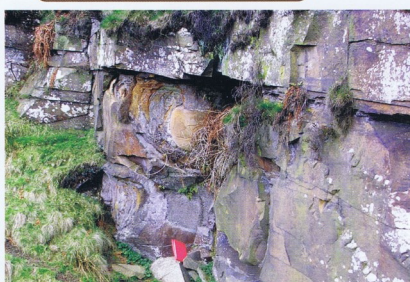


**1 The Ox Stones (SK 280831) Rivelin Grit**



The Ox Stones are two small tors on the moorland skyline above Lady Canning's Plantation. They were sculpted by intense weathering of the coarse gritstone followed by wind erosion etching out the bedding planes. A gritstone is a sandstone with angular grains of sand, laid down in huge rivers. The currents caused the sand to move as underwater dunes, resulting in superb cross bedding. Compass measurements on these cross beds show that the ancient river currents which deposited the grits came from a general east-north-east direction.

**2 Brown Edge and the Quarries (e.g. SK 273838) Rough Rock**



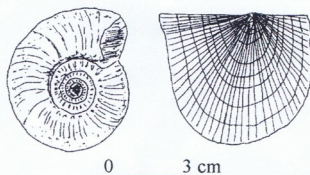
Follow the footpath from Hathersage Road, noting a slight rise between two boggy patches on the way to Brown Edge. The rise marks the outcrop of the Redmires Flags (sandstone), with the ruins of Kelly's House on it to the west of the path. Old flooded bell pits (coal workings) occur on either side of the path in the very rough ground (as well as some WWII bomb holes!).

Brown Edge Quarries themselves lie at the western extremity of extensively disturbed ground. The quarries were worked for "stone slates" and building stone in the 18<sup>th</sup> and 19<sup>th</sup> Centuries and provide an excellent section through flagstones and more massively bedded sandstones. The flagstones split easily because of myriads of mica flakes lying along their bedding planes. Large round concretions (or nodules) are also seen in the quarry face. These are rich in iron oxide and carbonate minerals and probably result from bacterial action soon after the sands were deposited by the ancient river.

**3 The waterfall below Porter Clough (SK 293845) Redmires Flags (cover photo)**

The four metre high waterfall is formed where massive-bedded sandstones of the Redmires Flags overlie softer shales. The fall started some 200m downstream and has slowly eroded its way upstream, leaving a steep-sided gorge below it. The roots of holly bushes are actively weathering the sandstone, ready for river erosion to continue the process in flood times.

**4 The river cliff below Clough Lane (SK297847) Marine shales of the Millstone Grit series**



The river has cut deeply into the dark shales on the outside of the meander bend. Near the base of the cliff, very poorly preserved fossils may be found. They are the remains of bivalves and goniatites (ancestors of the ammonites) and only occur in rocks of marine origin. This proves, that for a short time, a muddy sea spread over this region.

**5 The confluence of the Rivers Porter and Mayfield (SK 298848) dark shales of the Millstone Grit series**

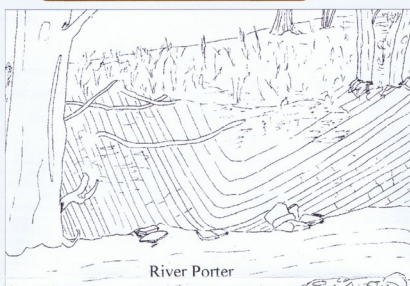


This should only be approached by the intrepid, wearing wellington boots to cross the deep ochreous bog!

More dark shales are seen, tilted steeply and folded, probably caused by "valley bulging". This is where the sheer weight of the rocks of the valley sides forces the floor upwards as the river cuts down and removes the rocks of the valley floor.

The orange ochre is formed by bacteria acting on weathered iron minerals in the shales.

**6 Folded rocks near Forge Dam (SK 305850) Rough Rock**

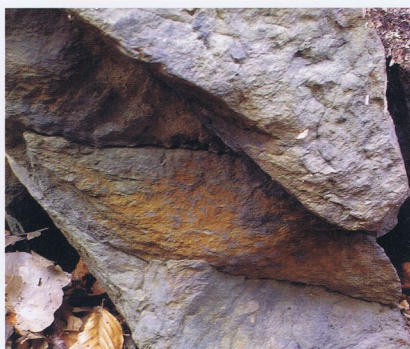


Take the lower riverside footpath below the Forge Dam road for about 100m. Exposed in the steep west bank of a meander is a superb fold, where the sandstones have been folded into a **monocline** – a fold where one limb is vertical and the other more gently dipping.

**7 Tilted rocks near Wiremill Dam (SK 311851) Rough Rock**

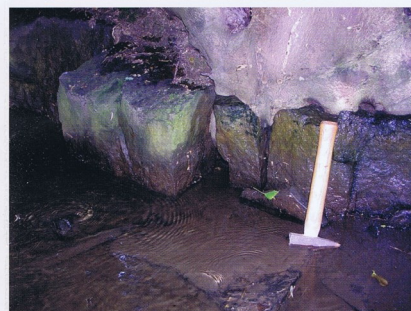
The main riverside footpath (not by the dam itself) passes below the cottages. Where a small stream passes under the path, the sandstones of the Rough Rock are seen to be dipping steeply towards the south. The Rough Rock is only present in this part of the valley at all because of faulting, and it is likely that the slippage of rocks at the fault produced the steep tilt.

**8 Tree roots of Carboniferous age (SK 315853) Rough Rock**



About 80m south-west of the road bridge on Hangingwater Road is a silted up mill dam ("Leather Wheel"). On the north bank of the old dam some large blocks of sandstone can be seen. Careful examination of these reveals some fossil tree roots and stumps of Carboniferous age. The woody tissue has long since gone, to be replaced with sand, but the structure is still visible. Please do not hammer these specimens, but leave them for others to enjoy.

**9 Shepherd Wheel (SK 317853) Rough Rock, Pot Clay**



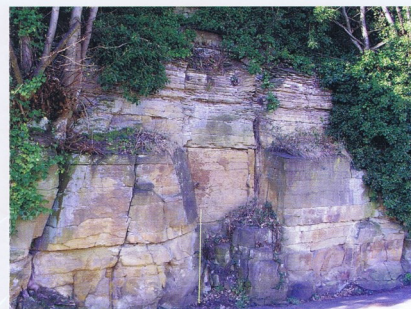
A sequence of north-easterly dipping strata is exposed in the river bed and banks, seen from the tarmac footpath along the valley bottom. Opposite the end of the railings, a hard sandstone known as **ganister** occurs beneath a holly tree. Ganister is a pure sandstone used in the refractory brick industry. It represents an ancient soil, in which trees once grew. Coal seams often formed from the dead trees, but here the coal seam is missing. Instead, there is a thin band of dark shales with marine fossils (but you have to get in the river to see them!). What happened? Did trees grow here 300 million years ago, only to be washed away when the sea level rose? We don't know, but the species of fossils are taken to mark the junction of the rocks of the Millstone Grit Series and the younger Coal Measures.

**10 Cliff behind St William's RC Church (SK 329854) Shales below Greenmoor Rock**



This site lies in the suburbs on the face of Brincliffe Edge, forming a high cliff behind a car park off Ecclesall Road. (No climbing!). Here siltstones and shales occur, formerly worked for brick making. Fallen sandstone blocks from above display superb ripple marks from the time when they were laid down in sluggish rivers. One of these sandstone units has been affected by a fault running into the rock face. Through the poplars, it is just possible to see that the sandstone on the north (left) side has dropped down by about 3m compared to that on the south side.

**11 Omega car park (SK 331850) Greenmoor Rock (or Brincliffe Edge Rock)**



The Omega Restaurant and nearby houses are built on the floors of extensive stone quarries. The quarry face is ivy covered, but it is still possible to see the massive-bedded sandstones and flagstones that were once in demand for grindstones, gravestones and paving flags. When fresh, the sandstone is a blue-grey colour, hence the trade name of "Brincliffe Blue".

The quarry face adjacent to the new apartment block has been stabilised with rock bolts and "shotcrete" spray.