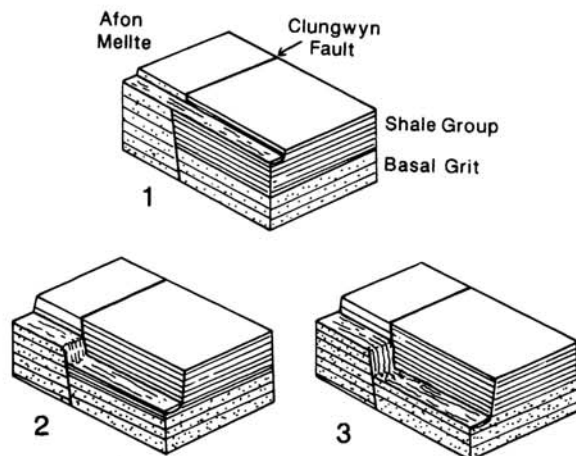


This hard rock is the Basal Grit which overlies the Carboniferous Limestone. It can be examined on the river bed at the top of the fall. Elongate depressions in this bed may indicate the positions of fossil logs or tree roots. The Basal Grit forms the lower part of a sequence of sandstones, conglomerates and shales called the Millstone Grit.

The same sandstone forms the river bed at the base of the fall, so the displacement of the fault is the same as the height of the fall. The face of the fall is the plane of the fault, and the line of the fault is marked by a gully on the opposite bank. Along the western edge of the fall, the shale beds on the downstream, downthrown side have been dragged up by the fault movement. The Clungwyn Fault is one of many NNW-SSE faults which cut the rocks of the Brecon Beacons and the South Wales Coalfield.



In the cliff on the downstream side of the fault, on the opposite side of the river, soft shales of the Millstone Grit Shale Group overlie the Basal Grit. At the top is a sandstone bed known as the '12 foot Sandstone' which occurs within the Shale Group.

For a better view of the fall, head uphill to join the upper path and turn left. Where the main path curves to the right, take a small path on the left which zig-zags down into the trees. The waterfall can be seen from near a tree with a large fallen branch.

**Locality 6** Looking upstream, the river can be seen falling over the plane of the fault. The beds of rock forming the fall are inclined to the south, causing the river bed to slope in that direction. This forces the river closer to its eastern bank, and concentrates erosion on that side.

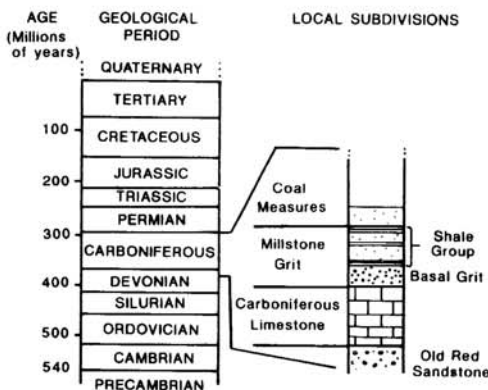
Retrace your steps back to Porth yr Ogof car park, following the main path back from above locality 4.

## Outline of the geology

The rocks of this area are sedimentary rocks, deposited in water as layers of sand, silt and mud. Some were formed in the sea while others were laid down by rivers. In a sequence of horizontal beds, the oldest lie at the bottom and the youngest at the top. Since the rocks were deposited, they have been tilted gently to the south, which means that the younger layers are found in the south of this area, and the older in the north.

The hills of Fforest Fawr to the north of Ystradfellte are formed of hard sandstones (the **Old Red Sandstone**) which can be seen as boulders in the bed of the Afon Mellte. About 350 million years ago, a warm shallow sea spread across South Wales, depositing limy mud which now forms the **Carboniferous Limestone** of the Ystradfellte area.

Later, rivers flowing south from Mid Wales covered the area with sand, gravel and mud as they built deltas into the sea. These river sediments now form the sandstones and shales of the **Millstone Grit** which lies above the Carboniferous Limestone. The lowest rocks of the Millstone Grit are coarse sandstones and conglomerates called the **Basal Grit**. Above these are shales and sandstones of the **Shale Group**.



The rocks of the Millstone Grit form the many waterfalls on the Afon Mellte, especially where they have been broken and displaced by fractures, or faults.

Throughout its outcrop in the Brecon Beacons, the Carboniferous Limestone contains **caves**, some of which have over 40 km of passage. Caves form by solution of the calcium carbonate of the limestone by slightly acidic rain water. Falling rain picks up carbon dioxide from the atmosphere, forming very weak carbonic acid. As the rainwater trickles down into cracks (**joints**) in the rocks, or flows underground along bedding planes, these cracks are enlarged by solution over many thousands of years.

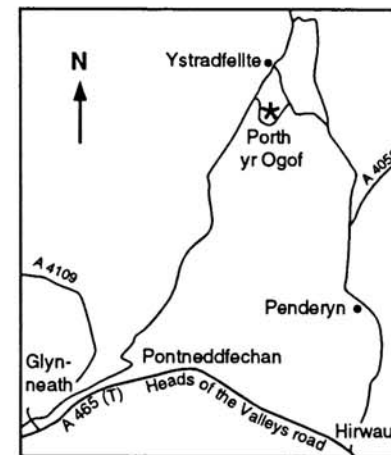
Produced by Geologists' Association, South Wales Group.  
T Sharpe, National Museum of Wales, March 1996

## Geological walks in Wales

### Porth yr Ogof to Sgwd Clungwyn, Ystradfellte, Powys



This walk follows the course of the Afon Mellte for 1.5 km from Porth yr Ogof to the waterfall of Sgwd Clungwyn and illustrates how different types of rock affect the landscape. The total length of the walk is 3 km.



**Location** In the Brecon Beacons National Park about 1 km south of the village of Ystradfellte, and about 6 km north east of Glyn-neath. Porth yr Ogof Car Park, grid reference SN 928124, is accessible from the A4059 by a minor road about 1.5 km north of Penderyn, or from the A465 (Heads of the Valleys Road) via Pontneddfechan.

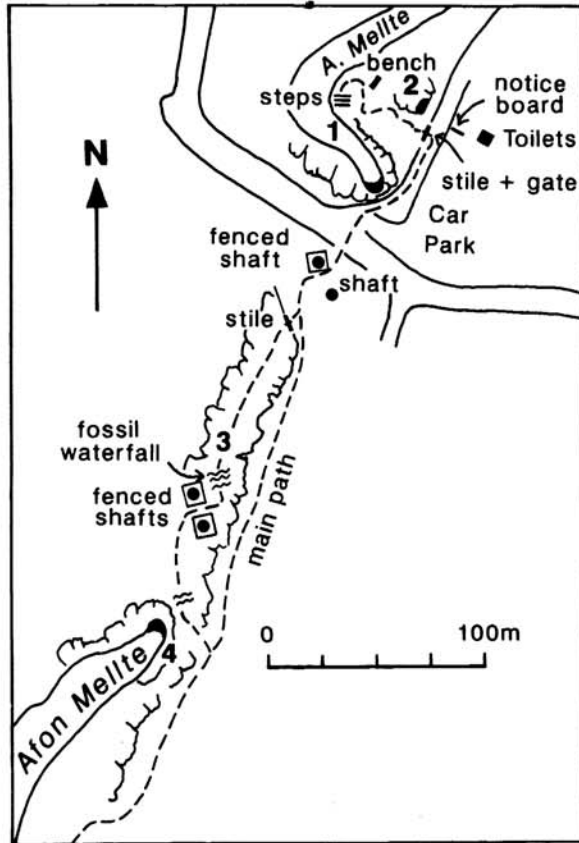
**Maps** Ordnance Survey 1:50 000 Landranger sheet 160 (Brecon Beacons); Ordnance Survey 1:25 000 Outdoor Leisure sheet 11 (Brecon Beacons Central); British Geological Survey 1:50 000 sheet 231 (Merthyr Tydfil)

**Warning** The sites to be visited on this excursion are accessible via footpaths which are often rough, muddy and slippery. Walking boots as well as warm waterproof clothing are essential. Do not venture into caves unless you are accompanied by an experienced caver. Take care on steep slopes and do not approach the edges of waterfalls.



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**Locality 1 Porth yr Ogof** Cross the fence by the stiles or gate opposite the toilets and descend the path carefully. At the bottom, by a wooden bench, turn left down some steps to the bank of the river.



Downstream is the large, main entrance to Porth yr Ogof at the foot of a limestone cliff. This is one of the best known caves in South Wales and has been visited by tourists since the late 17th century. In winter, the Afon Mellte flows into the cave mouth, but for much of the summer, the river bed is usually dry. The Afon Mellte and its tributaries, the Dringarth and Llia, drain a 35 km<sup>2</sup> area of Fforest Fawr. Near Ystradfellte, the Mellte crosses from the Old Red Sandstone onto the Carboniferous Limestone and, by the village church, soaks underground through cracks in the limestone. After heavy rain, there is too much water for the underground passages to carry and some of the water flows on the surface and into the main entrance of the cave.

This is the largest cave entrance in Wales, 15m wide by 5m high. The cave has developed in limestone beds with many vertical cracks (**joints**) beneath

a thick bed of lighter-coloured limestone. Formerly, the cave mouth would have been farther upstream, but erosion has moved the cliff downstream forming a gorge. The large, fallen joint blocks of limestone on the opposite bank of the river show that this process continues.

*If the river level is low, walk along the ledges of limestone (take care!) to the cave entrance. Stop just inside the mouth of the cave.*

The cave roof is cut by numerous closely-spaced joints. Along many of these are white deposits of calcite, and the bases of small stalactites formed by water, rich in calcium carbonate, seeping through the joints. The development of the cave has been controlled by these joints and by four closely-spaced bedding planes.

After very heavy rain in the hills to the north, the river level rises rapidly, and can fill the cave to its roof. The large tree trunk jammed some distance into the cave is evidence of the force with which water flows during storms.

Small depressions, a few centimetres across, can be seen in the limestone of the cave walls and floor. These are **scallop marks** formed by corrosion of the limestone by the swirling flow of the weakly acidic river water. If you run your fingers along the scallops you will notice that they are asymmetrical: they have a steep upstream slope, and a gentle downstream slope. Scallops can be used in dry, abandoned cave passages to determine the former direction of water flow.

Looking into the cave, you will see a deep pool. This is the Afon Mellte which has flowed through a passage behind the rock wall to your left. At the pool it turns through several bends before continuing south. On the rock wall at the back of the pool, you may be able to make out a vein of white calcite which has the shape of a horse (if your imagination is lively).

*Do not venture any farther into the cave. Return to the wooden bench and continue past it to the base of an overgrown cliff where flowing water can be heard.*

**Locality 2** The river can be seen flowing in its underground course where part of the cliff has collapsed. Upstream, the cave passages are almost completely full of water but they have been explored by cave divers for about a third of the way to the sinkhole at Ystradfellte. This is known as the 'Tradesman's entrance' and it is one of about 15 entrances to Porth yr Ogof. **Do not enter the cave here.**

*Return to the bench and climb back up to the car park. Cross the stiles and follow a path to the right along the fence to the road. Go through the narrow gap in the fence on the other side of the road.*

For the next 200m, the path follows the abandoned surface course of the Mellte above its present course in the cave below. At the start of this section, the path passes a fenced-off shaft on the right which leads down into the cave. There is another shaft, unfenced, in some rocks on the left. The pipeline here carries water from Ystradfellte Reservoir.

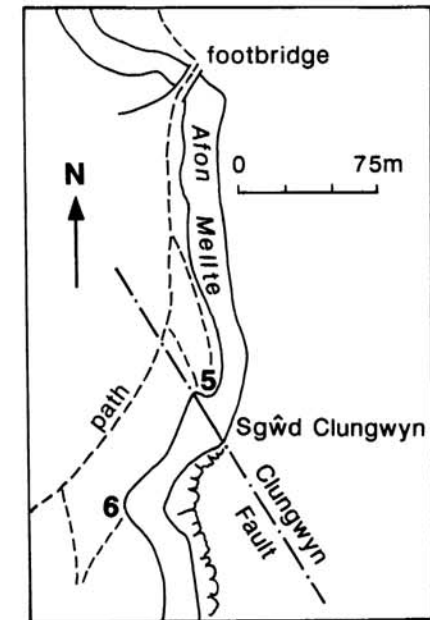
*Cross the triple stile, and take the path signposted 'Access for cavers'.*

**Locality 3** Water-worn rocks on the path mark the river's old course in this small gorge. The path then descends steeply over rocks which once formed a waterfall and crosses between two fenced enclosures. Within these, the cave has collapsed so that the river can now be heard and seen in the cave below.

*Where the path again descends, and the river can be seen on the right, leave the path and head down onto the ledges of rock above the river. (Take care!)*

**Locality 4 Porth yr Ogof resurgence.** The Afon Mellte emerges through a deep pool into a narrow gorge. The swirling motion of the water has worn circular holes (potholes) into the limestone. The water is cold, deep, and dangerous. **Do not attempt to enter the cave here.**

*Return to the path, turn right and climb up to the main path. Turn right and follow this path south, downstream. The path runs alongside the river, through several gates, for about 1200m to a footbridge. Cross the bridge and follow the path on the west bank of the river, keeping to the left where the path branches, to the top of a waterfall.*



**Locality 5** Sgwd Clungwyn (925109) is formed at a fault which crosses the river and brings hard and soft rocks into juxtaposition. The soft rocks on the downstream side have been worn away, leaving the hard rock forming the edge of the fall.