By the bridge

Two different rocks form the riverbed on the downstream (north) side of the bridge. Furthest from the bridge, the rocks look like large, flat, blue-grey slabs. These rocks are the Tynebottom Limestone, one of many beds of limestone of which the North Pennines are built. If the water levels are low, small tube-shaped fossils are visible in the limestone; these are crinoids, sea creatures related to sea urchins. The limestones were formed as layers of soft limey mud on the floor of a shallow tropical sea, about 330 million years ago, during the Carboniferous Period of Earth history. At this time, the area that was to become the North Pennines lay almost astride the equator. The Tynebottom Limestone is named after this section of river as the Tynebottom Plate. "Plate" was a miners’ name for shale. Shales of the North Pennines consist of regular alternations of beds of limestone, shale and sandstone on top of one another. The sandstone beds formed from sand washed into the Carboniferous sea by rivers (sandstone is not visible here).

Normally, the Tynebottom Plate overlies the Tynebottom Limestone. Here we see them next to each other with an abrupt change from one to the other. The change occurs at a fault, or break in the rocks. The rocks upstream of this fault have moved downwards relative to those downstream, placing the Tynebottom Plate next to the Tynebottom Limestone. At this locality, the throw (or amount of vertical displacement) on the fault is about 6.5m.

This fault is mineralised and is known as the Windy Brow Vein. Across the valley, to the east the vein consists mostly of quartz with galena (lead ore), some pyrite (fool’s gold) and a little chalcopyrite (copper ore). It was worked at Windy Brow and near Tynehead Farm. Here, at Dorthgillfoot, the vein contains few ore minerals but consists mostly of well-crystallised quartz and some calcite. The tunnel entrance to Dorthgillfoot Mine, visible here in the west bank under the track, leads to workings in this and other small veins.

Mineral veins of the North Pennines were formed about 290 million years ago, as warm waters, rich in dissolved minerals, flowed through cracks and faults, driven by heat deep beneath the surface. As these solutions cooled, the dissolved minerals crystallised on the walls of the faults to form mineral veins.

Walk back towards the bridge and the junction of Clargill Burn and the South Tyne. Walk up the track. About 200m after Tynehead Farm, cut down to a small waterfall in Clargill Burn.
2 Small waterfall

The rocks in the waterfall are the next limestone up in the succession: the Cockleshell Limestone. It contains abundant fossils of large, scallop-shaped shells – the remains of the extinct brachiopod **Gigantoproductus**. The riverbed at the top of the waterfall contains good examples. In the bottom of the waterfall you can see light-grey sandstone beneath the limestone. This sandstone contains fossilized vegetation indicating that vegetation grew here in Carboniferous times. Such sandstone is called ganister. Shale lies on top of the limestone upstream of the waterfall.

The river easily erodes the shale above the limestone but the hard limestone and underlying sandstone are more resistant and stand proud forming a waterfall. The different weathering characteristics of limestone, sandstone and shale are the reason for the repeated bench-like profile of many of the hillsides of the North Pennines.

Follow Clargill Burn downstream back to the South Tyne. Cross the burn, pass through the gate in the riverside wall and continue to follow the Trail southwards.

3 Sir John’s Mine

Sir John’s Mine worked lead ore from the Sir John’s Vein during the latter half of the 19th century.

Sir John’s Vein contains quartz with galena, sphalerite (zinc ore) and some chalcopyrite. The galena here contains one of the highest concentrations of silver in the North Pennines (approximately 40 ounces of silver per ton of lead). The mine entrance is visible here.

The mine was re-opened during the Second World War in an attempt to work the Great Sulphur Vein for iron sulphide minerals, mainly pyrite, as a source of sulphur. Blocks of these sulphide-rich ores can be seen as rusty-looking blocks on the dumps. In the 19th century, an attempt was made to look for gold in the vein but none was found.

Follow the South Tyne Trail over two stiles and down towards the riverbank. Continue southwards following the river for approximately 70m.

4 Great Sulphur Vein

At this point, one of the largest veins of the North Pennines, the Great Sulphur Vein, crosses the trail. It is at least 1.5km long. Unlike the other veins on this trail, the Great Sulphur Vein is not just one mineral-filled crack but a number of them. Here in the South Tyne Valley it is a two main veins: the northerly vein is visible here. The main mineral filling at this point is quartz and many small quartz-filled cracks are visible in the riverbed. Deeper in Sir John’s Mine the vein carries significant amounts of the iron sulphide minerals pyrite, pyrrhotite and marcasite.

Follow the Trail southwards, keeping close to the fence, cross the stile and continue to follow the fence until you have a good view of the waterfall.

5 Whin Sill waterfall

As the river flows down the gorge it passes over rusty brown-weathered rock with strong vertical cracks. This rock is known to geologists as dolerite. Unlike the limestone, sandstone and shale we have seen so far, dolerite is not formed from ancient sediments. It is formed from the cooling and crystallisation of molten rock. Such rocks are called igneous rocks.

The dolerite here forms part of the body of rock called the Whin Sill. This was injected into the layers of sedimentary rocks as a hot liquid at over 1100°C around 295 million years ago. Geologists use the term ‘sill’ to describe igneous bodies injected horizontally between rock layers.

As the Whin Sill cooled, it contracted and split along vertical joints to form columns. Columnar jointing such as this is a common feature of many igneous rocks. The Giant’s Causeway in Northern Ireland and Fingal’s Cave in Scotland are more well-known examples of columnar jointing.

Continue south along the South Tyne Trail, cross a stile onto the top of the gorge and head for the large barn in front of you. Join the metalled track, cross the river and follow the track down the valley towards Dorthgill to the first cattle-grid.

(If you wish you can follow the track up to the source of the South Tyne, then return to this point.)

6 South Tyne Valley

The view north-east across the South Tyne Valley shows how the different rock types we have seen on this trail can have a dramatic effect on the landscape. The bulgy form of the hills, their flat tops and the bench-like features of their sides that are so characteristic of the North Pennines reflect the near-horizontal alternating beds of limestone, sandstone and shale of which they are formed. The strong bench features are formed from resistant limestone and sandstone beds. The more easily eroded shale beds form the steep slopes between the benches. Spoil heaps, the remains of workings on the Windy Brow and associated veins, are visible above Tynehead House. Several sink holes, a common feature of limestone country, can also be seen. Limestone dissolves readily in rainwater. As a result, joints in the rock widen, cave systems develop and the overlying soil and rock debris fall into these openings generating distinctive hollows (sink holes) on the surface.

Follow the track back to the car park and the end of the trail.

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