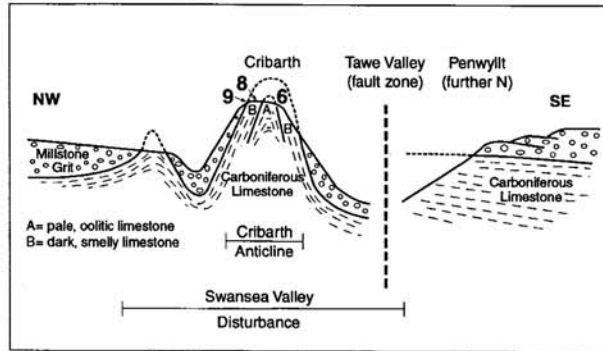


Cribarth Anticline continues the fold on Craig y Rhiwarth (Stop 3) and is part of a narrow zone of bent and broken rocks called the **Swansea Valley Disturbance**.



If you knock together pieces of limestone here, they make a sulphurous **smell**, caused by the decay of organic material. Related processes result in the formation of **crude oil**. Pale, oolitic limestones form the eroded core of the anticline: they underlie and are older than the dark, smelly limestones on the ridge flanks.

Hard, pale lumps in the limestone here are **chert**, made of **silica** that grew chemically in the rock, like flint nodules in the Chalk of southern England. In some places chert grew as tiny crystals: weathering dissolved the limestone, leaving a porous rock called **rottenstone**, that was quarried as a polishing agent (see Stop 9). You can also find white, glassy crystals of **calcite**, the crystalline equivalent of limestone, that grew in cracks in the limestone.

Turn left at the corner in the wall. Ahead to the right it is an easy ascent to the triangulation pillar at the summit (423m).

Stop 8 There is an excellent **view**. The Swansea Valley is in line with the ridge of Cribarth, because erosion has picked out weaker rocks along the Swansea Valley Disturbance. The valley has steep sides and a broad floor, typical of erosion by **glaciers**. During the last Ice Age, 18,000 years ago, a glacier flowed from the Brecon Beacons along the Swansea Valley.

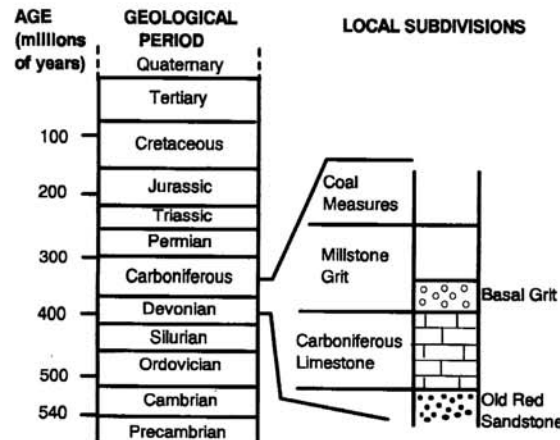
Walk north for about 50m across a damp hollow to a mound with small crags.

Stop 9 These crags are **quartzite** - cemented pure sand. They belong to the **Millstone Grit**, which overlies the limestone. It formed when sand and pebbles were washed into the area about 320 million years ago, starting the **delta** conditions of the

late Carboniferous **Coal Measures**. Most of the boulders at Stop 8 were Millstone Grit, including pieces of **conglomerate** - cemented pebbles.

North from here you can see Pwllwydden (see Stop 3). Dark, lumpy ground to its right is where rottenstone was quarried in the 1820's. The ditches between Stops 8 and 9 may be trial pits for rottenstone.

The Millstone Grit is tilted steeply to the north-west - **take care!** Across the valley below you can see bedding surfaces sloping towards you. This valley follows another fold - a downfold or **syncline** - running alongside the Cribarth Anticline. Limestone areas are well-drained, with short grass and thin soils, whereas Millstone Grit ground is poorly drained, with peat and ponds.



Descend gently to the north-east (the way you have come from), passing shake holes near the boundary between Carboniferous Limestone and Millstone Grit. An old tram-road follows the north-west edge of the plateau, ending after 1km. Follow a path which rises to the right then runs level and drops to a stone wall. Turn right to reach the stile (Stop 4). Cross this and retrace your steps to the Country Park.

Produced by the Geologists' Association South Wales Group. If you want to know more about rocks, fossils and the geology of South Wales contact the **Geologists' Association - South Wales Group** (Cymdeithas y Daearegwyr - Grŵp De Cymru) at The National Museum of Wales, Cathays Park, Cardiff.

Geraint Owen, University of Wales Swansea, April 1998.

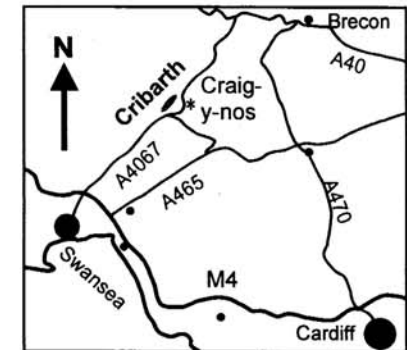
Geological Walks in Wales series editors: Stephen Howe, Geraint Owen, Tom Sharpe.

Geological Walks in Wales 11



Cribarth from Craig-y-Nos

Cribarth lies north of the upper Tawe (Swansea) valley. Its summit, reaching 423m, is a quarried plateau. This walk of about 6km climbs steeply to loop around the plateau, looking at rocks, fossils and scenery. The walk takes at least half a day.



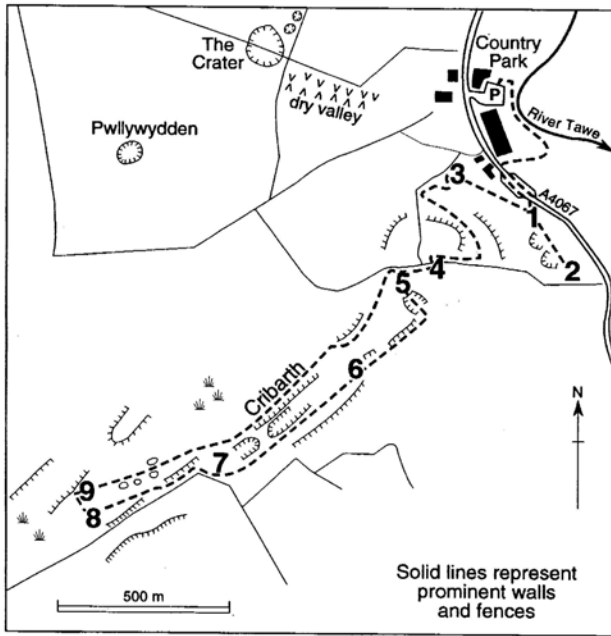
LOCATION Craig-y-nos Country Park is off the A4067, 40 km NE of Swansea (grid reference SN 8400 1554).

Maps Ordnance Survey 1:50,000 Landranger Sheet 160 (Brecon Beacons) and 1:25,000 Outdoor Leisure Sheet 12 (Brecon Beacons West and Central); British Geological Survey 1:50,000 Sheet 231 (Merthyr Tydfil)

The path is steep at first, but well-marked. Beyond the stile (Stop 4) the terrain can be confusing in poor visibility: take a map and compass and know how to use them. Beware of steep edges to disused quarries - TAKE CARE! Follow the Country Code and the Geological Fieldwork Code. Do not cause damage. Do not stray from paths. Collect from loose material rather than from fresh rock.

The Geologists' Association South Wales Group acknowledge the assistance of The Curry Fund of the Geologists' Association in the publication of this leaflet.





Turn left from the car park onto the road - beware traffic. Continue for 400m, past Craig-y-Nos Castle and the Coach House. Turn right at a gate marked "To open hill".

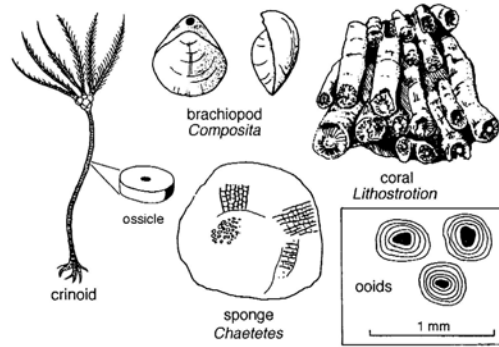
Stop 1 The Craig-y-nos Quarry Heritage Trail follows an old tramway. By the gate are examples of the main rocks in the area: **Old Red Sandstone** is made of sand and pebbles cemented together; **Carboniferous Limestone** is grey, with white, crescent-shaped fossil shells; **Millstone Grit** has round, creamy-coloured pebbles cemented together.

Follow the Trail to its end alongside the second disused quarry. A display board describes the view.

Stop 2 The stones on the path are **limestone**, made of pieces of fossils cemented together. The fossils include **brachiopods**, **corals** and **crinoids** that lived in a warm sea that covered southern Britain in the early **Carboniferous** period of time, some 350 million years ago - long before today's hills and valleys formed. The British Isles were then south of the equator: **continental drift** has since moved them northwards.

Look closely at the limestone - a magnifying glass is useful. Some pieces are made of tiny circles, less than 1mm across, called **ooids**. They formed as a coating of lime around a shell fragment or silt grain in shallow, turbulent water - they are not fossils. The rock is called **oolitic limestone**.

The layers - **beds** - of rock in the quarry are typical of **sedimentary rocks**, that built up on the sea-bed over millions of years. The beds were once horizontal and covered a vast area. They are now tilted (**dip**) to the south, and **erosion** has carved out the landscape.



Across the valley is a limestone quarry at Penwylt. Higher ground to its right is underlain by Millstone Grit, which overlies the Carboniferous Limestone - it formed later, and is younger. Notice the **scarp-and-dip** features - gentle slopes tilt to the south, following bedding surfaces, while slopes facing north are steeper, cutting across the bedding. Higher ground left of the quarry ends in a wooded cliff above the Country Park - **Craig y Rhiwarth**.

Return towards the gate and take the path on the left "To open hill". It is marked by white posts. After 400m stop at a crest with crags of limestone, near a prominent tree.

Stop 3 The Brecon Beacons are underlain by Old Red Sandstone, that is older than Carboniferous Limestone. To the north-west the Millstone Grit has scarp-and-dip features like at Penwylt. In between is Carboniferous Limestone. The buildings left of the road are Dan-yr-ogof, with its caves. Closer to you, on the extreme left, is a steep-sided valley with a large saucer-shaped depression, called "**The Crater**", near its head. There are smaller depressions to its right.

These features formed by **weathering** of the limestone. Acidic rain and water that has picked up acids from decaying plants in soil can dissolve and widen cracks in limestone. Eventually streams flow underground in **cave systems** like Dan-yr-ogof, leaving **dry valleys** at the surface. The circular depressions are **shake holes (dolines)**, formed by collapse above a cave. The largest ones are where Millstone Grit roofs over large limestone caves before collapsing. Millstone Grit crags can be seen in

Pwllwydden shake hole above and to the left of The Crater. At the end of the last **Ice Age**, 15,000 years ago, the ground was frozen: glacial meltwater could not enter caves, but carved out the steep-sided valleys.

Look at Craig y Rhiwarth, above the Country Park. Its gently sloping surface follows bedding in the limestone, but beds in the crag itself are vertical. The limestone was bent (**folded**) into an arch (**anticline**) before erosion took place.

About 200m further on the path splits. Take the level path to the left. Turn right at a stone wall, and continue to the stile.

Stop 4 There are many **fossils** in the limestone blocks of the wall - **do not collect from these!** There are also blocks of red rock: these are **erratics** of Old Red Sandstone, carried here from the north by ice during the coldest part of the Ice Age, 18,000 years ago.

Cross the stile. Turn right and follow the wall for 50m to a small rocky crest. Walk uphill away from the wall towards a rocky knoll on the skyline.

Stop 5 These pale crags have rounded, fluted surfaces. They are natural **limestone pavements**, formed by solution of the limestone when it was covered by soil. Notice that the bedding here is nearly horizontal.

Bear left. Cross the low edge of an old quarry. Follow the quarry floor to a level path.

Stop 6 This path follows the line of a **tramroad**, built in the 19th century when there were over 30 quarries on Cribarth. Limestone was taken to the Swansea Canal at Abercraf for agricultural use and later for the iron industry. Fossils include **sponges** - large oval shapes with a delicate, cell-like structure. Bedding is tilted steeply to your left (south), like at Stop 2. There are blocks of brown **sandstone** that were discarded during quarrying. Sandstone beds within the limestone were deposited by rivers during the Carboniferous period when sea-level fell, forming islands like the Bahamas today.

After 1 km, stop by a stone wall and turn right.

Stop 7 The tall crag ahead, near the corner in the wall, has bedding tilted away from you - towards the north-west. Along the path beds were tilted to the south-east, while on the summit plateau they are horizontal. Limestone beds on Cribarth form an arch - **anticline** - that has been cut through by erosion. You can see the bending if you look back the way you have come. The