal mines and showing miners the presence of methane. Safe to use in otherwise dangerous atmospheres, the colour of its flame could, to the trained eye, enable an estimate to be made of how much methane was present in the air. Methane is the gas the miners knew as "firedamp", with its threat of fire and death-dealing explosions.

The Davy lamp, however, had another important use, as was demonstrated to me dramatically one summer's day in 1950.

I was studying mining engineering at the Royal School of Mines, part of Imperial College in South Kensington. In the first six weeks of the summer vacation at the end of the first year, I went to gain practical experience at two coal mines near Swadlincote in south Derbyshire. These were called Cadley Hill and Bretby No 3. (My handwritten student report on these, with maps and diagrams, is lodged with the Derbyshire County Record Office in Matlock).

Bretby No 3 was quite close to the western edge of the coalfield. The seams in this area were in a broad syncline (shaped like ever larger giant saucers, the deeper, the wider), coming up to the surface (outcropping) one after another towards the west. The workings at Bretby were in the Stockings seam, about five feet thick, but the manager had his eye on the shallower principal seam, known as the Main Seam, which was about seven feet thick and contained plenty of good coal well worth trying to dig out.

There were two problems with this, however. To the west of Bretby's two shafts, where the seam rose towards its outcrop, it was on fire. This was a result of spontaneous combustion, supplied with air through a series of tunnels driven illicitly to get coal during the General Strike of 1926. In an attempt to starve the coal of oxygen, lorries came every day from Ind Coope and Allsopp's brewery in nearby Burton-on-Trent to tip their loads of bran mash waste onto dumps covering the entrances to those tunnels. This was not entirely successful, however, and the dumps themselves were extremely hot. If you plunged your hand into the surface of the mash, the tips of your fingers were unbearably hot before your hand was fully immersed.

Indeed the ground was so hot to the west of the mine that the manager found it necessary to employ a special gang whose job it was to go out each morning to apply a top dressing of sand on the sleepers of the railway siding. This was done so that the engine driver bringing the empty waggons in which the mine's output of coal was to be despatched would not see how charred the sleepers were. The manager was convinced that, had the driver been aware of the state of the track, he would not have brought his engine up it. Without the empty waggons, the mine would have had to close, which would never have done.

In contrast, to the east of the Bretby shafts, the Main seam was flooded. In the old days, maybe three centuries ago, many small coal pits had been sunk on the northern outcrop of the seam. To overcome the flooding problems encountered, the old men had driven a tunnel in the coal some four miles across country to drain this area into the river Trent. The tunnel, whose exact course was no longer known, served its purpose of draining the old northern pits very well. This meant that the section of seam down dip from Bretby's shafts contained a plentiful supply of water.

But the resourceful manager had a plan. In 1925 a company, Nadins, had had the idea of accessing this area of the Main seam and installing powerful pumps to take care of the incoming water supply. To do this they had driven an inclined tunnel (a "drift") down from surface until it reached the seam. They began near the edge of a farmer's field about half a mile east of

Bretby. This tunnel went down at an inclination of 1 in 4, steep enough to ensure it got to a good depth rapidly. They could tell when they were getting near to the Main seam by mapping the geological strata as they went.

The Main seam was known to have a very thin band of coal (about six inches thick) in the layers of rock which formed its roof. This was called a marker seam - once you got to it, one more blast and you would be through to the top of the Main seam. In due course, after driving down 200 yards, the great day had arrived: they had encountered the marker seam. Nadins assembled all the pumps they possessed, connected the pipework to take away the water, drilled the final round of holes, and blasted.

The water came in faster than their pumps could cope. It flooded the pumps, short circuited the electrics, and that was that. Their funds exhausted, Nadins bricked up the entrance to the tunnel, and left. And so it had remained since the 1920s.

The Bretby manager's great idea in the summer of 1950 was to open up Nadins' Drift, install more powerful pumps than they had had in the 1920s, drain the Main seam and work its coal. So it was that on the Wednesday of my last week at Bretby I was assigned to go with the group of men who were to open up Nadins' Drift, to gain experience of a different kind to that I had encountered underground.

It was a beautiful summer's day towards the end of July; the sun shining brightly in a blue sky dotted here and there with small cumulus clouds. We went in a lorry to the farmer's grassy field in which the Nadin's building stood. Knowing we were coming, the farmer had ensured that his cattle were grazing elsewhere, so all was peaceful.

A simple building covered the entrance to the drift. A short flat-roofed section at the front led to a sloping part at the back, following the 1 in 4 gradient of the tunnel beneath it. The side walls were also of concrete, but the front wall, which was obviously where the entrance had been located, was solidly bricked up.

The first job was to demolish the brick wall. For men used to hewing coal, armed now with sledgehammers and picks, this presented little problem. The broken bricks were thrown into the lorry to be taken away. Within an hour the entrance was wide open.

Standing in the opening, a fascinating view lay before one's eyes. The floor, inset with a narrow gauge railway track, quickly bent downwards and descended steeply. The neat concrete tunnel, seven feet square, was brightly lit by the summer sunshine all the way down - down, down, as clear as day, all the way to the pond of water at the bottom, perhaps fifty yards from where we stood. The daylight streaming in from the morning sun behind our heads meant there was no need for any artificial lighting. Even in the utter depths, all was as clear as day. There was absolutely nothing, it seemed, to prevent one walking all the way down without the need for any lamp.

After a brief moment absorbing this extraordinary view, the overman in charge of the group suggested we stepped back outside. To my uninitiated surprise he then, out in the field on this bright summer's day with glorious sunshine, reached for his Davy lamp and lit it. Carrying the lamp by its hook at his side, arm stretched straight downwards so the lamp flame was

close to the ground, he walked slowly into the tunnel entrance.

Once inside he was soon onto the downward slope, walking slowly. After only a couple of paces the flame in his Davy lamp went out. He immediately turned about and came out again into the sunshine. "Blackdamp!" he exclaimed, the miners' name for carbon dioxide. This gas, heavier than air, invisible and odourless, in quiet conditions dilutes then displaces air in hollows, reducing its oxygen content. Too much of it, and you suffocate. Nadin's Drift, the neat clear tunnel down which the sun was shining and you could see clearly to its very depths, was full of it. Blackdamp - a suffocating death awaiting the unwary.

The original electric power lines and switches were still in place, so a fan and canvas ducting were rigged up, blowing in fresh air to clear out the blackdamp. This began about mid-day on Wednesday. Every so often, a man would go down with a Davy lamp to see how far he could go, and additional lengths of canvas ducting would be added whenever possible. The fan was left running all day and all night and it took until Friday afternoon before we were able to walk down that tunnel as far as the water clearly seen on day one.

Every advance was determined by the flame in the Davy lamp. As long as it burned, it was safe to continue - the flame proved there was enough oxygen for a human to breathe. A lesson to be learned, long remembered: the Davy lamp's other use.

Tony Brewis

Editor's Note: This article was first published on the Jiscmail Mining History website: mining-history@JISCMAIL.AC.UK) and is republished with the permission of the author (who has a lengthy association with North Wales). Thanks are due to Tony Waring for bringing it to our attention.

Lucretius on "The Origin of Species by Natural Selection"

Reading recently from a cheap second hand book, picked up for all of 50p, in the outside castle wall "free for all" book shop in Hay on Wye, I was, albeit metaphorically, hit over the head with a hammer. The book was "The Discovery of Time" a Pelican Edition dating from 1967 by Stephen Toulmin and June Goodfield, a husband and wife team of philosophers who were then lecturing at Leeds University.

In reading a lot about Evolutionary Theory in recent years, I had taken on board the established canon that basically nothing of any real significance had happened before Darwin and Wallace. Yes, by sheer weight of empirical evidence, most nineteenth century naturalists had accepted "*development*" as evidenced by the fossil record – but ascribed such events as unfolding to "*Final causes*" in accordance with God's Plan, paving the way for us – his masterpiece.

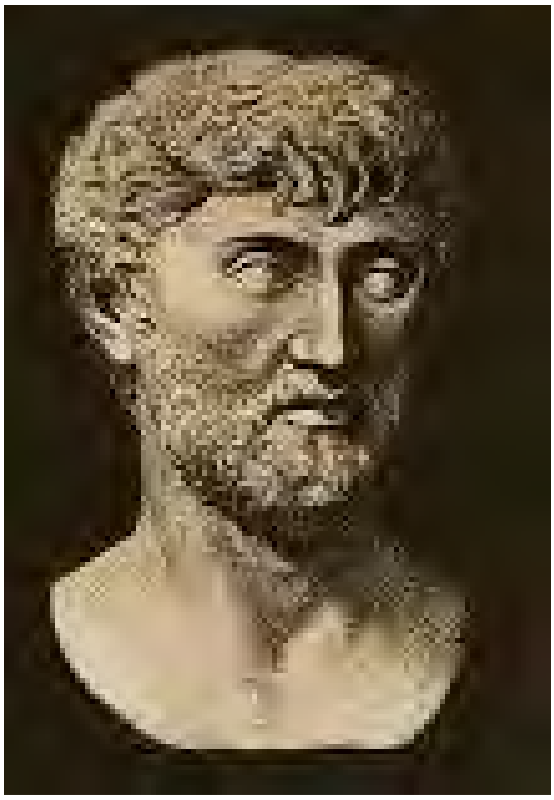
Before Darwin, the thoughts of those speculating about the nature of natural, rather than scriptural, driving forces behind creation had, we are told, been about spontaneous generation, or the inheritance of acquired characteristics. As an example, the text book by Ruse and

Travis reviewed in the previous Newsletter states:

"*..it was not until the eighteenth Century, and the Enlightenment that evolution (as we now call this idea of natural development) really started to gain a serious number of supporters*." It goes on to comment that the Classical scholars (the Greeks specifically) "*thought they had irrefutable reasons to reject ongoing incremental organic change*". The established canon can therefore be defined by the question posed by Ruse and Travis:

"Why then, did evolution start its rise in the Eighteenth Century?"

Well so far so non-contentious, until I picked up Toulmin and Goodfield and read their take on Classical philosophy. I was shocked – "*No that can't be right*!" was my first thought, on reading the following, attributed to the Roman Epicurean philosopher Titus Lucretius (c. 99BC-55BC):



"Centaurs there have never been, nor yet
Ever can exist things of two-fold natures
And double body, moulded into one
From limbs of alien kind…
But each thing has its own process of growth;
All must preserve their mutual differences,
Governed by Nature's irreversible law."

Am I alone in seeing in this verse a fairly coherent definition of species? Read on and it gets worse for the current received wisdom:

"*Such monstrous prodigies did Earth*
Produce, in vain, since nature banned their growth,
Nor could they reach the coveted flower of age,
Nor find food, nor be joined in bonds of love;
For we see numerous conditions first
Must meet together, before living things
Can beget and perpetuate their kind…
And many breeds of animals in those days
Must have died out, being powerless by their offspring
To perpetuate their kind. For all those creatures
Which now you see breathing the breath of life,
'Tis either cunning, or courage, or again
Swiftness of movement, that from its origin
Must have protected and preserved each race"

In addition to establishing a workable definition of species we now see Lucretius apparently noting the "*monstrous prodigies*" of the fossil record, as well as their extinction due to collapse of food chains, or isolation of breeding populations. Finally, to turn our assumptions in respect of Darwin and Wallace entirely on their head, we have in that final few lines "*Tis either cunning…..preserved each race*" (the bold text above is mine, for emphasis), a

seemingly clear account of evolution – in its full "*red in tooth and claw*" glory. Written two thousand years before Darwin, indeed before even the birth of Christ, it appears that Lucretius was describing the origin of species by a process much akin to what Darwin was (much later) to call natural selection.

KHN

References:

The Discovery of Time, Toulmin, S. and Goodfield, J. (1967), Pelican Edition.

"Evolution: the first four billion years", Editors: Ruse, M. and Travis, J (2011), Belknapp Press (Paperback) Edition.

Help with Identification Required

In July 1990, I visited with my family the region of Snowdonia and Anglesey. On the 8th July, after visiting Caernarfon Castle, we walked along the shore of the Menai Strait. There we found lots of green banded stones and pebbles. One of them (15 x 12 x 8cm) we took home and polished one side.

We don't know how this stone is named. We were on a geological trip, as we did almost every time we have been to Great Britain, I think 20 or more times, from Southern England to Scotland.

Although not a member of your Association, I have a question: Is it possible, that there is one of your members, who can answer this for me after so many years?

Copyright Robert Kolk (NL)

Above is a picture of the stone. It was a little bit difficult to photograph; in reality it appears rather more green.

Robert Kolk

Response 1: Jonathan Wilkins

A puzzle is always interesting. If such stones were common on the Menai Strait then it is very likely that it was local. Huge volumes of rounded pebbles and cobbles have their origin in glacial erosion during the last ice ages, and they have come from the local mountains. Some are more travelled in the ice streams and originate in Scotland or the Lake District, but the nature and age of such rocks are similar and they cannot be differentiated.

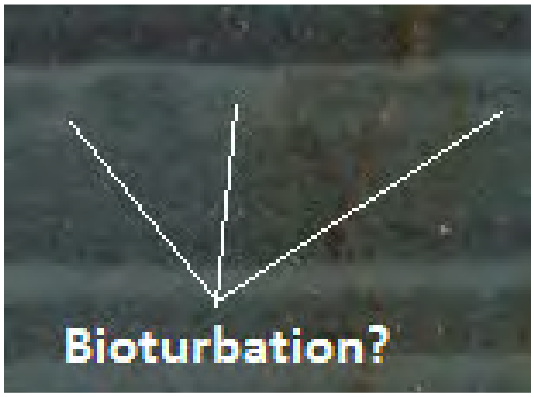
My thought is that it is a mudstone of Cambrian or Ordovician age, and has originated simply through sedimentary layering in the deep ocean, where alternate layers are more or less muddy. This can arise because of turbidity currents running down off the continental slope. Maybe there were episodes of deposition of volcanic dust. An alternative is that the layers were originally of material containing more or less organic material arising from bacterial and algal growth in the ocean water, possibly as a response to changes in oxidation due to sea level changes. Sedimentation in deep water is very slow, so the layers may represent

hundreds or thousands of years each.

The final step is down to metamorphism. All the rocks of Snowdonia have suffered metamorphism during the Caledonian Orogeny, and many mudstones are now slates. At the temperature of the Caledonian metamorphism the clay minerals are re-crystallised to chlorite, which is green in colour. The pale layers are mostly quartz, so there is almost no change except for crystals to grow and become more transparent. It is not possible to tell from your picture how hard the rock is, but I think it has not taken a high polish.

Response 2: Keith Nicholls
That is a laminated hemi-pelagite - common either side of the Hirnantian (c. 445Ma) glacial interval - basically marine "varves". At outcrop they are fascinating. The varves reflect (seasonal?) changes in clastic input. The coarser and paler laminae show increased flux of oxygenated silt as opposed to the darker and finer background pelagic (deep marine) sedimentation.

These rocks occur from place to place in the Welsh basin - but also in rocks of the same Lower Palaeozoic age in the Lake District, and in Scotland. The varves are not necessarily annual.....could be cyclical a sort of El Nino event, or even Milankovitch cycles over hundreds or thousands of years (but my bet is annual).



One of the reasons why we don't see such well-preserved laminae in many rocks is the fact that in most cases the layering gets disrupted by the activity of the infauna – chewing it up, filtering, processing and egesting – giving rise to all sorts of trace fossils on surfaces and in the fabric of the rock itself. I've looked very hard at these images, and suspect that there may be weak evidence of such burrows associated with one horizon half way "up" the slab.

Darwin Wall at Ogwen Cottage

After the AGM I decided to take the high road home, taking in the recently completed "Darwin Wall", at the Ogwen Cottage Visitor Centre. So with Frank Buxton captive beside me in the passenger seat I headed south, down the A5, and up the valley toward Cwm Idwal.

It seemed that most of North Wales' population had decided to head for this popular starting point for the walk up Snowdon on what was a surprisingly bright late January afternoon. Nevertheless we parked (20 minutes only!) immediately in front of the recently completed wall which is the frontage to the newly redeveloped Visitor Centre.

The disappointment that I felt on seeing the wall was enormous, not in the design of the wall itself, it is a thing of utilitarian simplicity, but with the lack of any apparent attempt to use this as a resource for raising awareness. Set into the top of the wall are a series of beautifully polished sections of rock which illustrate the rocks along the route of the traverse which Darwin undertook through Wales. The wall is however, as most such walls will be, given over to use as a rucksack storage device, and backside rest.

I received a number of perplexed, even suspicious, looks from the walkers and climbers milling around as I started to photograph the polished sections and the wall in general. Eventually Frank broke into conversation with a couple of the climbers ("*up from London*") who on being shown the sections were fascinated: "*really I've often wondered about…..*".

There is clearly an interest in the geology from the outdoor types who frequent Ogwen Cottage, and in this wall there is a teaching resource with huge potential. Unfortunately without any guidance as to what the slabs are, and how they fit into the geological history, I feel the opportunity is being wasted.

There is an interpretation board of sorts, (apparently salvaged from the previous café wall) sited a few metres away, but it seems to have been designed by someone with only an interest in the historical aspect, and is rather dumbed down (although immaculately presented).

With a properly designed display mounted behind the glass front of the visitor centre there could really be some useful outreach done here. Perhaps that process is in hand somewhere, and a suitable "wall guide" will be made available so that the visitors can appreciate the rather fine museum quality specimens on which they sit (see below and the front cover of this Newsletter).

Lingula Flags


Lithic tuff


Slate with pyrite

KHN

Book Reviews:

"A Grey Past and a Blacker Future: Reminiscences of a Cardiganshire Lead Miner in the early 1900s"
Edited by Megan Waring,

This book was a joy to read. For someone who has worked in the South Wales Coalfield tidying up the legacy of coal mining, but now has interests in the geology of the Mid Wales Lower Palaeozoic it was always going to be something of a page turner. Being published as a bilingual document made it a lot shorter than it first appeared – but the speed with which it was devoured was down to my interest in the subject matter.

Elias Jones was clearly a man not afraid of a hard day's graft. He was also a community man, and seemingly a plain speaker, very much to be admired and respected. The lifestyle into which he was born was oddly familiar, as I can personally confirm that in the 1960s Welsh Primary School pupils still had to recite the 10 commandments. Just as he left school to join the mining men of his district, most of the cohort of school leavers of my age, in my part of Swansea at least, left for the steel works at Port Talbot, or the Tinplate works at Trostre. It rather struck home for me how much stayed the same in Wales for the seventy years between his schooling and mine, and how much has changed in the forty years between my schooling and my children's.

This book is a Social History set alongside the Mining History of Wales, both coal and metalliferous, and I heartily recommend it to anyone interested in the people of those communities.

KHN

Waring, M. (Editor) (2014) *A Grey Past and a Blacker Future: Reminiscences of a Cardiganshire Lead Miner in the early 1900s,* Gannock Publishers ISBN 978-0-9930557-0-6
Availability as detailed in the previous Newsletter (£9.95).

"Quarrying industry in Wales — a history"
Ian A Thomas

This book is about "stone", its uses and history; produced with significant funding from the Aggregates Levy Fund for Wales. Aimed at a broad readership it is best described as a historical guide to quarries with useful material for teachers. The first thing to notice, on opening the book, is that it is bi-lingual; with English on the left of the page and Welsh on the right. This layout works well and is easy to read, not having to constantly sort through the text for your chosen language. However, it is not a book to sit and read, but rather to dip into for information on the particular quarry or area of interest. The book is split into eleven stone quarrying areas, plus introduction and appendices. Inside the front cover is a geological map showing the eleven areas.

When talking about "stone" the author excludes both coal and slate, perhaps the best known commodities mined and quarried in Wales, but does include limestone, sandstone, volcanic rocks, and sand and gravel. Covering mainly commercial quarrying over the last 200 years, there are references to activities going back into prehistory. In each of the eleven areas described in the book several quarries, both large and small, are discussed individually. The author talks about the history of the ownership of the quarries, as well as the materials and quantities excavated, and how this changed over time. He also talks about the buildings (churches, bridges, roads etc.) that were constructed with stone from a particular quarry.

The geology of each area is only discussed briefly, with very little about how the geology controls the type of materials that are extracted, or the effects on the viability of the commercial operation.

The book is well illustrated with colour photographs, which also have bi-lingual captions; also included are some old sepia photographs of quarry workings. There are some unexpected, and interesting, subjects, such as the cattle grid at Llithfaen made out of bits of old quarry machinery — but which it has now been replaced with a tarmac road. Use of this quarried material is not limited to building, but is also found in surprising things like the pan scouring product 'Vim'.

The Appendices have a list of quarry locations (which include the map references), glossary and references, plus further reading.

My enjoyment of this book was spoilt by the poor English and lack of punctuation. Regrettably my Welsh is not to a sufficiently high standard to comment on the translation.

Lyn Relph

Thomas, I.A. (2015) *Quarrying industry in Wales — a history*, Published by The National Stone Centre, ISBN Number: 9781871827385, 224pp
Available from the National Stone Centre at an estimated cost (to be confirmed) of £19.95.

"Footsteps Through Time, The Rocks and Landscape of Anglesey Explained".
Campbell, S., Wood, M., Windley, B.F.

Writing a book about the geology of Anglesey is akin to the search for the Holy Grail; and only the brave would dare. First in the field was Henslow in the early nineteenth century, followed almost 100 years later by Greenly, and now almost a century further along comes the volume which calls itself a "virtual study tour of the Island". Its predecessors conveyed no inkling that geology would be a driver of economic and social development except

in the sense that mineral wealth contributed to well-being through exploitation. What would Greenly have thought of his beloved island as a global exemplar in the guise of a GEOPARK? And, more to the point, what would he make of the guide to Plate Tectonic Theory that makes up Chapter 1?

The authors of Footsteps Through Time, The Rocks and Landscape of Anglesey Explained are well known in their field, as photographer (Campbell), GeoMôn Director and long-term champion of Anglesey geology (Wood) and academic with a special interest in global tectonic processes (Windley). What strikes one immediately are the images with which the book is lavishly illustrated, and virtually all are by Campbell. This is unashamedly a picture book and I have to agree that the rocks of Anglesey conspire to make compelling and spectacular images, but there are actually too many, and for my taste the use of graduated filters to create brooding skies and disquieting colour pallettes is overdone. The narrative is broken into chronological chapters which include "Geotrails", or field excursions on a particular theme, which include strip cartoons with an explanation (not particularly detailed) of the points of interest and a geological timescale, though the Period which is being discussed is not indicated and the column creates an unnecessary clutter. The clutter is accentuated because the topical images are small, do not always convey the message well and are often repeated from within the narrative. While some images are annotated with geological boundaries, there is little doubt that carefully drawn figures would communicate the message better in many instances.

The narrative is good and very readable. Taken at the rate of around one chapter per evening it would occupy a week-long holiday nicely, and a novice geologist should set off home with a good working knowledge of many of the processes that are pivotal to the understanding of the geological evolution of the island, but some discussion with a qualified guide while following the geotrails would be hugely beneficial. Exposition of the idea of "Ocean Plate Stratigraphy" is good, and the "snowplough" model for inversion of the accretionary prism is developed well to account for the famous way-up battles of the twentieth century. However, being informed through Figure 2.27 that the distant rocks being covered rapidly by A55 roadside scrub are of blueschist is not useful and I can detect real battles over how to tell the story through pictures when a decent map of the Precambrian slices would be really illuminating - especially if the A55 with its inaccessible outcrops were included. Cartoon geological maps adorn many of the Geotrail pages, but are not at a size to be of value, and at no point is a larger geological map presented despite Henslow's 1822 map being trumpeted as a synoptic tour-de-force in the frontispiece.

The book is a heavyweight paperback, running to almost 200 semi-gloss pages of A4 size and printed within North Wales. A key decision early in the design process was the decision to offer only English text in the printed edition, while the Welsh is available online from the GeoMôn website as PDF. The weight of all those pages is considerable, and I found it a strain to hold for reading for long periods. It certainly won't last if it is chucked into a car for extended days in the field and thumbed regularly, but it is intended as a virtual, and not actual, field guide. Neither does it make a good coffee-table book, since the paperback binding is very springy and I didn't wish to compromise its integrity by opening the pages firmly enough to prevent them closing promptly when released. The book is published by Anglesey County Council, and is only available through the recognised outlets of GeoMôn, including their web site. Selling

at £25, it is not cheap, but neither is it especially dear, and there are no competitors, unless you opt for the true field-guide by Jack Treagus.

I cannot say how the book might be received by the informed novice at whom it is clearly directed, but through my knowledge of both the subject and the locations illustrated I have to say that it is a spirited attempt to infuse an exposition of the picturesque landscape of Anglesey with sufficient technical content to show why interest and debate continue long after its special place in Earth history was first divined.

Jonathan Wilkins

Footsteps Through Time, The Rocks and Landscape of Anglesey Explained. Campbell, S., Wood, M., Windley, B.F. (2014). GeoMôn, Isle of Anglesey County Council, 193pp. No ISBN.

Field Visit Short Abstracts:

Joining details for all the events described below are available in the "Dates for your Diary" section.

"A Sedimentary Interlude in Snowdonia - Based upon Llyn Ogwen and Capel Curig"

Although Snowdonia is famous for its exposures of volcanic rocks, considerable quiet periods endured, which leave a rich legacy of sedimentary rocks resulting from erosion of the volcanic edifice. Some surprising and interesting strata will be demonstrated, as well as the contemporary and widespread eruption of the Pitts Head Tuff.

The morning itinerary starts and ends on steep steps but is neither long nor particularly challenging. The afternoon commences after a pit-stop at Ogwen Cottage or Capel Curig and is a potentially damp but unchallenging walk on a mostly level terrain. Certainly not as hard as Porth Ceiriad!

JW

"A new look at an old problem – the Ordovician – Silurian boundary at Llanymawddy"

The purpose of this visit is primarily to review the nature of the O/S boundary strata in and around the crags of Daren Ddu and Pistyll Gwyn. The location is along strike from the outcrop seen a couple of years ago at Cwm Hirnant. In this case however the Hirnant Limestone has only been recorded in boulders in the drift, and the *Hirnantia* Fauna has not recorded in large concentrations. What has been found however is a quite unique (and as yet undescribed) "*Cruzianid*" trace fossil, which may or may not be associated with the one relatively common trilobite known from the *Hirnantia* Fauna – *Mucronapsis mucronata* – a box of Maltesers to the first find of each!

There will be the opportunity to see the underlying Caradoc "Nod Glas" sediments – pyritous again - and there is plenty to see here also for those with an interest in old extractive industries, and plenty of Quaternary interest.

KHN

Reports:

North Wales Geology Association

Saturday 24th January 2015

Dr Martin Bates – Lampeter University

"***Drowned landscapes of the British Isles"***

The post-AGM talk this year was presented by Dr Martin Bates on the drowned landscapes of the British Isles, with particular focus on Norfolk and the North Sea, Jersey, Orkney and the fossil forest at Borth. I am told the talk came about as a result of a chance meeting with Martin's father on the beach at Borth during last year's field excursion to view said forest, after the big storms in the early part of 2014. And what a lucky strike it was for those of us able to make the talk following on from the AGM. I for one was particularly looking forward to the section on Orkney, due to my previous connection with the Islands.

The presentation began with an introduction and history to the field of study around the British Isles, with reference to the key figures active in early exploration and enhancement of the concept, including Clement Reid and his publication of 1913 entitled 'Submerged Forests'. Suitably inspired, I ordered a reprinted copy the following day. This introduction was accompanied by a series of maps illustrating the extent of the 'British Isles' during various past time intervals and how during certain intervals 'we' were connected to Europe as the 'English Channel' had not yet formed. The resultant climate and sea-level variations allowed the likes of elephants and hippopotamus to inhabit 'London' at certain times.

Four case examples were presented, the first illustrating how the palaeo-Thames ran North-West of its present location across what is now Norfolk. The resultant estuary was located near present day Happisberg. Evidence for this was presented along with amazing pictures of humanoid (primarily children's), footprints; which unlike common trace fossil footprints, which usually represent trails or tracks, instead seemed to show a congregation of peoples. A lively debate then ensued as to the origin and reason for this pattern of prints, one suggestion being children looking for shellfish in a puddle?

The second example, looked at cave deposits from Jersey in the Channel Isles which during previous excavations yielded large amounts of mammoth bones that were attributed to animals having been driven over the cliff edge by early humans. However, dating these cave sediments and using knowledge of the sea-level at that time (which would have been much lower) combined with the sub-sea topography indicated that the cave was located at the head of a valley, which early hunters could have driven the animals into before slaughtering them when they became trapped?

The next case example, took us north to the Bay of Firth just off the coast of Mainland, Orkney. Here the emphasis was on a multi-disciplinary archaeological investigation of a submerged, prehistoric shallow-marine landscape; ultimately providing an understanding of the landscape in which the prehistoric settlers lived. Essentially they identified areas of archaeological potential and sediment preservation where evidence of human occupation survived on the present seabed (a formerly dry area). One of the approaches used, involved reconstructing palaeo-environments using fossil microfauna such as ostracods. In addition to Orkney being a place I lived as a child, ostracods were the subject of my PhD

research and hence this was a happy double-sided blast from the past for me. Not only that, the microfaunal work is undertaken by Dr John Whittaker, my PhD external examiner! Interest stirred at the mention of a sub-sea mound, 40m in diameter, identified by the bathymetric survey, particularly when one considers the similarly sized chambered cairn located onshore nearby at Maeshowe. However, divers have confirmed the structure is natural and not archaeological, although thought then questions what in the Devonian Old Red Sandstone could result in such a structure?

Finally, we were brought back home to Wales with an account and description of the Borth fossil forest, which a number of us visited early last year. The forest uncovered by last year's storms and found on the beach, and particularly visible at low tide, indicates that sea-level in the past must have been much lower and land extended further out to the west. The make up the forest was presented and evidence of the fauna inhabiting the environment were provided by the footprints that have been recognised, including potentially a bear print?

Gary Eisenhauer

Wednesday 25th February 2015

"Fauna of the Llanberis Slate"

Dr Richard Birch, Capita Group

This meeting was blessed with an excellent turnout of members and friends, as well as a fascinating talk by Richard Birch. It even included a 30 minute film that Richard has been putting together placing the fossils of the Welsh Cambrian (bit of a tautology there) in their proper global context. In many ways Richard's talk built on the point made last year by Joe Botting – why study overseas when we have so much on our doorstep?

Over 8 years Richard has been painstakingly building up a collection of trilobites from overseas, and primarily much nearer to home, in the Llanberis Slates. We were treated to four events in one over the course of the evening – an introductory lecture on the history of research in the area (Murchison / Sedgwick etc) before seeing the film. This was followed by an invitation to view many of Richard's finest specimens – (hands on and touchy feely – quite unlike the modern museum experience). We then retired to the drawing room (at its' mid-winter finest – roaring fire and hot tea urn) for a convivial and lively discussion session which covered more on Sedgwick, plans to perhaps accompany Richard on one of his collecting days, and that "new Chestnut" the Darwin Wall at Ogwen Cottage.

KHN

Wednesday 17th March 2015

"Radon – just another ground gas?"

Peter Waring – Ground Gas Solutions

Following the near full house for Richard Birch's talk the previous month, the rather small turn out for this talk was a little disappointing. Those that did make the journey on a spectacular early spring evening were certainly not disappointed with Peter's lively and engaging talk.

Beginning with some basic physics (alpha & beta radiation etc) we were led through the implications of the presence of radon in the context of human health as it is applied to new build development planning (it is apparent that the arrangements in respect of the existing building stock is quite some way behind).

For those of us who live in Flintshire, Peter's talk was both interesting and somewhat worrying with the dark colouration on the regional radon maps suggesting the situation is every bit as bad as it is in "granite country" of Aberdeen, and Cornwall. For once, I am glad of that draughty air-brick in my living room.

Peter spoke well, and after his talk answered a number of questions from the audience. I am sure all the Association's members present will join me in wishing him well with his forthcoming move back to Cornwall, hopefully to find a home with a suitable under floor radon sump or perhaps even an active radon pumping system.

KHN

Institution of Civil Engineers, Manchester Branch

Wednesday 5th February 2015
"The current status of geological screening for Radioactive Waste"

Professor Cherry Tweed – Radioactive Waste Disposal Ltd

This meeting was held in the Board Room of the St James Building, Oxford Street, Manchester – quite an impressive venue – for what was quite an impressive talk.

Initially, Professor Tweed gave a brief background to the UK's nuclear industry, before describing the scale of the legacy issue we are to deal with, new build or no new build. However the meat of the talk was about the geology, and the politics, and the efforts being made to bring them together.

In respect of the technical aspects of the siting it appears that whilst there are some rock types that are better than others, it is a combination of engineering and geology that makes the multiple containment systems currently being designed viable. A poorer rock mass will require greater engineering to produce the same level of security.

The political size of the problem however, seems to be the key driver here. It is apparent that government are expecting "communities" to come forward and offer the use of their environment in return for substantial investment during exploration and development. Realistically, whilst no one could answer my question as to what exactly constitutes a "community", I don't foresee Westminster, or Knightsbridge offering themselves up for exploration anytime soon. Similarly I can't see any community, other than Copeland perhaps, coming forward in the near future.

When nuclear power was being developed in the forties and fifties (primarily as a spin off from military developments) waste disposal wasn't properly considered. As Professor Tweed openly admitted, concepts relating to proper disposal only began to be developed in the seventies. I have a deep concern that we are about to embark on a second episode of running before we can walk, with the need to fill the energy gap going to appear well in advance of our ability to deal with the waste from the ageing first phase of nuclear build, let alone the second.

One pleasing thing at least to emerge from the meeting was the lack of any mention of deep on-site borehole disposal which was talked about at one of the Herdman Symposium meetings in recent years. It seems that the prospect of boreholes being drilled into the Menai Fault system and then being charged with Wylfa's radioactive waste (out of sight, out of mind?) has receded somewhat.

KHN

Dates for Your Diary:

NWGA: 2015 Programme

NWGA Meetings

Wednesday 29th April, 2015
(NB change of usual venue)
Joint Meeting with GeoScience Wales
Dr Alastair Welbon – VNG Norway
"Characterizing and producing from reservoirs in landslides: challenges and opportunities" – see Abstract published in previous Newsletter
Royal Cambrian Academy Conwy 6:00PM for 6:30PM start

Wednesday 9th September, 2015
Dr Lucy Muir – As Old as the Hills, Builth Wells
"Exceptionally preserved fauna from China" – Abstract to be published in next Newsletter
Pensychnant, Conwy 7:00PM for 7:30PM start

NWGA Field Visits

Sunday 14th June, 2015

Leader J Wilkins et al
"A Sedimentary Interlude in Snowdonia - Based upon Llyn Ogwen and Capel Curig"
See abstract published elsewhere in this Newsletter.
For detailed Joining Instructions contact Gary Eisenhauer.

Sunday 5th July, 2015

Leader K Nicholls
"A new look at an old problem – the Ordovician – Silurian boundary at Llanymawddy"
See abstract published elsewhere in this Newsletter.
For detailed Joining Instructions contact Gary Eisenhauer.

Geologists' Association (UK)

Saturday and Sunday 16th / 17th May, 2015

Field Weekend: *"The Old Red Sandstone of South Wales"* led by John Davies and Geraint Owen. For further details contact Sarah Stafford at the GA Office Tel: 020 74349298 (Cost £10pp)

North Staffordshire Group of the Geologist's Association

Saturday and Sunday 6th / 7th June, 2015

Field Weekend: *"Ordovician / Silurian rocks of the Ceredigion coast"* led by Keith Nicholls and Jerry Davies. NWGA members welcome to attend, for joining details speak to KHN.

Geological Society of London – North West Regional Group

Thursday 16th April 2015

"Understanding Historical Lead Mining at Halkyn Mountain" by Andrew Moore
WSP Group, University of Chester
further details on the Society Website at:
http://www.geolsoc.org.uk/~/media/shared/documents/specialist%20and%20regional%20groups/nwrg/Newsletter%20Autumn%202014.pdf

The Palaeontological Association

14-17th December, 2015

"59th Palaeontological Association Annual Meeting"
Cardiff University and Amgueddfa Cymru – National Museum of Wales
Further details on the Association Website at:
http://www.palass.org/index.php

Irish Sea Maritime Forum

Friday 12th June 2015
"4th Annual Conference – Irish Sea 2050: meeting the challenges of coastal and marine adaption"
Eirias Park, Colwyn Bay
More details at:
http://www.irishseamaritimeforum.org or contact:
cllr.dr.stuart.anderson@conwy.gov.uk

Shropshire Geological Society (and others)

October 2nd, 3rd and 4th, 2015
The Geology of the Marches, Murchison to the Modern Era
Further information, links to trail guides, booking forms, full programme and charges:
www.geo-symposium.eu
email: paulolver@hotmail.com
Telephone David 01886 888398

British Geotechnical Association

September 13th – 17th 2015
XVI ECSMGE Edinburgh "*Geotechnical Engineering for Infrastructure and Development"* – Conference web site at:
http://xvi-ecsmge-2015.org.uk/

Web Site and Social Media:

Up to date information on our activities is posted regularly on the Association web site at:
http://www.ampyx.org.uk/

A much more informal way of keeping in touch with an eclectic mix of NWGA events, and other geological News items is available on the NWGA Facebook page at:
https://www.facebook.com/groups/northwalesga/

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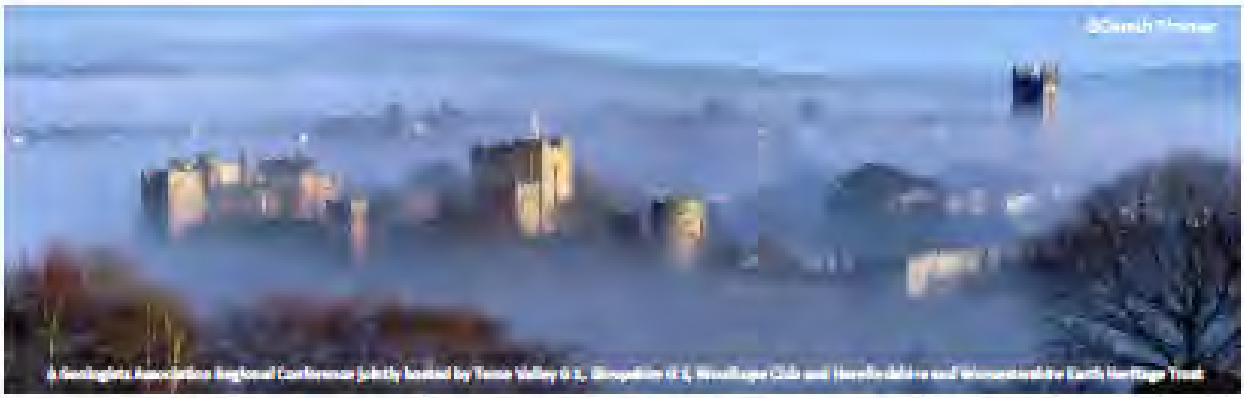

The Geology of the Marches
Murchison to the Modern Era

Ludlow, Shropshire, Friday 2nd-Sunday 4th October 2015

A wide ranging symposium, open to all

Emeritus Professor Martin Rudwick: (Cambridge)
The King of Siluria—how the Marches became known to geologists everywhere

Dr Alex Liu (Bristol):
Pits, Mounds & Animal Evolution, what we have learned from the Ediacaran Rocks of Shropshire

Emeritus Professor David Siveter (Leicester):
Sensational soft-bodied fossils from 425Ma volcanic ash-The Herefordshire Lagerstatte

Self-guided Ludlow geology trails
Museum Resource Centre workshops
Three keynote lectures
Discussion groups
Displays
Museum tour
Symposium dinner
Choice of guided field trips

Further information, links to trail guides, booking forms, full programme and charges:
www.geo-symposium.eu *email Paul* paulolver@hotmail.com *ph David* 01886 888398