

FGS Field Trip to Snowdonia, 16 - 23 August, 2002

A group of 17 members of the society spent a week during August in North Wales, staying at the Drapers' Field Centre north of Betwys-y-Coed.. David Cronshaw, who has led a Farnham group on four previous occasions from various field centres around the country, had planned six full-day excursions. Five of these were in the Snowdonia National park and the sixth necessitated a long drive westwards in the two minibuses to the end of the Lleyn peninsula.

For the most part, the rocks in this area to the west of the Conway valley are pre-Cambrian, Cambrian and Ordovician. To the east of the Conway Valley Fault the rocks are mostly Silurian but those were only studied as we passed through in the bus from Farnham. Because of the extreme age of the rocks being studied - back to over 600 ma - they have undergone many periods of folding, uplift and erosion which has resulted in the present day complicated mixture of rock types and geological structures. The group found the Ordovician rocks particularly difficult to interpret and Dave needed all of his deep knowledge - his PhD thesis was on regional metamorphism in North Wales - and his great reserves of patience in dealing with a group whose enthusiasm was somewhat greater than its knowledge. When scientific analysis became mentally overwhelming there was, however, the magnificent scenery to be seen all around, a product of the geological complexity. Also there was an entirely different diversion on most days when the RAF were using the valleys and surrounding hilltops as ideal training ground for low-flying jets - noisy but exciting!

Cwm Idwal

This cwm (corrie) is situated south of Lake Ogwen and north of the central peaks of Snowdon. It is ideal for studying landform and the complex geology of the Ordovician rocks referred to earlier. Landform is dominated by the effect of mountain glaciation carving out these huge corries and leaving moraines on the valley sides.

During the climb up into the Cwm Idwal syncline it was surprising to find in these folded, compressed rocks which had been subjected to volcanic ash bombardment during Ordovician times, small exposures of sedimentary rocks showing minor folds and cross-bedding. In a narrow gully left by the removal of slate one could see the cleavage planes of the slate where mudstones laid down in the Ordovician Sea had been heated and compressed during the folding of the Idwal syncline. Further evidence of this intense compression was the sequence of quartz veins squeezed out of the original sediments. But the rock that was to become the best known by name, although not always readily recognised, was Rhyolitic Tuff which is a lithified deposit of airfall volcanic ash sometimes mixing with original mudstones to form tuffites. Another type of tuff was the Pitts Head Tuff which is derived from volcanic ash flow and here produces a hard ridge standing above the Nant Ffrancon valley which Telford used for relocating the route of the A5.

A lunch stop at Llyn Idwal before climbing up to the massive, steeply dipping Idwal Slabs of rhyolitic tuff used for practising rock climbing. As an example of the complexity of the rocks of this region Dave Cronshaw pointed out some breccias comprising blocks of acid tuff, vesicular basalt and sandstone in a matrix of fine debris ☐ phew!

Lake Ogwen and the Nant Ffrancon Valley

At the foot of Cwm Idwal alongside the A5 road is Lake Ogwen which we walked round clambering over boulders of rhyolitic tuff fallen from the adjoining mountain ridge. This arduous scramble was relieved from time to time by the discovery of a variety of rock types such as microgranite, lapilli tuffs and cross-bedded sandstone. Our leader attempted to explain the presence of these exposures but admitted that there is a major problem in the interpretation of volcanic rocks in the Snowdonia area because of the uncertainty about the location of the eruptions 500 ma. It has been established that a series of volcanoes was involved but with no clear idea of their location. However, it is fairly clear that there were two distinct groups of volcanoes, those around the central volcanic group of the Snowdon area and those to the north east of the area called the Crafnant Volcanics.

Lunch was taken this day on the eastern slopes of the magnificent mountain called Tryfan and afterwards, the party set off down the old road over the ridge west of Lake Ogwen into the Nant Ffrancon valley. This valley had been seen from above previously when climbing into Cwm Idwal and it presents a marvellous example of a U-shaped glacial valley running down towards the slate mining area of Bethesda. Its wide flat bottom, covered by deep deposits of glacial melt material from 10-12 thousand years ago, supports small-scale farming activity. On the south western side of the valley could be observed a line of corries in which the ice had accumulated as part of the mountain glaciation in this area which was distinct from the major ice sheet moving from the north west.

Walking along the valley in bright sunshine one could see the spoil heaps from Bethesda's old slate industry which were deemed to be too unsightly by the planners of the Snowdonia National Park so its boundary was drawn to exclude them!. Before climbing out of the valley to rejoin the minibuses we saw a huge roche moutonniere standing by the path which was climbed to examine its quartz porphyry composition.

Capel Curig and the Gwder Forest

The village of Capel Curig is sited where the A5 ,heading westwards from Betwys-y-Coed to Bethesda, junctions with the road heading up through the Llanberis Pass. From the car park a steady climb was needed to reach several important geological features and also the classic view of the Snowdon Horseshoe to the south west. The first feature was an outcrop of fine grained porcelanic tuffs demonstrating a feature called "slump bedding" where the ash beds have been distorted by subaqueous sliding of unconsolidated material Next was a

further climb to a well-known feature of Capel Curig hill called "The Pinnacles", consisting of bedded coarse grained basic tuffs which weather into these crags.. More detailed examination in the area of the Pinnacles has produced an interpretation that a small volcanic vent existed here. Descending from the crags other features inspected were chloritised dolerite, a tuff with orthoclase crystals and other distinctive aspects of the Lower Crafnant Volcanic formation which, as already mentioned, have a provenance different from the Snowdon Volcanics.

At the furthest point eastwards in the walk at the site of a dried up lake, Dave pointed out that the afternoon visit was to the forested area clearly visible to the east but even he, with his mountain hare attributes, would not attempt to reach it from there. So into the minibuses and back through Betwys-y Coed to a forest road leading south west from Llanwryst. The drive northwards from Betwys-y-Coed along the Conway Valley clearly demonstrated how different the Silurian landscape was to the east. At Sarnau, another dried up lake, the group set off to inspect several old mines in this Llanwryst mining district where lead and zinc ores were extracted in the C19th. This whole area lies within the Middle and Upper Crafnant Volcanic Formations. An important feature of these formations is the admixture of components ranging from blocky tuffs to bonded mudstones and tuffites containing feldspar crystals, coarse shards in a matrix of fine greenish mica flakes and chlorite. The interpretation of these features is that they have developed from the incorporation of unlithified mud into a large ash flow.

Around Llanberis □ a day □s walk through 100 million years.

Sunday was the only wet day for this traverse from the head of Llyn Padarn to the south east of Llanberis. Along this four mile section pre-Cambrian gave way to Cambrian followed by Ordovician. The pre- Cambrian was the Padarn Tuff Formation which is the oldest exposed rock in northern Snowdonia. An Ordovician period dolerite dyke was seen intruded into the tuff and a little further along was to be seen illustrated in a roadside wall two different types of rocks where the pre-Cambrian gave way to Cambrian in the shape of a basal conglomerate together with green coloured mudstones and sandstones. Although this differential layering was a little contrived in a man-made wall Dave assured the group that across the busy road was a rock face of the same constituents!

In Llanberis the minibuses parked in the slate museum car park and the group made its way to the old Vivian slate quarry now flooded and used by divers for honing their underwater skills. The sides of the quarry showed huge cleavage planes of purple and green slates with some bedding planes discernible with the "eye of faith".. Dave described how selective the slate miners had been in extracting only the best slate and pointed out that a large dolerite intrusion jutting out into the water had been left untouched. The quarry museum records the history of the mining activities in the major Cambrian slate belt between Bethesda, Llanberis and Nantlle.

Having emerged from the quarry and re-crossed the bridge between Llyn Padarn and Llyn Reis we noted three excellent examples of "reduction spots" which had been elongated by compressed forces and are in fact used to calculate the degree of compression experienced. Following the A4086 road to the outskirts of the town a series of exposures can be seen recording cycles of deposition of fine and coarse sediments, the latter produced by turbidite flows into the Welsh Basin.

Lleyn Peninsula

A 50 mile drive from the Field Centre takes you to the western coastline of the Lleyn Peninsula. The first stop was at Aberdaron for a walk along the beach with its crumbling cliffs of glacial till overlain by soft sand sediments. Whilst it was very pleasant to sample the atmosphere of a holiday beach for a brief time, the object of the walk to the far end of the strand was a much more serious matter. It was here that pre-Cambrian rocks of the Mona Complex were to be seen in the cliffs side by side with rocks of the Ordovician period, a major unconformity leaving out the whole of the Cambrian succession. Since lunch was taken at this spot far from "the madding crowd" there was plenty of opportunity to study these exposures. The pre-Cambrian rocks revealed examples of ancient schists and pillow lavas. (On the northern side of the peninsula at Nefyn there can be seen classic pillow lavas along with their associated jaspers.) The Ordovician rocks had clearly been subjected to low level metamorphism. Some basalt columns could also be seen in the cliffs.

Returning to the minibuses the group headed towards the very tip of the peninsula in order to visit the site of the late pre-Cambrian subduction zone. On the hillsides there was a breathtaking display of heather and Atlantic gorse, their purple and yellow blooms glistening in the sunlight. There were several pre-Cambrian boulders to study on the way up, some consisting of porcellanous tuffs. There was also a unique feature on the headland called a melange comprising dolomitised limestone blocks and pillow lavas with low grade metamorphism..

Snowdon

For the last full day in Snowdonia what more appropriate than a climb to the summit of Snowdon. It is possible that some of the younger members of the party, ie those below 60, would have willingly climbed on foot, but in deference to group solidarity, everyone used the Snowdon Mountain Railway for the ascent but assuaged their consciences by walking down ☐ including some not so young!

The train journey is an exciting experience and the views are superb all the way up to the summit at 3560 feet. It is actually more relevant to talk about the Snowdon Horseshoe because, viewed from the south by Llyn Llydam, there are 3 peaks forming a narrow arc with Snowdon (3560 ft), Crib y Dylsogl (3493 ft) and Crib Goch (3027 ft) .. Looking westwards from the train on its descent and studied at closer quarters by those walking down is the dramatic north-facing

corrie of Clogwyn Duŵr Arddu. This is one of several corries on the northern edge of Snowdon which are witness to the major glaciation in this area. The highest cwm is Glaslyn near to the summit which is bounded by steep ice-scarred crags and occupied by a lake that drains into Llyn Llydaw. In these crags one can determine the contact between the Lower Rhyolitic Tuff which comprises much of Snowdon and the Bedded Pyroclastic formations which are at the peak of Snowdon and consist of basic tuffs, tuffites, thin basaltic lavas and tuffaceous sediments.

At the evening "talk through" with Dave Cronshaw there was heated discussion about the rock face of Clogwyn Duŵr Arddu and the Snowdon syncline. For those of us who had taken the train back down, the complexities of this cwm were not obvious but the outline sketch drawn by Dave convinced us that this exposure was indeed a very good example of the mysteries of Ordovician Volcanics.

A marvellous week with a first-class leader. And so back to Farnham.

This article, by Peter Cotton, was written for the February 2003 issue of the Society Newsletter