

MID WEEK GEOLOGY GROUP – Annual Trip – 22/26 April 2013

ANGLESEY

Why Anglesey? The island shows the origin of the earth in the tectonic rocks, it has the oldest fossils in England and Wales and has rocks from all the geological periods except Jurassic and Cretaceous. As there is far too much to visit in detail in just 5 days Geomon from Amlwch advised us as to which of the many of their researched areas we should plan to examine with their guides.

We met on **Monday** 22 April in the delightful Victorian seaside town of Llandudno with its sweeping promenade, pier and two limestone headlands. Near the top of the Great Orme is the **world's largest bronze copper age mine** which was unearthed in 1987 to disclose narrow tunnels and open cast workings up to 4,000 years old. After an explanation of the site in the new visitor centre we were led through the workings wondering how ancient man dug all this by hand and smelted the copper ore, mixed it with tin from Cornwall perhaps, to develop bronze and the many tools and artefacts which allowed man to progress.



We travelled on to the Gadlys Hotel in Cemaes Bay, where after settling in, Dr Margaret Wood gave us an explanation of the geology of the island and what we would see during our stay in Anglesey. The long debates over interpretation seem to have settled. It seems the formation was caused by colliding plates under an ocean and subsequent development which are now set into groups the main ones being South Stack, New Harbour, Gwna, and Skerries. More on these later.

Tuesday was a fine sunny day and after travelling south west to Newborough to meet Paul Gasson we walked the Geotrail which was to take us through the pine woods which now cover the large sand dunes and on to **Llanddwyn Island** which has all the features of a whole continental plate.

First, in the forest, were large examples of the blue schist which was formed of oceanic crust which had been subducted to about 30kms down under immense pressure. Also we saw the green and purple banded chert from the Gwna Precambrian Group.

Next we went to the beach where the world famous pillow lava was seen. This was lava which had been erupted deep underwater about 580m years ago like toothpaste from a tube and cooled in "blobs" which are unchanged today. Between these pillows we found some jasper.



On the island we crossed the schistose rocks and at Porth Twr Bach between the two lighthouses we encountered the very colourful and world famous "melange" This had been scraped from the surface of one plate and accreted to the underside of the opposing plate at their margins. All this very interesting

geology was in- dispersed with the glorious views of Snowdonia, almost tropical beaches, and unforgettable stories of the Mabinogion and St Dwynwen - The Patron Saint of Lovers – who lived on the island and is celebrated on 25th January.

After a late lunch we moved on to **Rhosneigr** – a lovely beach near the end of the RAF runway. Here we examined the dramatic folds of greywacke and siltstone bed within the black slates.



Wednesday was a “free” morning when everyone chose to undertake their own interests which varied from Art Galleries in Llangefni, birdwatching, other geological sites and local museums. Several visited Amlwch, which for many years exported copper ore from the Parys Mountain and made the area rich and famous. At the harbour here is found the Geomon Office which had a small but detailed exhibition of Anglesey geology and also the new “Copper Kingdom” exhibition which focussed on Parys Mountain and its development by the “copper king” – Thomas Williams. At its height of production it exported 44,000 tones of copper ore a year which made it the worlds most productive copper mine at that time – all excavated by hand!! This it seems helped England win the Battle of Trafalgar by copper sheathing the hulls of the fleet. Around the harbour were green schistose rocks of the Cambrian New Harbour Group (530my)

In the afternoon we walked from the Gadlys Hotel to **Llanbadrig Peninsula and Church** with Andy Short as guide. The Peninsula has a variety of rocks from Precambrian melange (860my to 620my ago) to Ordovician quartzite, limestone, phyllite and jasper of the Gwna Group.

At the headland itself is a major quartzite block, originally quartz sandstone, which is seen as an outcrop pinnacle called the “White Lady” in the bay. It was near that pinnacle that two of our group found graptolite fossils in a shale bed. Next we see an area of the Gwna melange with evidence of excavations for jasper. Our party took much time to check if there was more to be found. Above this area is the bright orange siderite – a sedimentary rock being an useful source of iron. Finally the Precambrian limestone which was extracted and converted to lime here. Below is St Patrick’s cave where stromatolites (micro blue green algae fossils) were found which proved that these rocks were Precambrian sedimentary rocks 860million years old and the palaeozoic dolorite dyke. So much to see and examine.

After watching the porpoises we took our group photograph and moved to visit Llanbadrig (Church of St Patrick) which had been founded in 440AD when St Patrick was shipwrecked on his way from Iona to Ireland. The church was refurbished in 1884 by Lord Stanley in an Arabic and Moslem style. Walking back to the Galys Country House around the coast we passed a very large limestone quarry and industrial kiln which at one time was a source of work and income for the people of Cemaes Bay .





Thursday was a big travelling day as we started at the early Cambrian rocks at South Stack in the north west (which initially was fog bound) with Jonathan Walsh then travelled across the island to the mid east to see the Devonian Rocks at Lligwy bay and the Carboniferous Limestone at Moelfre guided by Terry Beggs by which time we had blue skies again.

The fog horn on the **South Stack** Lighthouse indicated that a walk along the edge of the cliff would not be a good idea so we started by visiting the remains of Ty Mawr Hut Circles. About 50 ancient dwellings were found here in 1860 and 1970s which comprised about 8 farms from Iron Age (4000 years ago) to post Roman all of which were round houses or store rooms. The fog had now lifted so we walked the edge to Ellin's Tower which overlooks the South Stack lighthouse.

Generally the rocks here are the oldest in Wales being Cambrian and Precambrian (550 to 500my) being white quartzite and also green schist which is banded and folded both of which are metamorphic. There are also dolerite which appears as brownish weathered dykes. The first section along the very edge could be seen a series of anticlines and synclines generally heading in a south west direction as indicated by a geological map of Anglesey. We could imagine the undulating hills which were once there 500m years ago but are now eroded. We omitted on this visit to go down the 300 steps to the South Stack Lighthouse from which we would have seen the huge expanse of the cliffs and the spectacular large scale folding caused by the Caledonian Orogeny .

On we travelled after lunch to **Lligwy** where we met Margaret Woods again who explained that the rocks to the north of the bay were Devonian but to the south where we visited the rocks were quite different and of horizontal Carboniferous and also Terry Beggs who continued our walk across the limestone cliff tops showing us the quarries en route to Cemaes Bay and the unforgettable story of the shipwreck of the Royal Charter in 1859 with the loss of 459 lives.



Friday was our last day' so after packing we headed for home but stopped on the way at **Parys Mountain** near Amlwch which had been the centre of industry in this area from 1768 to 1883 during which time it was the principle source of copper in Europe. There is evidence however of mining by the Romans and in the Bronze Age 4000 years ago.

The rocks in this area are underlain by Ordovician shales of the Arenig age and are followed by the Silurian shales of the Llandovery age all of which were folded in the Caledonian Orogeny 400 million years ago. Most of the rocks which are seen are either volcanoclastics or chloritic cherty shales. This type of mineralization is often referred to as Kuroto type where magma has been intruded on the sea

floor causing hot water to circulate through the rocks concentrating minerals such as iron, copper, lead and zinc – which combining with sulphur – crystallise in veins. The example here is unique in Britain. We walked around the mine with its colourful deposits in awe of the magnitude of the excavation which was all done by hand and also of the understanding at that time of the extraction process to obtain the valuable copper. In summary:

The best ore was exported from Amlwch to Lancashire and South Wales for smelting.

Other copper was extracted on site and in Amlwch using smaller kilns and furnaces.

Small quantities of purer metal was obtained by precipitation from drainage water (with more than 5% copper) with scrap iron in ponds. These are still in evidence on the site.

Copper in solution + solid metallic iron = **metallic copper precipitate** + iron in solution

Iron in solution + oxygen in air + water = iron hydroxide ie **ochre** + hydrogen



As we were leaving the site, looking north we could see the several wind turbines and on the north shore the Wylfa Nuclear Power Station shortly to be replaced by a new generation. This is the new industry of the area producing energy for man's unstoppable appetite.

A pleasant drive home along the A55, M56 and M62 reminded us how easy it was to get to the lovely and geologically interesting island of Anglesey. No doubt we will return.