Cymdeithas Daeareg Gogledd Cymru:
North Wales Geology Association

Volume 45

April 2006

INSIDE THIS ISSUE:

Don't Miss the Second Talk of the Year: at Conwy, Wednesday April 26th:

Dr Neil Glasser from University of Aberystwyth: the Glaciation of North Wales

From The Chairman's Orbit

Welcome to our Spring Newsletter, and thanks to all of you who have renewed your membership already. I am delighted that the rise in subscription rates has certainly not put everyone off, and we hope that you will see value for money in the coming year.

With this Newsletter you will find either a membership card or a final reminder that your subscription is due. Please continue to support us as you have in the past.

At our March meeting, Gareth Williams took us to places that we have not explored as an Association - and there will not be a follow-up field meeting, I am sorry to say. A very unusual twist of our programme took us to the 'Big Bang' and the birth of our solar system as collapsing clouds of dust and interstellar hydrogen coalesced to form our star and planets.

We are stardust, as the song reminds us, but Stardust popped up in the news again recently in a different guise. Stardust is the name given to a 7-year NASA mission to gather some of that dust which was first gathered by comet Wild-2 and has subsequently been trailed around the solar system as the comet's nucleus slowly evaporates into space.

The probe trawled a very fancy filter through the trail of debris in the wake of the comet, and returned it to Earth in a capsule a couple of months ago.

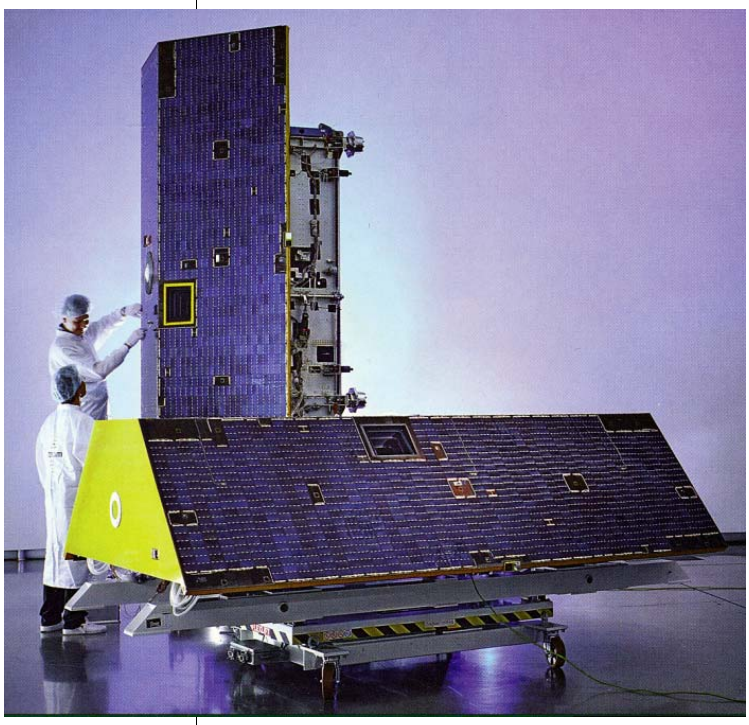
A few dozen of the millions of micron-dimensioned grains have been analysed by scanning electron microscope, and with an x-ray spectrometer to map the chemistry of their surface.

I am delighted to say that the old suspects have turned up once again - Olivine, Pyroxene and Spinel. It is very reassuring that even stardust has a very down-to-earth composition, although NASA are now wondering why such high-temperature minerals were included in icy comets in the cold and distant reaches of our solar system. So, we are not so much stardust as picrite!

Now where did all that carbon come from?

Jonathan Wilkins

GRACE: Gravity Recovery and Climate Experiment

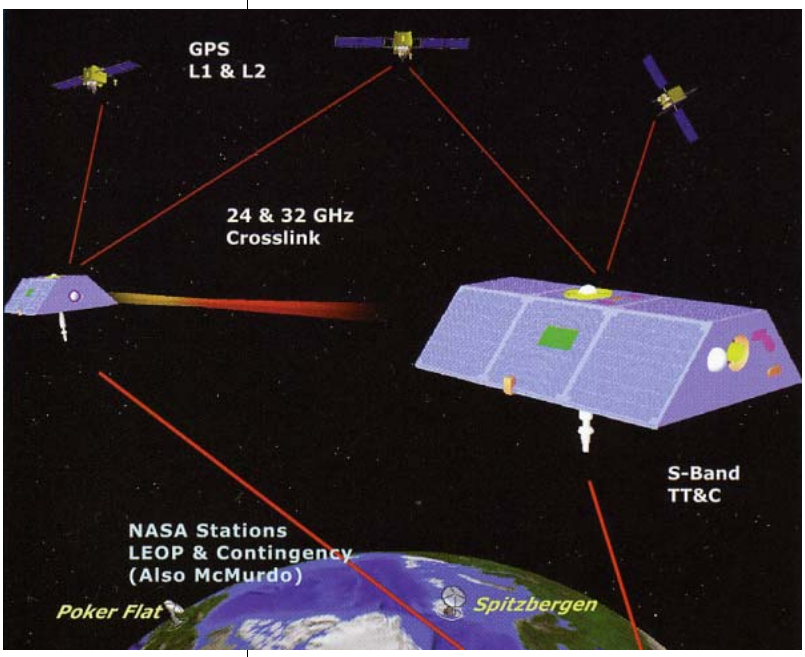


Keeping with the space technology theme, very interesting results are now being published (American Geophysical Union conference December 2005) from a pair of satellites launched to measure the Earth's gravitational field.

The larger gravitational effects, due to major variations in the distribution of mass in rocks across and within the Earth, have been known since the early days of satellite tracking. The "push-ups" (when flying over low gravity areas) and the "pull-downs" (flying over high gravity areas), can be mapped as the satellites orbit the Earth.

The ups & downs on the gravity potential globes (opposite), generated by the German Georesearch Centre in Potsdam (GFZ), are in effect the reverse of the movements the satellites make during orbit (ups represent high gravity areas).

The two GRACE satellites "chase" each other around the Earth, on the same track, but separated by 220 km. Their general position in space (at 300 to 500 km altitude) is measured in relation to the Global Positioning Satellites (that also give us GPS locations on the ground).



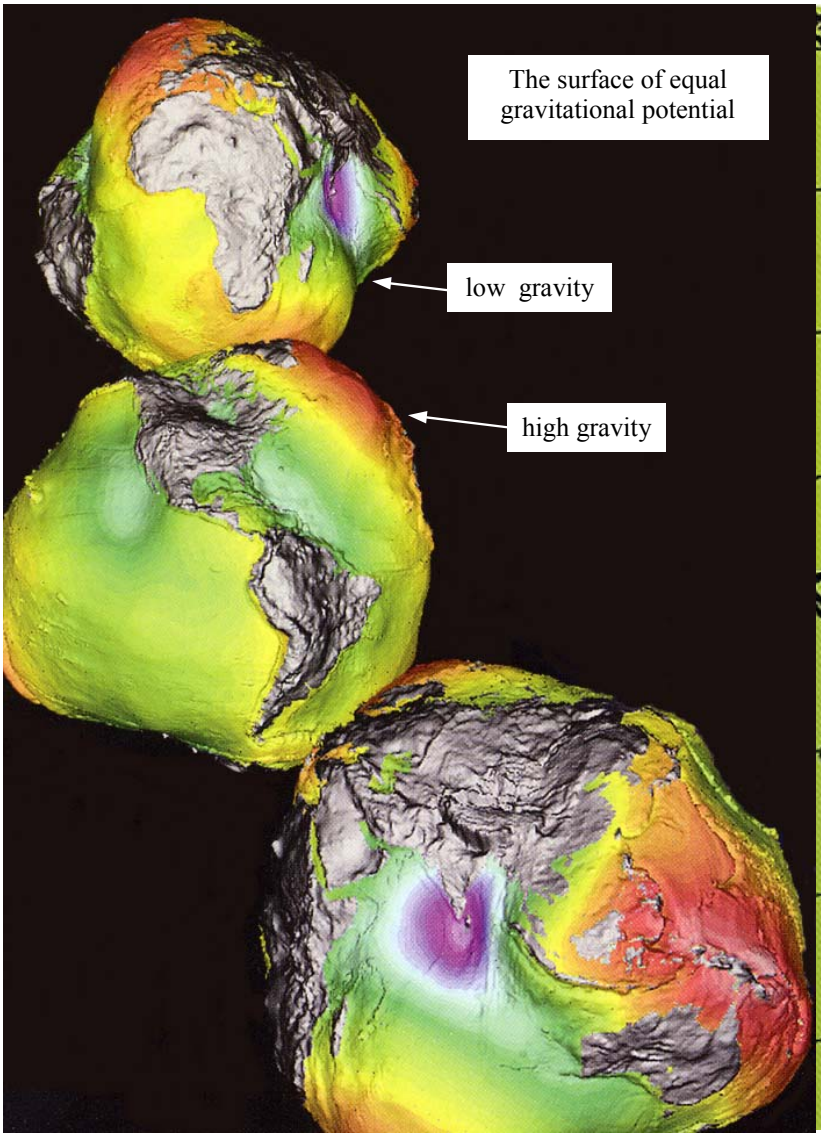
Now comes the really novel and clever bit: microwaves are fired between the two GRACE satellites, which enable them to measure their positions relative to each other to within 10 microns (comparable to the diameter of a blood corpuscle). The ultra high precision of these measurements means that more subtle variations in gravity can also be studied.

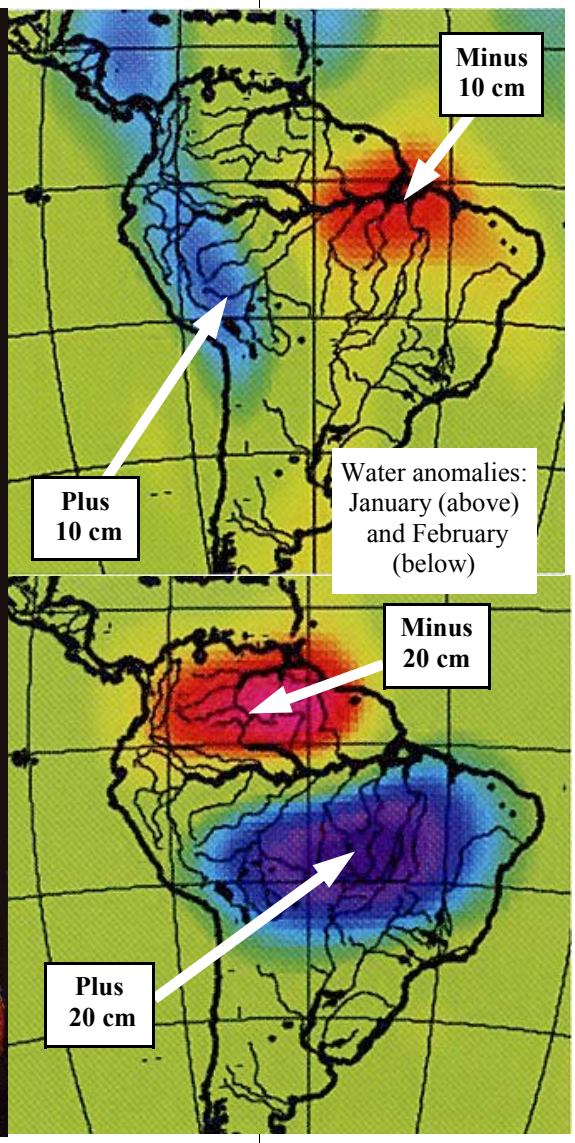
For example, the additional mass due to a few centimetres of rain accumulating in the soil, rivers and lakes can be detected. An illustration from the Amazon Basin for January and February 2004 is shown opposite.

This does not mean that rain gauge measurements can be abandoned! The gravity signature of tiny differences in wetness can only be detected if they extend over distances in excess of 300 km (a 5 cm thick layer of water 300 km in extent does represent a substantial, and therefore detectable, extra mass). Also, the orbit timings mean that estimates of gravity changes are presently only reliable on a monthly basis. So, patches of wetness from local storms will not be detected, but the ability to detect monthly variations in average rainfall/aridity across wide areas has obvious value.

The GRACE satellites should also be able to detect the gravity effects of mass variations due to changes in ice thickness, sea level changes, changes in deep ocean current pathways (because the currents have different densities from surrounding waters), ocean bottom pressure and oceanic heat flux— but I have not seen anything published on these topics yet.

Rob Crossley





Other Geological Organisations

Manchester GA

Weekend 3/4 June: Ketton, Northants, Castle Cement Quarry with Dr Joe Macquaker

Sat 10 June: Rossendale with Dick Crofts
Weekend 12/13 August: Rhoscolyn/Parys Mountain structural geology with Dr Giles Droop. NWGA members are welcome to join this on a daily basis subject to availability-must check with Jane Michael first.

Fri 1 to Tues 5 Sept: Strathaird Peninsula, Isle of Skye with Joe Macquaker.
Contact: Jane Michael 0161 366 0595 or at outdoors@mangeolassoc.org.uk

Liverpool GS

Sat 29 April: Mersey Tunnel, Birkenhead
Sunday 7 May: The Roaches with Chris Hunt
Sunday 4 June: Hurstwood and Burnley with Iain Williamson
Contact Tom Metcalf 0151 286 9975

GC OUGS (taken from their March 06 NL)
Sunday 6 OR 13 May: Dolomitic limestone at Llynclys Quarry, Oswestry. Contact Sue Hughes 01938 500624
Sunday 18 June: Llanrwst Gwyddyr Forest Miners Trail. Contact Rachel Atherton 01942 270152
Sunday 9 OR 16 July: Llanwddyn Island, Anglesey. Contact Wendy Owens 01352 715531

Jan's Roadside Rock Sessions – No. 4
The NANT FFRANCON / OGWEN Valley, Part 3

"And the famous Nant Ffrancon Pass, with mountains up like walls from the damp, boggy bottom and the whole giving a feeling of a great trap, jaws open and at any moment ready for the sudden snap, and an end to everything". (Clewedyn Hughes)

Hello everyone, and welcome to the third part of our little triptych of the Nant Ffrancon.
This time let me show you the great dyke that crosses our valley, some of the processes of Iron deposition, and also give you a fleeting glimpse of the many and varied faces that this valley has worn in her years.

So to start with, as before pass through Bethesda heading inland on the A5 until, after about a mile you will reach the Snowdon Lodge at Ty'n-y-Maes, where you can park up for a moment by the red post box, just outside the motel. Cross the road, and look up to the steep cliff face on the opposite side of the valley. This is the one at the back of Cwm Graianog that we were looking at before from the old road, in the first part of the Nant Ffrancon "Roadside Rocks".

Remember how we viewed these exposures in order to find the unconformable boundary between the Cambrian and Ordovician beds? Well, this time I've included a photo taken in this winter's snow, from just where you are standing.
Take a few moments to get your eye in, and you should soon be able to see how the later Ordovician beds transgress in an overstep up the slope of the more steeply dipping older Cambrian beds. A classical "text book" example of an overstep unconformity, and a joy to behold!

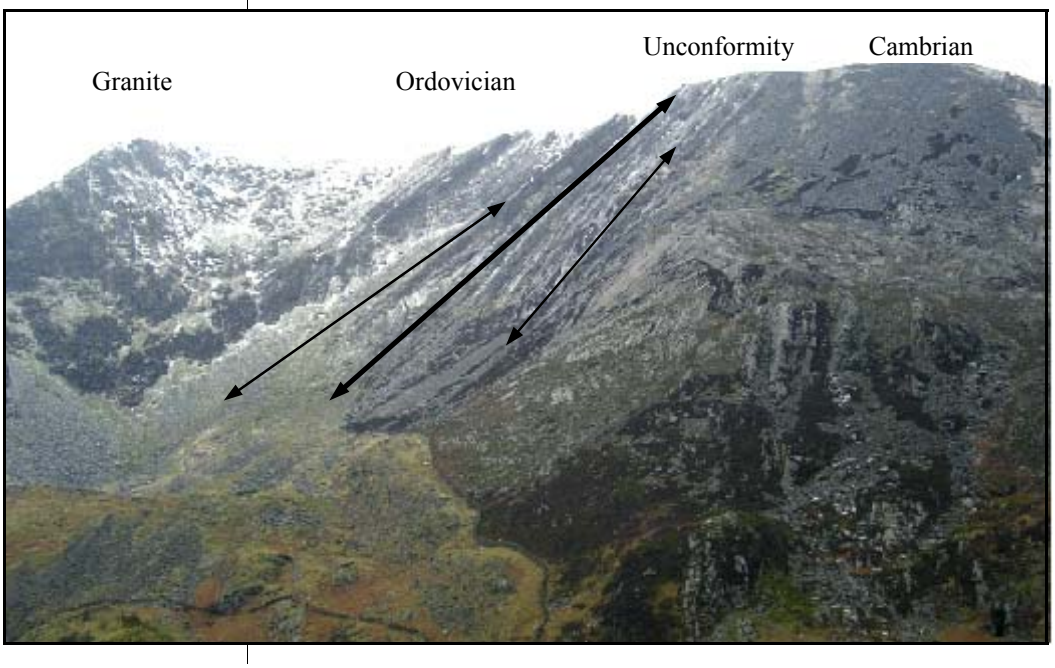
When you've finished, contrive to turn your car about, then go back and take the a left turn onto the old road as before (you should know your way by now). Pass over the little Ceunant bridge where we started out first adventure and keep driving up the valley.

If you have had the forethought to bring binoculars with you, pause for a moment at the side of the first cattle grid, just past the Gwaith copper mine (SH 631 633), and look up at the face of the Cambrian beds. You should easily be able to see some of the splendid submarine mega-ripples over quite a large exposure.

Pass through Maes Caradoc farm and after about another 300 yards park on the right hand verge just beyond the next cattle grid, where there is a noticeable streambed and a narrow gateway marked "National Trust – Glyderau" (SH 638 623).

We are going to look at several features here, and to start with we need to study the rough, slaty debris that the stream has cut its ravine through. The ground here is actually a broad alluvial cone of Llanvairn slate fragments that have washed down from Cwm Bual above. Examine the deposits exposed by the stream and see how the fragmented slate has been moved down by successive torrents.

Note that the Bual cone is broad and flat, in fact several hundred yards across, due to the fact that it is constructed of slate debris which moves easily. Other cones in the valley are much steeper as they are made of hard rock, which fractures into blocks and quickly consolidates.



Incidentally, Cwm Bual is very close to the late Ordovician Cywion igneous intrusion that we looked at in Part 2, and is within the metamorphic aureole that extends for the next mile up the valley (an area of country rocks that were altered by the heat of the intrusion). As a result, there is good mineral ground to be searched up above in Cwm Bual, but we will leave that for the younger and fitter "tigers" amongst us!

Evidence of a different mineralisation process can be found within the slate debris

from Cwm Bual, and good hand specimens of rusty pyrite are very readily found in the stream bed that you are looking at. So plentiful in fact that you should find a good specimen within 30 seconds of arriving on-site! Please don't be greedy – break one for your research by all means, but please leave the rest for others to find. See if you can identify some of the other minerals in your sample. This iron is from an enriched section of the sedimentary beds above, and forms a known iron horizon that extends for several miles. This horizon is mapped as outcropping again in the valley below Aber falls, where again the iron has been mined.

If you look across the valley to the scree slopes above the A5 opposite, you should clearly see a very large moraine-like hump, where a huge mass of glacial and other debris has slumped, or been dumped, on the steep hillside (SH 644 623). The A5 was built across the face of this slump, but several times the face has given way and taken stretches of the road with it. There are two fresh scars above the road, and between them is an old Ironstone quarry, which chases this iron horizon. If you want to you can visit this site at the end of the day, where you may find samples of pyrite similar to those in the Cwm Bual streambed.

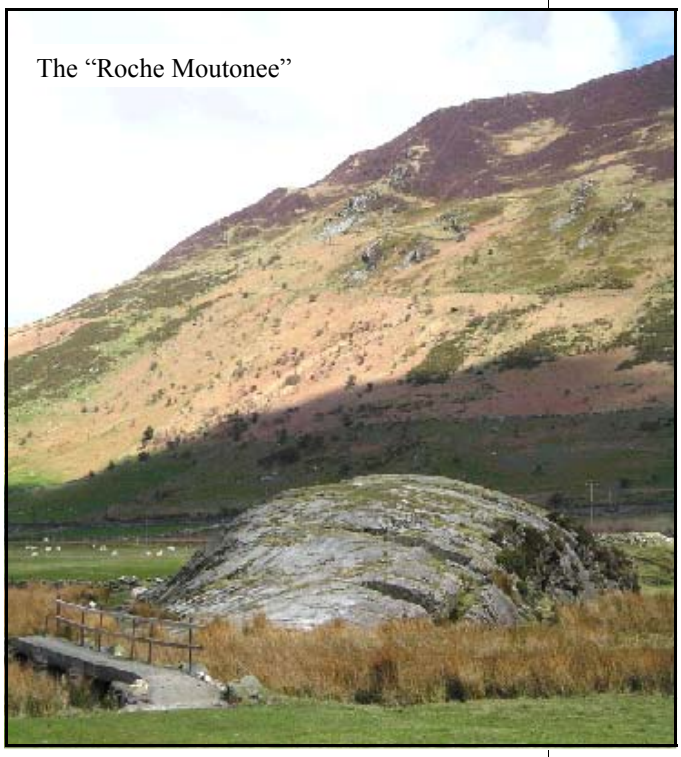
The iron pyrites in this horizon is an example where iron in the sediment combined with sulphur (which is relatively abundant in sea water), in anoxic conditions within the sediment, soon after deposition.

Let's now go and look at the very prominent Palaeozoic porphyritic quart-dolerite dyke that runs down the hillside and straight across the valley (SH 638 625). In the middle of the valley floor the dyke rises up as a big, hard "Roche Moutonee" (a geological term for a glacially polished rock – named after the goat's wool gentlemen's wigs that were popular in the Georgian period – not after "sheep's backs" as is often literally translated).

This dyke is quite difficult to build into the history of the valley as neither it's strike, nor it's composition seem to associate it with any of the know local igneous activity. It obviously arrived at an early stage of the orogeny, as it was subsequently faulted and displaced into an "en echelon" series of outcrops, seen rising up the valley walls. This early date for emplacement disassociates it from the later granitic intrusions, and yet it's strike is at 90 degrees to the majority of other early Palaeozoic dykes and so it becomes something of an enigma. It can also be difficult to estimate its emplacement dip, but the clue is to look for the transverse cooling joints. It actually dips steeply to the east (up-valley). There is obviously some interesting interpretive work to be done here.

If you take a quick walk around the roche, the transverse cooling joints will easily be seen, along with some flow structures. Along the eastern (up-valley) side, you can see how glacial action has torn away the surface, exposing the porphyritic structure. Low down on the face, you can also see a couple of quite large inclusions of cleaved country rock – the Ordovician slate – embedded within the dyke.

The "Roche Moutonee"



You can walk up onto this big roche if you wish, as a footpath crosses the valley here, but take care as the rock is quite slippery underfoot, even when dry, and getting down again can be perilous. If you do get to the top, pause to look around you, and imagine how the valley once contained two large lakes, separated by this hard dyke bar, that have now been completely infilled by sediment washed down from the valley walls.

Much work was done here by INQA in taking core samples of the peat in order to establish the past flora of the valley from pollen analysis. In sequence, since the retreat of the ice cover, the valley has seen repeated phases of solifluction clay and organic muds. Besides the usual peats of sphagnum moss, the early valley hosted tundra-like low scrub, passed through a period of open birch woodland, and then returned to tundra. If we could borrow the "Tardis" for a moment, we would remain standing on our dyke roche, cast our eyes up the valley and perhaps

Jan's Roadside Rock Sessions – (cont.)

see the Glyders and the Idwal slabs reflected in a mirror lake, which is in turn surrounded by a picturesque stand of birch trees. Do we have a keen Photoshop fan who could re-create the scene for us?


View south


View north

From the roche, walk along the top of the dyke to the river, and then over the footbridge. On the far bank, immediately downstream of the bridge, there is a convenient outcrop of glacially-polished dyke. Do take care if you step on it, as a slip will leave you in very deep water, with little chance of escape. On the riverbank, you will see the glacial till and mud raising up to not one, but two thin covers of grassy turf, with mud between them. This turf/mud "sandwich" suggests an early turf cover overcome by a major flood (did the upper lake burst its banks?) followed by a later turf cover.

The interesting thing to look at, however, is lower down. Here anoxic, organic acid-rich waters leached iron whilst percolating down through the sediments, and re-deposited the iron at an impervious horizon towards the bottom of the bank. This is an orange-brown hydroxide complex formed during oxidation when the water reaches the air. This is a present-day example of iron mineral precipitation shortly after sediment deposition.

Well, that concludes our "virtual" trips to the Nant Ffrancon for this year (but do come on my field trip in August). So now all that is left is to take our usual meander up to Idwal Cottage car park to savour yet another mug of well-deserved tea.

Look out for more "Roadside Rocks" in coming issues, when we'll look at some sites near Llanberis. If you have any sites of your own that you would like to write about, please do send something in, as we are desperately short of articles for the newsletter.

Be seeing you….

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Point Lynus – mystery fossil

The story so far. During the fieldtrip to Point Lynus October last led by Rob Crossley, a large detached boulder was examined close to the site of the Carmel Head Thrust exposure. The boulder was set firmly in local till and on examination by Jonathan Wilkins the boulder was found to contain highly fragmented clastic material, mostly of a calcareous nature. Just one fossil seemed to be relatively intact, but even that was not complete.

There was much debate on site as to whether it was part of the thorax of a trilobite or a fragment of a brachiopod and as the fossil could not be removed easily from the boulder, field examination was far from easy.

A couple of days later I went back to the site and photographed the fossil in situ (1), as well as taking a Plasticine impression to get at the interior of the remains (2).

The two images were then sent away to Dr Robert Owens, Head of Palaeontology at the Department of geology at the National Museum of Wales for an expert opinion.

The conclusion. Dr Owens replied in March this year expressing the opinion that ' ... it is the ribbing of an orthid brachiopod, which occur in this particular facies'. The mystery of the Point Lynus fossil resolved?

Ken Howarth

Cobbles display at Knutsford Heritage Centre

My geology trail around Knutsford includes a variety of cobbles, laid in the ancient street of the coaching era, behind the historic Royal George Hotel. Since mid 2004 this area has become a major construction site for a new shopping precinct, to be named Regent Street, with an underground car park, due for completion this year. As a result these cobbles have been 'lost' forever. That is with the exception of eleven, which I saved in 2003, with the permission of the developer, for their geological and heritage interest. Since then I have been working with the Knutsford Heritage Centre to erect a permanent, outdoor display to show the remarkably clear geological features on their polished surfaces – polished over 200 years by horse's hooves, carriage wheels, tyres and feet..

The cobbles are sub-angular glacial erratics consisting of andesite lava, andesite porphyry, superb ignimbrites, agglomerate and ash of the Borrowdale Volcanics Group, granite, granophyre, *Siphonodendron* colonial coral in Carboniferous limestone and sandstone displaying liesegang rings.

The cobbles are set in 57,000 yrs bp glacial outwash sand from the WBB Minerals Dingle Bank Quarry, Chelford, which is used by Pilkington's at St Helens for making their glass. A colourful poster explains the features of each cobble and how they were formed. The cobbles are set broadly in sequence from north to south of the Borrowdale Volcanics Group, granite and granophyre and Carboniferous limestone and sandstone.

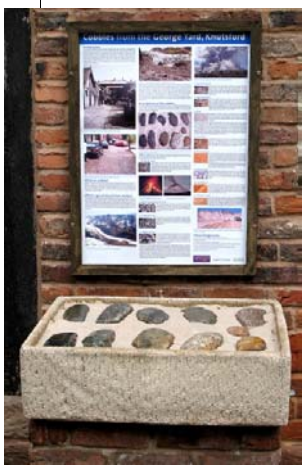
For me it was important to set them at a height where they could be easily seen and touched by both children and adults. It is amazing that the first thing everyone does is to stroke them! My hope is that they will raise the interest of visitors to the stones around them in buildings and underfoot.

The full cost of ca £600 for mounting the display has been generously funded by the Manchester Geological Association.

The project came to fruition on 16 March, when Dr Fred Broadhurst unveiled them to an audience of invited guests then I formally handed them over to Mrs Joan Leach MBE, representing the Heritage Centre Trustees.

The Knutsford Guardian printed a half-page article on the event which gave welcome publicity to the geological connection with a small part of the town's heritage.

Fred Owen



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Visit our website: www.ampyx.org.uk/cdgc

NORTH WALES GEOLOGY DIARY:

April 26th Wed, Conwy, 7.30 pm, The Glaciation of North Wales, Dr Neil Glasser, Centre for Glaciology, Institute of Geography and Earth Sciences, University of Wales, Aberystwyth. Neil will explain his new approach to the reconstruction of Quaternary ice sheets with particular reference to the history of the North Wales Ice Cap.

May 21st Sun, Moel Hebog field day, a day in the field with Jonathan Wilkins on the volcanics and intrusives of SW Snowdonia. Phone Jonathan (01492 583052) for details.

June 14th Wed, Conwy, 7.30 pm, Anglesey Geopark: Progress and Plans, Dr Margaret Wood. Margaret will update us on proposals to obtain Geopark status for Anglesey.

July 12th Wed, Menai Straits field evening, an evening with Rob Crossley, traversing the coastal section from Nant Porth to Bangor Pier, details in next newsletter.

August 9th Wed, Nant Francon, field evening, with Jan Heiland as a follow-up to "Roadside Rocks", details in next newsletter.

September 13th Wed., Conwy, 7.30 pm, The last 20,000 years in the Menai Straits, Prof. James Scourse, Marine Geology, University of Wales, Bangor. James will describe new discoveries about the glacial and post-glacial history of the North Wales coast, made from geophysical surveys and sediment coring along the Menai Straits.

October 18th Wed, Conwy, 7.30 pm, Unravelling Folds at Rhoscolyn, Anglesey, Dr Sue Treagus School of Earth, Atmospheric and Environmental Sciences, University of Manchester. Sue has been working for a number of years on understanding these spectacular, complex, folded beds.

November, Wed, Wrexham meeting, details in next newsletter.