

# Cwmbran Cistercian Way Area Geology

## General Overview

In mainly one section of the Llantarnam Abbey to Twmbarlwm ancient pathway, the Cistercian Way follows a convenient geological boundary line along the edge of 360 million year old rock deposits bordering the Carboniferous coal measure basin of South East Wales.



There are four variables to the forces that shaped the terrain of Cwmbran and surrounding area. These are plate tectonics, climate, sea level fluctuations and the biosphere. All have helped form and mould the Cwmbran area bedrock to its present day formations.

Tectonic plate movements occurred during the development of what we see as the Cwmbran terrain. At around 400 million years ago, the earth's crust was compressed and rifted during what is known as the Caledonian orogeny causing the basement rocks underlying South Wales to fold and stretch in a mountain building episode. Two later mountain building episodes occurred which have been called the Hercinian Orogeny, then finally much later at around 110 million years ago the Alpine Orogeny.

'Ice house' and 'greenhouse' states created sea level fluctuations. The early land plants took hold and during water influx conditions, marine organisms dominated the terrain of what is now Cwmbran.

This changing pattern of deposition on land and in the sea created sedimentary environments which produced coal, sandstone, limestone and mudstone in varying grades and purity. All these rock types can be seen around Cwmbran today.

The map shows the area covered with a type colour code which indicates age and type of bedrock. The sequence goes from the oldest rocks - purple then pink on the right, to the youngest - green to yellow on the left. In the Cwmbran area older rocks lie to the east. Whereas in Britain generally we find that older rock Deposits lie to the west.

The sequence of rocks in the Cwmbran area were laid down over a time period of around 100 million years, from a time called the Devonian Period to the end of another time period called the Carboniferous, approximately 400 to 300 million years ago.

Around 200 million years ago a major mineralising event occurred. Fluids rich in lead, zinc fluorite and baryte percolated up through faults and fissures from the molten rocks below and enriched the rocks at and near the surface with pockets of mineralisation.

## Cistercian Way Geology

The oldest rocks in the area of the Cistercian Way are at Llantarnam Abbey and further east, dated at around 400 million years and older, laid down during the Devonian Period. These deposits occurred when Britain was situated just south of the equator and connected to one massive continent, we call the mythical Pangea. At that time, north and mid Wales were undergoing crustal stresses, as plate tectonic forces thrust up new mountains. South Wales was part of a relatively stable fluviatile – water rich region of sandy alluvial plains, giving rise to freshwater fish and Crustation, leaving fossil remains and plenty of sandstone, commonly known as Old Red Sandstone.

From Llantarnam Abbey if we head east towards younger rocks on the upper hill of Mynydd Maen, around Llanderfel Farm you would pass through a quick series of rock boundaries shown by the tight banded colour formations on the geological map. Our path would cross the Cistercian Way alongside the Old Red Sandstone conglomerate. Continuing on, we would quickly reach the coal deposits outcropping just below the top of the hill, having traversed across 50 million years of sedimentary rock deposits, formed over 300 million years ago. The rocks here are vary in resistance to erosion and often form small hills next to the softer, rocks of the earlier Devonian Period. During the Carboniferous, a succession of marine transgressions - sea level rises and regressions - sea level falls resulted in a varied cycle of rock deposition. Broadly, warm shallow seas invaded the area creating coral reefs which over millions of years produced limestone and by 300 million years the area had become part of a coastal delta and swampy plains, with huge forests of early plants, ultimately producing coal seams, ready for us hundreds of million years later.



From the most northerly point of the Cistercian Way near Upper Cwmbran, the path runs SSW either on top of Upper Old Red Sandstone conglomerate or, as is generally the case alongside the outcrop. Two OS map grid references for 3 metre wide sections of this exposure used conveniently as the ancient Cistercian Way are 27159633 and 26409441. These conglomerate rocks were named by geologists as the Basal Beds of the Upper Old Red Sandstone. The deposits were laid down in a high energy environment such as, tidal estuaries and deltas and consist of large rounded to sub-angular quartz crystal pebbles in a finer grained, cemented sandy and calcareous matrix.



If you were to continue your walk along the ancient pathway towards Llanderfel Monastery, you can see how this conglomerate outcrop was used by the early travellers as a safe and convenient guide and pathway, heading in the direction of Twmbarlwm Mountain.

Not shown on the British Geological Survey map of the area, the outcrop has been found to run through Llanderfel farm, continuing to approximately 300 metres west of the buildings. Here, the Cistercian Way develops a 3 metre deep gully on the southeast side of the outcrop, creating a sunken path indicating that the older Old Red Sandstone rocks are less resistant to weathering and erosion than the more resistant, large blocks of conglomerate.



## Structural Geology

Faulting of the Cwmbran terrain has been found mostly in the Carboniferous basin rocks of the area and along its boundaries. Yet very little faulting has been found on the south-eastern border of the carboniferous outcrop. Not on the geological map of the area, a strike fault running NNW for approximately 200 metres curving NNE up the mountainside was found to occur from the corner of and along the west side of the ancient monastery field boundary, grid ref. 26229527. There is lateral displacement of 18 metres, but no obvious downthrow side has yet been determined. The direction of the fault, including its slightly curved aspect, follows the same orientation as the Twmbarlwm fault and others in the area, although the fault at this location crosses into the conglomerate of Upper ORS Devonian rocks. The conglomerate exposure was twisted sideways during the fault movement, indicating displacement during a later structural event.



## Fossils

The vegetation that made up the Late Carboniferous Coal Measures of South Wales consisted mainly of lycopod spore bearing plants. These were restricted to growing in swampy environments because of their reproductive cycle, yet evolved into large trees of up to 50 metres height for the first time, with the development of vascular woody tissue impregnated with lignin for strength.

This type of plant was pointed out to me by our kind Archaeologist Dave. Fossil remnants can be found on the ancient pathway near the top of Twmbarlum, at about 20 to 30 metres from the top. There are other fossil remains in the rocks of the pathway yet to be discovered by any intrepid explorer. Please take pictures only as these fossils should be left there for our children to see and appreciate. Dave's boots are in the picture.



## Glacial advances

South Wales may have been affected by at least three major ice advances over the last one and a half million years. They have been termed by workers as the First Welsh Glaciation, the Second Welsh Glaciation and the Little Welsh Glaciation. All three have been correlated with glaciations in northern Germany

Evidence of glaciation is rocks dumped by the last extensive glacial advance into the Cwmbran area. These can be obtained in deposits, situated in the Llwyd Valley. A new buildings site by Barrett Homes, which is just south of Court Road Industrial Estate on Llantarnam Road, grid ref. 30359376, reveals from its site entrance a metre depth of well rounded rocks in a gravelly till or 'boulder clay'. These rocks may have been shifted for hundreds of miles by glacial end-moraines.

## Economic Rock Deposits

All of the deposits listed below can also be found within the close vicinity of the Cistercian Way.

*Red marls* – hard earthy limestones in ORS have been used in the production of bricks and tiles around Caerleon and Pontnewydd. See Oakfield Quarry at grid ref. 28909380.

*Coal* mining has been done on a relatively small scale in the area due to small exposures and closeness of coal seams on the Mynydd Maen and Mynydd Twyn-glass hillsides. Coal workings at various locations near the area have been utilised in the past.

*Clays* from the coal measures have been mined in the area during more recent times for brick making. Fireclay collieries which extracted clay from the Five-Foot Gellideg band of the coal measures sprang up in Upper Cwmbran, Pontypool and Risca.

Medium to low Grade clay- *ironstone* forms thin beds which have been worked at many locations from open pits and mines in the area. Occurring in the coal measure deposits, the Upper Cwmgorse Marine Band outcrops on the upper slopes of the hills around Cwmbran, these deposits were the main source of iron ore in South Wales up until the early 1800s, with estimated average iron content from the rock of 30%.

The first centre of iron working in Monmouthshire was at Pontypool in 1570. Two others at Trosnant and Pontymoel were built six years later. The first centre for iron workings in South Wales was built near Taffs Well around 1564.

*Roadstones* from Machen, Tongwynlais and Cwmyniscoy Quarry grid ref. 28209970, have all been extracted from the Carboniferous, dolomitized Main Limestone. This is another one of the seams that outcrops in a narrow band along our hillside. Magnesium rich sea-water altered limestones to become dolomite, which is preferred over limestone because of its high crushing strength. Large amounts of this stone have been quarried for roadstone and building aggregate in the recent past.

The *Water Supply* of Cwmbran and area comes from large impounding reservoirs outside the district in the upper Usk Valley. Smaller amounts are reserved and used from the drainage of mines from the South Wales Coalfields.

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