



Cymdeithas Daeareg Gogledd Cymru

North Wales Geology Association

Inside this Issue:

Chairman's Message

Articles:

A letter from Sedgwick (ii)

In the Footsteps (ii) – The Torrent Walk, Dolgellau

A question of scale

Discussions:

What's this rock and how was it formed? (from Issue 70)

***Nereites cambrensis* – continued (from issues 69 & 70)**

Abstracts:

New Publications

Reports

Dates for Your Diary

Web News

Committee Contacts

Call for Papers

Issue No 71

NEWSLETTER

August 2012

Chairman's Message:

These words are written as I look out over the North Channel towards the Isle of Man during my annual holiday. Many of you have been to far more exotic locations, I know. Following almost immediately from the Anglesey Research Workshop, this step across the suture marking the death of the Iapetus Ocean brings opportunities to examine the fantastic collection of deformed turbidites, greywackes and granitic intrusions that makes one of the first "accretionary prisms" to be recognised in the geological record. The Rhins of Galloway offer a superb cross-section across the Southern Uplands, and with its pivotal position on the edge of the Irish Sea, wonderful quaternary interest as well.

With that in mind, I must commend to you the forthcoming field meeting in northern Lley. It is a long time since we have had a meeting devoted to the Quaternary, and I am expecting a very interesting day out in the company of a researcher who is well known for his studies of ice-related structures and landforms in the Irish Sea Basin. The Association only exists in order to bring people together to study and discuss geological topics and localities, so we will be pleased to see you and enjoy the company of an expert.

I am going to write no more, except to declare the Autumn programme well and truly open. There is plenty more from me inside.....

Jonathan Wilkins

Articles:

A letter from Sedgwick (ii)

The dispute between Sedgwick and Murchison over the naming of their respective Cambrian and Silurian Systems, or rather what lay between them, is often what these two pioneer geologists are remembered for. It is often overlooked that they worked together for many years, and contributed enormously to the advance of the geological sciences in the mid nineteenth Century. In this newsletter we publish extracts from a letter written by Sedgwick to Murchison, in which, it is possible to see an early indication of future "controversy".

First however some lessons in the pronunciation of Welsh place names given by Sedgwick in a letter to Miss Fanny Hicks, a niece (*sensu lato*), written on July 23rd 1846 from Tremadoc:

"...miserably damp weather made me rheumatic and low-spirited, so I nursed one day, at Caernarfon, and then drove to Pwllheli. What a charming name! In order to pronounce the first part (Pwll) you must blow out your cheeks just as you do when you are puffing out a very obstinate candle; then you must rapidly and cunningly put your tongue to the roof of your mouth behind the fore teeth and blow hard between your cheeks and your tongue, holding your tongue quite steady all the while, as a man does a spade just before he is going to give a good thrust with his right foot. With such a beautiful direction you cannot fail to pronounce Pwll quite like a genuine

Celt. Should the word be Bwlch, take care to observe the previous directions, only in addition while the wind is whistling between your rigid tongue (sticking forwards spade-fashion), and your distended cheeks, contrive by way of a finale to give a noise with your throat such as you make when an intrusive fishbone is sticking in it."

Subsequently (written on the 7th August 1846) Sedgwick wrote from Carmarthen, to Murchison:

"... spite of the merciless rain I did some good work in North Wales, I have my Cambrian System better in hand than I had, having now locked Carnarvonshire and Merionethshire together. There was a screw loose before. As a great physical system they are all inferior⁽¹⁾ to all South Wales⁽²⁾ (excepting Pembrokeshire of which I speak nothing and know little or nothing). Again much of South Wales is inferior to the two bottom groups of your Silurian System, and therefore out of your System in the sense in which you first used the words.

I will not now touch on controversy, only I state thus much; that I have now the precise general views I had at the end of 1832 – of course with infinitely improved details and better sections. South Wales is a great puzzle, with much of which I mean not to trouble my head."

(1) Inferior is used in the sense of "lying below".

(2) It seems likely that Sedgwick was referring to the area around Llandovery, Llandeilo and Builth Wells, much of which we now recognise as being underlain by Ordovician strata; rather than the

Carboniferous rocks of the Coalfield, or the Old Red Sandstone of the Brecon Beacons. These latter rocks are, of course, younger than (or "superior" to) Murchison's Silurian Series.

Reference

Clark JW and Hughes TM, *The Life and Letters of the Reverend Adam Sedgwick, Volume II*. Cambridge University Press, 1890.

(KHN)

In the footsteps (ii)

The Torrent Walk, Dolgellau

As with the previous article this edition's commentary is from Allen and Jackson's "Geological Excursions in the Harlech Dome. Unlike the previous formal excursion this was originally presented as a geological description along the route of a popular walk. As such this walk is ideal for an afternoon stroll with some geological interest. It is not however a "hands-on" location, with relatively little accessible exposure. Leave the hammer and compass - clinometer in the car!

There is parking available in a lay by at the "top" of the walk alongside the A470, and limited off road parking at the bottom adjacent to Clywedog Mill. Well constructed and maintained footpaths follow both banks of the Afon Clywedog, allowing a circular walk, of about 1 1/2 hrs duration.

Allen and Jackson's published itinerary starts at the "bottom" of the section and follows the younging of the strata to the

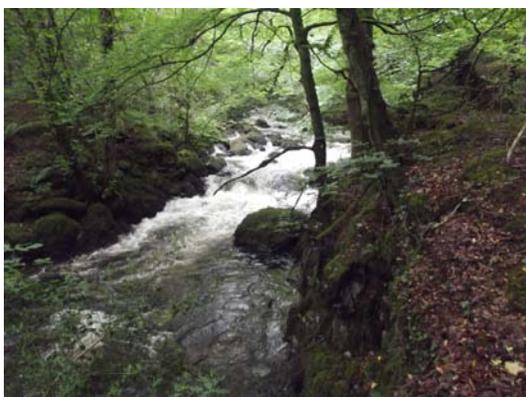
west, passing through Ffestiniog Flags up into the Cwmhesgyn Formation, and subsequently into the Rhobell Volcanic Group. Both the Cambrian sediments and the volcanic rocks are seen to be intruded by doleritic dykes.

Allen and Jackson listed seven locations, but with the inaccessible nature of much of the route only a select few photographs are worth detailing, as follow below.



Allen & Jackson Location 1

“Blocks from (the Ffestiniog Flags Formation) have been used on the parapet of the bridge, and show the lens-like bedding, cross-lamination and inverted ripples typical of the formation.”



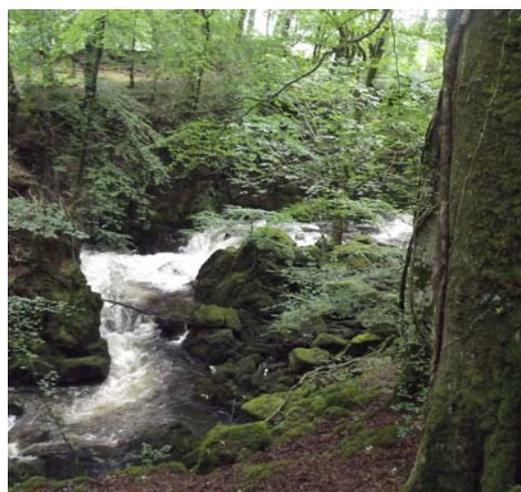
Allen & Jackson Location 3

“Dolerite is exposed in the stream near the steps in the path”.



Allen & Jackson Location 4

“...the transitional nature of the junction between the Ffestiniog Flags and Cwmhesgyn formations is clearly demonstrated”



Allen & Jackson Location 5

“...exposure is continuous in the river, though dangerous to reach. Mostly the rock is greenish grey basaltic lava with phenocrysts of amphibole up to 1cm long, feldspar and in some varieties, pyroxene.”

Reference

Allen PM and Jackson AA, *Geological excursions in the Harlech dome*. Classical Areas of British Geology, BGS, HMSO, 1985.

(KHN)

A question of scale



The two images of an ammonite were posted on the GSoL web site recently making the point that using “everyday” objects such as camera lens covers and geological hammers, may not be the best choice given the variability of the size of the scale device.



The point is well made, and valid – but you do wonder about the utility of this particular hammer...or as one was asked out on the GSoL web site... “How big is that battery?”

<https://www.facebook.com/groups/geologicalsociety.northwest/#!/media/set/?set=a.473128249370033.125916.135315536484641&type=1>

(KHN – original Facebook notice – by Nik Reynolds)

Discussions:

What’s this rock and how was it formed?

(C O’B Issue 70)

Jonathan Wilkins writes:

From the assumed size of these nodules I would be tempted to suggest re-sedimented rip-up clasts of muddy or tuffaceous material. I would not postulate deformation of a pebbly conglomerate because there is insufficient temperature in the Caledonian Orogeny in Snowdonia for ductility of that nature. On size grounds, I would not favour these being bird's eye tuffs (accretionary lapilli) but if it were possible to present the hand specimen I am sure that examination would be easier than dealing with a flat image.

Keith Nicholls writes:

Around there should be all Ordovician intrusives – volcanic tuffs and making an appearance for the sedimentary side – the Cwm Eigiau Formation which is a sandstone – but I don’t think it generally is a coarse clastic thing like this. The degree of rounding is remarkable – when I’ve seen “rip up clasts” of mudstones in similar rocks they are generally rather angular. This degree of rounding looks almost fluvial. Suspect the imbrication is tectonic rather than original. I have seen some Wenlock turbidites further east on the A5, at Garn Prys near Pentrefoelas, that had a lot of rounded pebbles (golf ball and cricket ball size) – but they were “exotics” and generally of hard igneous origin.

Barry Wrightson writes:

I know we ID'ed this (Rock Identification - Tryfan) at the Hirnant meeting, but I think it is worth directing interested parties to: http://www.thegcr.org.uk/Sites/GCR_v03_C04_Site2559.htm where the GCR description and loads of references for the Dyffryn Mymbyr (Capel Curig Volcanics) (GCR ID: 2559) can be found.

Editor's Note: A short extract from the GCR citation identified by Barry follows (it appears that in the original it is incorrectly spelt as "Dyffryd Mymbyr Formation"):

"The tuffs ... contain accretionary lapilli (originally, spherical hailstone - like accumulations of volcanic ash). These now perfect ellipsoidal objects are excellent indicators with which the Caledonian strain within the Ordovician volcanic rocks of Snowdonia can be measured. Their degree of distortion makes it possible to assess the actual amount of tectonic deformation (crustal shortening) to which Snowdonia was subjected during the Caledonian mountain-building episode, around 400 million years before the present."

Reference:

R Scott, (1990), *DYFFRYD (sic) MYMBYR (CAPEL CURIG VOLCANICS)*, Volume 3: Caledonian Structures in Britain South of the Midland Valley, Geological Conservation Review, JNCC.

Anthony Heeley writes:

Could this be a piece of the accretionary lapilli tuff which forms part of the 4th member of the Capel Curig Volcanic formation? Certainly the location is right (on the west.face). I will go and check it out once the western gullies and cliffs

have dried out. The western face is a grand place to potter about on a summer evening and more rewarding from a geological viewpoint than the cliffs of the east.face. I agree with you that anything in those gullies is unlikely to have come from anywhere other than a location close by.

**Nereites cambrensis –
continued**

Keith Nicholls writes:

Further to the recent discussion relating to the trace fossil *Nereites cambrensis* believed to be from the Lowermost Silurian (Llandovery) rocks of South West Wales our readers may find the following photograph of interest – taken at low tide on the beach at Traeth Carreg Ifan near Llangranog (scale rule is 150mm long).



Whilst *Nereites cambrensis* is, along with other "nereitid" traces, considered diagnostic of deep water conditions it is evident that there are modern trace makers (ragworm?) of similar scale, and apparently (superficially at least) morphology, in modern intertidal facies.

Abstracts: forthcoming NWGA Meetings

Plants through the ages.

Nigel Brown – University of Bangor

The talk will link fossils with living representatives from around the world looking at how, when and where the major plant groups emerged. There will be lots of fossils and living representatives of relevant plant groups on display and we shall use binocular microscopes to take a closer look at some of the fossils and living plants. The speaker will explain how major features of plants such as strengthening tissue, leaves, and flowers evolved and how fossils help understand this evolution. There will be opportunities to view some of the relevant plants in situ such as the larger cycads in two of the illuminated plant houses.

The Big Chill – Life, Death, and Destruction, a story from the end of the Ordovician.

Keith Nicholls – University of Chester and Geotechnics Ltd.

Global warming, extinction episodes and rising sea levels are not new concerns for planet Earth. Whatever your position on the extent to which these phenomena are happening today, the evidence that such events happened some 444My ago seems unequivocal.

This talk will describe changes in the palaeogeography and palaeoecology recorded in the Hirnantian strata, focussing primarily on the Iapetus and Rheic Ocean shelf and deep water sediments, seen in Scotland, Brittany

and last, but by no means least, the Welsh Basin.

Reports:

NWGA Field Trips: Cwm Hirnant & Malltraeth

Two field meetings convening in the same month merits special treatment, and in view of their proximity I will cover both in one report.

Cwm Hirnant is one of the localities that crystallises certain problems and controversies in the geology of the Welsh Basin - a tract of mostly muddy rocks and turbidites that endured from Cambrian times through to the Silurian, reached its maximum extent in the Ordovician and then became smaller and more interesting as the Silurian progressed and with the onset of the Caledonian Orogeny when it ceased to exist and suffered 'inversion'. As a newbie in Deganwy I was thrilled to discover that it was famous for beds with a Hirnant fauna (but I didn't know what that was and have never found any fossils anyway) similar to the Hirnant Limestone. So after a lot of reading and not a lot of progress it was good to take up the opportunity with another 10 members to visit the type locality of the Hirnant Limestone, and its eponymous fauna, or Cwm, or both.

The larger, road-level quarry at the foot of Cwm Hirnant appeared to be weathered mudstone debris and talus deposits and was essentially without interest apart from a 1.5m wide boulder of oolitic limestone. The individual

oids are up to 2mm in diameter, often re-crystallised to single carbonate crystals and very obviously nucleated on mineral fragments. Broken debris of solitary corals up to 5mm in size were common. I have to say that this close examination was in our laboratory after the patina caused by sheep using the boulder to scratch themselves had been removed by vigorous scrubbing (it was a very small sample, a benefit of XRD as a petrology tool). Keith assured us that this was about the best exposure of the Hirnant Limestone, despite its dubious relations to outcrop. We were instructed to work up the steep hillside to the Hirnant Quarry, but several members overshot the target as they were expecting more than a scrape in the ground with a fallen tree occupying most of the space. The problem here is what to make of this minuscule locality. A steeply-dipping bed of limestone has been largely removed, leaving the flanking beds of weathered, cleaved and wonderfully fossiliferous mudstones in situ. Some limestone remains, but not enough to get a true sense of dip, and it proves to be impossible to reconcile modern observation with historical, measured sections. So we have an excellent opportunity, but outcrop is so poor that it is impossible to draw much conclusion - except that shallow-water deposits occur intermittently, but we don't know if this patch is unique, or whether poor exposure of this horizon is to blame for the scarcity. The site is an SSSI, but that also means that sampling and/or site clearance are essentially off-limits. Going back to Deganwy, which exposes similar end-Ordovician strata, it is notable that the uppermost bed of the massive and clearly slump-related Conwy Castle Sandstone is packed with

a derived assortment of crinoid and coral detritus that do indeed speak of limestone deposition, although it is never seen in-situ. Whether the Hirnant Limestone was deposited in shallow water as a result of a glacially-induced reduction in global sea level is not going to be proved easily. We were impressed at the enthusiastic participation by the locals in our meeting - ridiculous swarms of very hungry midges who were thoroughly enjoying the damp, muggy weather and were thrilled that so many people had presented themselves as a meal.

We then retraced our steps to the bottom of the Cwm, by the river where we looked at the erosion of the till and soliflucted mudstones in its meanders.



The Afon Hirnant

Quaternary specialists were thrilled to find tree roots at the top of till overlain by clay and peat - clear evidence of the onset of wetter climate and the drowning of the contemporary forest before the deposition of peat under waterlogged conditions dominated until much more recent times. The glacial origin of Cwm Hirnant was not discussed in detail, but it is a superb landscape, and worthy of study in its own right. As we set off up the hill from Cwm yr Aethnen towards

the forest we were pleased to see the sun and to leave the midges behind. Lunch was taken on a promontory high above Cwm Gwyn, on the slopes of Foel y Ddinas, where we pondered the question of what Gertrude Elles would make of the locality today, were she able to see it? For a start she would probably be horrified at the forestation of the entire landscape (Cwm Hirnant appears to have been spared because of its singular beauty), but all of the hills to the south and east are thickly clothed in conifers.

On the other hand, rock outcrop is very sparse indeed, and the construction of roads by the Forestry Commission has created some excellent exposures at the roadside and in borrow-pits, quite apart from making access easier.



Foel y Ddinas Mudstones

A sample of the Foel y Ddinas mudstone was collected, and compared with the (fossiliferous) Hirnant Mudstone of Elles (1922) by XRD back in the lab, and both proved to be a typical Welsh Basin samples - mudstones under the influence of moderate metamorphic conditions are transformed into mixtures of mica, mg-rich chlorite, quartz and plagioclase feldspar - though the Hirnant was slightly more quartz-rich and

correspondingly poorer in mica and chlorite.

The walk around Foel y Ddinas enabled a view to be taken of the differences between the muds and silts in the Moelfryn and Foel-y-Ddinas formations. So far as I recall, no fossils were found, the silts and muds proved intractable and a great deal of attention was spent in determining the orientation of bedding and cleavage - a good game in a circular walk.



Circular Walk

The forest clinging to the hillside above Bwlch yr Hwch had a delightful, Zen quality and the sun kept on shining, so it was an excellent ramble. Finally we walked southwards onto the Silurian, and found several boulders at the forest margin that were loaded with characteristic brachiopods, but graptolites were elusive, and outcrop vitually non-existent. We then walked up the forest track and found a large quarry where rock has been taken for road maintenance, where wonderful turbidites could be seen within the silty or muddy sequence and good sole and ripple marks quite stole the show, even though they were not what we should have been looking at.

This most interesting itinerary was followed a fortnight later by an excellent outing along the northern shore of the Afon Cefni at Malltraeth. The features of this trip could hardly be more different. No more Welsh Basin, for a start, and Carboniferous for a change. The basement and Caledonian structure of Anglesey has been re-activated in a couple of places, and a couple of quite significant half-graben structures (strata hingeing downwards along one edge of a deepening structure) which have been filled with much more recent sediments. One example is the Afon Menai, with similar strata along the shore between Brynsiencyn. The other is the Malltraeth structure, which crosses to Red Wharf Bay, and finally there is the Lligwy structure which also contains Devonian strata.

Once again, paucity of outcrop is a problem - though the first exposure, a large lump of (palaeogene) microgabbro was soon disposed of as erratic in nature. Only the top of the beach has any exposure, there is a thick layer of broken bedrock and till on top a small cliff, and it abuts a jealously-guarded estate. We were then faced with a series of coarse and gritty sandstone outcrops which weather to a dark brown colour, cross-stratified and prone to cementing into baroque pipes and nodules (concretions that resist weathering). The individual grains are frequently rather angular, but usually well sorted. One mystery cleared up quickly by (subsequent) XRD was the brown weathering crust - which is rich in iron oxides because the sand grains are cemented by an iron-rich (ferroan) dolomite. A series of stacked channels was found, with wonderful cross-stratification, and then bizarrely a sticky

grey clay with abundant septarian nodules. The clay turned out to be mostly illite, which surprised me as I was expecting something more like a seat-earth, which would be tend to be a kaolinite-rich material today.

The general assumption so far is that we were walking westwards down the stratigraphic column, so we were surprised to find thick, pebbly conglomerate beds apparently overlying more steeply-dipping red beds as we approached an unconformity with the Pre-Cambrian Gwna Melange. The extraordinary fact is that the structure of the melange, with large clasts floating in a foliated matrix looked remarkably similar to the much younger material cascading over the topography of the weathered melange, and it was easy to read the sequence in a quite different manner when traversing in a younging direction compared to a traverse in the ageing direction.



Base of Red beds

My interpretation of relations here is that the red beds are essentially terrestrial, and have a steeper dip, following the contemporary topography, which dies out as deposits build up further away

from the local high ground into a more obviously fluvial environment.



Stigmaria location

After lunch, taken on a small comfortable beach just short of Bodorgan, we set off back along the outcrops and found more delights - a sandstone chock full of large crystals of pyrite, and an erosion surface in the conglomerates that was covered with the impressions of *Stigmaria*, thought to represent the roots of club-mosses. We had missed this completely on the way out - despite its being featured in the guide to the geology of the Anglesey Coastal Path. My own view on that is that one should always read the field guide AFTER an excursion, so that one's true perceptions are tested, rather than looking for the features one is told to find, and hence reinforcing the prevailing orthodoxy.

Anyway, it was an excellent excursion, and should be commended to anybody who fancies a half-day scratching about and enjoying the top of a very fine shore. Carboniferous outcrops on Anglesey are rare apart from the ubiquitous limestone, and this section is important. As one steps out southwards into the half graben, younger rocks are found at

greater depth due to faults spoiling the perfect hinge line, though they are all hidden beneath the thick superficial deposits of the marsh, which is an important wildlife habitat. The youngest strata are the Productive Coal Measures, which were worked further to the east, and with associated shale partings which Barry has observed as spoil and collected an excellent range of fossils - see previous issues of the newsletter for details.

Thanks are due to Keith Nicholls (Cwm Hirnant) and Barry Wrightson (Malltraeth) for putting their necks on the line and offering their local knowledge and insights to the members of the Association.

(JW)

Geoscience Wales Cluster Meeting

21st June 2012, Royal Cambrian Academy
Arabian Adventures: Geological Mapping in the United Arab Emirates
Simon Price: British Geological Survey

A small but appreciative audience heard a fascinating talk on a recent mapping exercise carried out by the BGS across the United Arab Emirates. The mapping has been completed at a scale of 1:100,000, and includes preparation of sheet explanations, formal memoirs and a digital set of data.

The geology of the Emirates was described as comprising a westward younging sequence of sediments (Palaeogene, Neogene, Quaternary and Holocene) deposited in a foreland basin to the west of the Oman Highland

Ophiolite Complex. There is considerable evidence (in the form of fluvial sediments and faunal assemblages) that the Arabian Peninsula has been significantly wetter in the recent geological past. The current arid climate is thought to have been established as recently as 4000BP.

As well as detailing the geology Simon described the use of rugged laptops and integrated satellite GIS and the BGS Sigma database tool in mapping, along with the traditional tools of compass, hammer and auger.

The vote of thanks was offered by Bill Fitches, and enthusiastically received by the audience.

(KHN)

GeoMon Research Seminar

Anglesey Research Workshop, July 2012

Members of the NWGA may not need reminding that the geology of Anglesey, with its enigmatic insights into the Pre-Cambrian, has long been regarded as a challenge or an opportunity. Like the 'Wilson Cycle' of ocean basin creation and subsequent destruction, models of the formation and juxtaposition of these ancient rocks have been published and regarded as a workable synthesis only to be demolished later by someone brave and dedicated enough to tackle the inevitable uncertainties once more. As a student at Leeds University in the 1970's the protagonists that I met were Robert Shackleton, Mike Coward and Andy Siddans; sadly none of them are with us

now. It was good to be reminded that research into the tectonic origins of Anglesey remains a topic of international interest through the convening of a small research symposium with the backing of the Anglesey Geopark in late July.

The principal parties turned out to be research groups under the tutelage of Professors Yukio Isozaki (University of Tokyo) and Shigenori Maruyama (Tokyo Institute of Technology), the British Geological Survey, Professor Brian Windley (University of Leicester) and researchers at Birmingham and Manchester Universities. In the audience we were delighted to welcome Tony Barber, whose name will be well known to anybody reading his influential papers on global tectonics in addition to the epoch-defining paper on the Mona Complex with Michael Max in 1979. In total around 40 delegates were present at the recently-opened Copper Bin interpretation centre at Amlwch Port, a poignant and evocative location that is a reminder of just how important the quirks of Anglesey's geology have been to economic progress in the past.

The first day was chaired by Brian Windley, whose textbook of global tectonics was first published in 1977 and rapidly became required reading. Maybe if it had been published a couple of years sooner, and I had been persuaded to read it, my geological career may have been more focussed. The scene was set by two excellent review presentations by the Japanese professors, both excellent and compelling speakers with excellent English. For getting back up to speed in a discipline that I had last considered seriously over thirty years ago, this was

good therapy. To summarise, Anglesey is regarded as one of the best places in the World to study Neo-Proterozoic subduction-related tectonics. The Japanese group are also active in Scotland, which occupies a complementary position on the opposite side of the Iapetus Ocean on the Laurentian accretionary margin, while Anglesey defines the margin of Avalonia. The accretion of island-arc volcanic complexes is seen in both locations, but in Avalonia we do not have the post-tectonic granitic intrusions into extensively metamorphosed sedimentary accretions that are found in Scotland and Ireland.

I shall not give reviews of individual papers because it is hoped that the NWGA will be associated with publication of a brief proceedings volume, where all the papers will be summarised. Instead I shall try to convey a general impression of what we heard and the issues that were discussed. It must be recognised that most presentations and poster explanations were given by young people for whom English is not a native tongue. All credit to them for their linguistic effort over and above their geological endeavours. TLA's (Three Letter Acronyms) therefore formed a critical part of most presentations and formed a convenient linguistic shorthand where pronunciation was a significant hurdle. Here are a few that were used a great deal:

OPS or Ocean Plate Stratigraphy

Recognition that the famous Gwna Melange is of tectonic, rather than sedimentary, origin in the 1960's has been key to understanding its context. Anglesey is the type locality of melange,

although its significance and mode of formation has differed for different workers over time, and is thus an important stratotype. Melange is common in Japan, where its key components, sandstone, limestone, basalt and chert, all within a muddy matrix, have been decoded into a tectonic context. OPS betrays the origin of melange in an oceanic plate with (pillowed) basalt representing the oceanic crust, chert the deep-ocean siliceous ooze, limestone for shallower marine sediments and sandstone the incursion of coarser, terrigenous sediments from the accretionary margin with 'lubricant' muds their distal counterparts. The coincidence of these rock types as clasts in these chaotic units is thus diagnostic of the subduction of oceanic crust - and highly significant. Current thinking suggests that the melange is actually mixed up by the subduction process, and not by sliding into the trench which was a famous model from the past.

PTM or Pacific Type Margin

A shorthand description of the tectonic disposition of rock units characteristic of subduction at destructive margins, as seen in the Pacific Ocean i.e. Japan today. Subduction has been proceeding continuously around the edges of the Pacific plate for hundreds of millions of years so remnants of the process of different ages are abundant in Japan. A PTM is typified by the following features: OPS, onshore volcanism, a thin blueschist metamorphic belt, and distal (onshore) granitic plutonism. Certain elements are missing if we discuss the origin of Anglesey as a PTM, but at least one speaker suggested that the extent of outcrops is simply not great enough to

recognise the plutonism and we must look elsewhere for it.

MORB or Mid-Ocean Ridge Basalts
Isotopic and chemical signatures discriminate between basalts erupted at constructive margins (ridges) and Ocean Island Basalts (OIB) or island-arc complexes which are intra-plate features or subduction-related. This is important, because the oceanic crust implicated in the PTM or OPS would be expected to be MORB, and it would be useful to know if it wasn't. QED, and yes, I do realise that MORB is a FLA.

ZAP or Zircon Age Profiling

I admit I made this one up, but it was properly discussed and it goes like this: zircons are critical for Uranium/Lead radiological ages. Zircon crystals grow only at high temperatures, so zircon populations are formed at key moments when granitic rocks are crystallised or metamorphosed at high temperatures. Some zircons are recycled and have growth-rings of different ages. Instead of focussing upon single grains, as many ages as possible are measured from a large population. Clustering of ages defines their provenance at particular times, and pieces of continental crust from different locations can be traced by having igneous/metamorphic dates characteristic of their known tectonic history. In this way it is possible to discover where slices of crust, or terranes, originated. Bizarrely, it can be shown that Anglesey and North Wales have accreted on the western margin of the Gondwana super-continent from elements of West African and Amazonian origin, with all that entails for enormous strike-slip movement

along highly-mobile shear zones during subduction/accretion.

I think you get the picture by now that this was fairly heavy stuff at times, so we were delighted to take part in a short field excursion to Llanbadrig church and nearby outcrops of the Gwna melange. Under kindly skies we looked at the great raft of limestone within the melange that was big enough to be a useful quarry, and where Margaret Wood discovered stromatolites back in the 1970's to general amazement, and a record age at the time for British fossils. A great deal of discussion then centered upon the different ages of the clasts and the formation of the melange, and here we heard of recent work by Jana Horak giving dates around 800 Ma to the limestone, which is much older than the 530-620 Ma of the Gwna Group. Then we had to get our heads around the idea that accretion above a subducting slab gives inverted ages, since the first material to be scraped off the subducting slab is successively under-plated by more recent materials.

The second day was chaired by Rob Crossley of Fugro Robertson and GeoMon, and kicked off with the Keynote Talk by David Schofield of BGS - a lively romp through the recent work on Anglesey relating to comparison with metamorphic events and accretionary complexes on the Gondwana and Laurentian margins, and the likely extent of oblique subduction during the closure of Iapetus. British workers talked of new research into the sedimentology of the Gwna melange (continuing) and high resolution age profiling of prograde and retrograde mineral zoning to look at the pressure,

temperature and Argon/Argon dating of metamorphism in Britain's only blueschist belt, and demonstrating a history spanning the period 600 to 533 Ma. Several papers dealt with constraining pressure/temperature paths and chronology of metamorphic zones of Scotland, from the Laurentian margin, of course, and questioning the simple models that have endured for a long time regarding their formation and context. It is good to see the application of new techniques to old problems in Scotland as well as in Anglesey. Finally, Brian Windley chaired a closing discussion in which there was spirited duelling and exposition of insights into the tectonic evolution of other destructive plate margins worldwide. We were reminded that reconstruction of Earth history is a truly multi-disciplinary problem and that a large number of complementary techniques, as well as basic fieldwork and mapping, are required to achieve a satisfactory synthesis.

This was a most interesting and wide-ranging meeting, and appreciation must be extended to the speakers, to Margaret Wood, Professors Windley and Maruyama, to GeoMon, to Anglesey County Council and all the other assistants - not least for the provision of lunches, refreshments and quite excellent Welsh Cakes and Bara Brith which were much appreciated. I look forward to the next such event with great anticipation.

(JW)

New Publications relating to North and Mid Wales

Anglesey (Ynys Mon): A landscape carved by ice, with 1:50,000 analysis of a glacial landscape, glacial photo gallery. British Geological Survey (2011).

Dinas Mawddwy, 1:50,000 Geological Sheet E&W 150, Bedrock and Superficial Edition, British Geological Survey (2012).

Dates for your Diary:

NWGA

September Field Visit

September 2nd

Leader Geoff Thomas – University of Liverpool

Glacial Landforms of the Llyn Peninsula

For details, or to book a place, contact Cathy O'Brien.

NWGA

Autumn Evening Lectures

September 19th

Dr George Nash, (Dept. of Archaeology & Anthropology, University of Bristol)

“Misunderstanding, myth or might be? The discovery of upper Palaeolithic rock art in South Wales”

Pensychnant, Conwy. 7:30PM sharp

Oct 25th (Joint Meeting with the North West Group of the GSoL and UoC Department of Biological Sciences)

Keith Nicholls (University of Chester)

“The Big Chill – Life, death, and destruction, a story from the end of the Ordovician”

Venue: Beswick Lecture Theatre (CBE017), Parkgate Campus, University of Chester.

Refreshments at 6:30PM, Talk commences at 7:00PM. Map of venue at: <http://www.streetmap.co.uk/map.srf?x=340120&y=367335&z=120&sv=340120,367335&st=4&ar=y&mapp=map.srf&searchp=ids.srf&dn=689&ax=340120&ay=367335&lm=0>

November 7th

Nigel Brown (Bangor University)
“*Plants through the ages*”

Venue: University of Bangor, Treborth Botanic Garden Laboratory, 7:30PM. Tea, coffee and biscuits available.

The location maps for the venue are available from the garden web site at <http://treborthbotanicgarden.org/> or from a link on the NWGA website.

OTHER ORGANISATIONS EVENTS

Geological Society of London North West Regional Group September 9th

“*Field Visit Mam Tor: Derbyshire*”

Professor Ernie Rutter, Professor of Structural Geology at the University of Manchester, who will give an overview of the ongoing high resolution monitoring of the landslide and rheology of the Edale Mudstone.

Contact Nik Reynolds for Joining Details through the GSoL NW Facebook or Linked-in Pages.

September 13th

Laurence Donnelly, (Wardell Armstrong)
“*Potential Reactivation of Faults due to former Coal Mining*”

Williamson Lecture Theatre, University of Manchester

Geological Society – History of Geology Group

22nd-23rd October

“*Appreciating Physical Landscapes: Geotourism 1670–1970*”

The Geological Society, Burlington House, London

EIG Conferences

5th – 7th September

Edge Hill University, Lancashire
Extractive Industry Geology 2012

<http://www.geolsoc.org.uk/webdav/site/GSL/shared/pdfs/events/EIG%202012%202nd%20Circular.pdf>

Shropshire Geological Society (and affiliated groups)

<http://www.shropshiregeology.org.uk/SGSEvents.htm>

Saturday & Sunday 08 & 09 September 2012

Open Day at Snailbeach Mine

<http://www.shropshiremines.org.uk/snailbeach/sbheri.htm>

Sunday 16 September 2012,

“*Surviving the Century: What will life be like in 2050 and beyond?*” (guest speaker: Lord Rees of Ludlow) - to be held in St Laurence's Church, Ludlow, organised by the St Laurence's Conservation Trust (01584 877771) or e-mail rosemary.wood3@virgin.net). £10 per person. Tickets from the Trust, the Church Shop, or pay at the door: 5PM Start.

GeoMon

Monday 17 September

Llanddwyn Island

Meet at 12.45am for 1.00pm start. Start from Newborough Beach Car Park

Sunday 14 October

Holyhead Mountain Geo Walk –
Start at 10.00am Meet at RSPB Car Park
on the Range

Wednesday 17 October

Llanddwyn Island
Meet at 12.45am for 1.00pm start. Start
from Newborough Beach Car Park

Wednesday 14 November

Llanddwyn Island
Meet at 11.45am for 12.00pm start. Start
from Newborough Beach Car Park

Wednesday 12 December

Llanddwyn
Meet at 10.15am for 10.30am start. Start
from Newborough Beach Car Park

Please note that some of the GeoMon meetings carry a small fee, others require payment of a car park charge. Some of the walks are lengthy, and in some cases traverse difficult terrain. Further details are available in a downloadable pdf file at:
<http://www.geomon.co.uk/>

Geomon's web e-contact details are available at:
<http://www.geomon.co.uk/#/contact/4533286691>

Alternatively you can write to The Old Watch House, Porth Amlwch, Angelsey or telephone 01248 810287.

Manchester Geology Association
Wednesday 19 September - Friday 21 September 2012

A visit to the North West Highlands of Scotland based round "A Geological Excursion Guide to the North-West Highlands of Scotland" by Kathryn and her colleague at BGS, Maarten Krabbendam.

Saturday 6 October 2012

Field Visit to Pott Shrigley
To examine the Lower Coal Measures, evidence of former coal mining and the relation between geology and scenery

Contacts for all MGA Meetings – Jane Michael through:
<http://www.mangeolassoc.org.uk/outdoorvents.htm>

The Palaeontological Association
16 – 18 December, 2012

University College Dublin

56th Annual Meeting

Details at <http://www.palass.org>

National Association of Mining History Organisations

(NAMHO)

28 June to 1 July 2013

Conference: Mining Legacies - the environmental, physical and cultural impact of mining

Venue: University of Aberystwyth
(see Call for Papers at the rear of this Newsletter)

Web News:

1) Sedgwick Museum

With much recent discussion in the newsletter relating to the work of the Reverend Adam Sedgwick, you may find a visit to the web site of the Sedgwick Museum at Cambridge of interest:

<http://www.sedgwickmuseum.org/>

2) Sigma

Details of the BGS Sigma (Sigma) database tool (described by Simon Price, above) can be seen at the BGS website at:

<http://www.bgs.ac.uk/research/sigma/home.html>

3) Areofilms

A new searchable database of British aerial photography (the former Aerofilms archive) has been made available by English Heritage on a new web site at:

<http://www.britainfromabove.org.uk/browse>

4) TED – Ideas worth spreading

Check out the Jack Horner lecture on “*Shape Shifting Dinosaurs*” (and links to many other similar lectures) at: http://www.ted.com/talks/jack_horner_shape_shifting_dinosaurs.html

5) NWGA

Our Facebook and Linked-in pages are slowly attracting a select band of followers. Please take a little time to visit and “link” or “join” as appropriate at:

<http://www.facebook.com/groups/northwalesga/>

and

http://www.linkedin.com/groups?gid=3031675&trk=myg_ugrp_ovr

At the moment these are being updated regularly and provide useful links to a wide range of materials. We do however need to see more activity to continue to keep the sites fresh and updated.

Finally a reminder of the NWGA Web site itself at: www.ampyx.org.uk/edgc

The web site has been updated recently with all except the very recent editions of the Newsletter now available for direct download.

Committee Contacts:

Chair and Website:

Jonathan Wilkins
01492 583052
wilkins@ampyx.org.uk

Meetings Secretary:

Dr Cathy O'Brien
01248 484082
07721 860420
Cathy.obrien@environment-agency.gov.uk

Secretary:

Judith Jenkins
judith.sunfield@yahoo.co.uk

Treasurer:

Frank Buxton
francis62@talktalk.net

Newsletter Editor:

Keith Nicholls
07799 888372
keithandkaren@tiscali.co.uk or
knicholls@geotechnics.co.uk

Colour Hard copy reproduction by:

geotechnics

Front cover image:

Dyffryd Mymbyr deformed “Bird’s eye” tuff – photo copyright Cathy O’Brien (see discussion)

Advanced Notice and Call for Papers

NAMHO Conference to be held at Aberystwyth University 28th June to 1st July 2013

Mining Legacies: examining the impact of historic mineral working and ore processing on land, landscapes and perceptions of place

A three to four day conference looking at the multiple legacies of historic mineral extraction with the opportunity for field visits to relevant mining sites in the Ceredigion uplands.

Over the last four thousand years mining has left a footprint on the environment, leaving both visible and hidden legacies for today and the future. Evidence of past mineral extraction can be prominent in the landscape as spoil heaps, discharges, dressing floors, mine entrances, derelict buildings, rusting machinery, transport infrastructure and settlements. Other remains are less visible, such as earthworks indicating sub-surface remains and subterranean workings, heavy metal residues, sometimes dating back thousands of years captured in polar ice caps or peat deposits. Less tangible still are the socio-economic, political and cultural impacts of mining, such as in the sense of place and identity, the development of heritage and alternative economic pathways, and the moral dilemmas of current and future mineral exploitation that these historic sites have often provoked and represented over time. Papers are invited on all aspects of the mining legacy.

Investigating, in some cases, rectifying and also promoting the post industrial landscape can inform our knowledge of mining over the last four millennia. This conference aims to bring practitioners from a variety of academic disciplines, industry, the public sector, heritage charities, and independent researchers together and provide a stimulating platform for the transfer of knowledge and expertise.

For further information contact: Dr Peter Cloughton: p.f.cloughton@exeter.ac.uk (01437 532578) or Dr Catherine Mills: c.j.mills@stir.ac.uk (01786 467583)