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## 14 The Northern Pennine Orefield: Weardale and Nenthead

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### Purpose

This excursion explores the central part of the orfield. Mineralization will be seen *in situ* and in dump material. Several sites of industrial archaeological and socio-historical interest will be visited.

### Logistics

The excursion begins at Westgate in Weardale and ends at Nenthead, covering approximately 32 km; it is suitable for car or minibus and takes a whole day. Maximum walking distance at any one locality is less than 0.8 km. Refreshment and toilet facilities are available at Westgate, Allenheads, Killhope and Nenthead.

*Note:* Safety helmets are advisable. Several old mine sites will be visited. *On no account should any underground workings be entered.* Particular care should be taken in the vicinity of old shafts.

### Maps

O.S. 1:50 000 Sheets 87, Hexham & Haltwhistle (Locality 1) and 92, Barnard Castle (Locations 2–8). B.G.S. 1:50 000 Sheet 25, Alston.

### Geological background

The Carboniferous rocks of the Northern Pennines are cut by numerous mineral veins. These typically occupy normal faults of small vertical throw. A characteristic feature of the veins is their relationship to the wall-rocks. In hard rocks such as limestone and many sandstones the fault fissures are typically wide and nearly vertical; where they cut soft beds such as shale they are very narrow and inclined. Veins are therefore commonly wide and productive in hard beds and are usually barren in soft beds. Many veins are little over 1 m wide but in places widths of over 10 m have been recorded. Adjacent to some veins the chemically reactive mineralizing fluids have altered the wall-rocks, particularly limestones, giving rise to wide horizontal replacement deposits commonly rich in ore and known locally as 'flats'.

A marked zonation of the constituent minerals within the deposits, especially the non-metalliferous or gangue minerals, is a striking feature of this orfield (Figure 14.1). Deposits in the central zone carry abundant fluorite, commonly with quartz. Chalcopyrite is locally common near the central parts of this zone. Galena is most abundant towards the outer parts of the zone, where in places, workable concentrations of sphalerite are also present. Surrounding the fluorite zone is a wider zone of deposits in which barium minerals including baryte and witherite are the characteristic gangue. Galena and other sulphide values are commonly low in this zone.

The mineral zonation is interpreted as reflecting progressively lower temperatures of crystallization from mineralizing fluids as they flowed outwards from central 'emanative centres' above high spots (cupolas) on the underlying Weardale Granite. The granite may have contributed some of the elements to the deposits but its principal role in their formation is likely to have been as a heat source.

### Excursion details

Drive north from Westgate [NY 908 381] along the steep unclassified road which leads to Rookhope and park opposite an old lime kiln on the roadside adjacent to West Rigg Quarries (Figure 14.1).

### **Locality 1, West Rigg Quarries [NY 911 392], an S.S.S.I.**

West Rigg Quarries, on the east side of the road, provides one of the finest surface exposures of a major vein in the orefield today. The Slitt Vein forms a conspicuous vertical wall several metres wide running almost east–west through the quarries. Here it consists almost entirely of quartz with a few lenses of fluorite and only rare bands of galena. Old levels driven along galena-rich bands may be seen within the central part of the vein. Horizontal slickensides are present on the south face of the vein indicating lateral movement after its formation. At West Rigg the vein cuts the Great Limestone, large volumes of which have been replaced by the iron carbonate minerals siderite and ankerite during the mineralizing episode. Weathering of these to 'limonite' produced huge deposits of iron ore which were quarried here late last century. The quarry represents the extent of these 'flats', a few remnants of which may be seen as dark brown outcrops on the quarry walls.

This quarry is best examined from the road. Immediately west of the road are further extensive opencast workings and dumps, also associated with iron ore 'flats', though little is exposed here today.

Further west across the Middlehope Valley the overgrown dumps and reservoir of Slitt Mine may be seen. Slitt Mine, from which the vein takes its name, worked galena from levels and a shaft 178 m deep sunk into the Whin Sill, here beneath the Tyne Bottom Limestone. Mining at Slitt ceased in 1878. Slitt Vein, one of the longest veins known in the orefield, belongs to a small group of predominantly east–west fractures known as the 'Quarter-Point' veins along which the main displacement was horizontal rather than vertical. The 'Quarter-Point' veins, including Slitt Vein, have been the main sources of fluorspar in recent years (see also Excursion 15).

Continue north along the hill road to Lintzgarth.

### **Locality 2, Lintzgarth [NY 925 429]**

A short distance northwest of Lintzgarth the sole surviving arch of the Rookhope, or Lintzgarth, smelt mill chimney is conspicuous. The smelt mill itself stood immediately south of the arch. Like most Pennine lead smelters its toxic fumes were conveyed via a long horizontal flue up the fellside to a chimney on the fell top. The course of Rookhope Chimney can be followed northwest to the top of Redburn Common. Rookhope Smelt Mill processed lead ores from mines in Rookhope and Weardale operated by the Weardale Lead Company until 1919. It was the last working smelt mill in the orefield.

Turn right and drive to Rookhope Village.

### **Locality 3, Rookhope village [NY 937 428]**

The shaft of the last major lead mine in the valley, the Boltsburn Mine, is situated on the south bank of Rookhope Burn opposite the village school. This mine, which worked the northeast trending Boltsburn Vein and associated 'flats' in the Great Limestone, was world famous for the magnificent fluorite cubes found in cavities of the 'flats'. Exceptionally clear crystals were exported to Austria for the manufacture of specialized lenses. The mine closed in 1931. Apart from the shaft collar and remnants of the waterwheel mountings little remains at the mine today. At least two other mines worked until recent years close to the village; their sites have been landscaped.

Close to Boltsburn shaft the Rookhope Borehole [NY 93744 278] was drilled in 1960–61. This important research borehole proved the pre-Carboniferous Weardale Granite at a depth of 390.5 m at what is believed to be one of its shallowest points beneath the orefield. The granite was continuously cored to the bottom of the hole at a depth of 806 m. The bulk of the core is stored in an old mine building at Burnside Cottages immediately west of the village. Parties may arrange to visit the core store by prior arrangement with the Department of Geological Sciences, University of Durham.

Return to Rookhope Smelt Mill and drive up the road towards Allenheads. About 4.0 km along the road the surface plant of Groverake Mine will be seen to the south of the road.

#### **Locality 4, Groverake Mine [NY 896 442]**

Groverake and the associated mines of Frazer's Hush and Greencleugh are the only remaining fluorspar producers in the orefield. At Groverake at least three major veins unite but the main producer has been the east–west Groverake Vein. The outcrop of this runs between the two shafts and can be followed up the fellside east of the road as a series of collapsed stopes and opencasts. Purple and green fluorite are the main constituents of the Groverake Vein which is locally up to about 10 m wide. Galena values are relatively poor. Quartz and chalcedony are also abundant. Chalcopyrite is comparatively common here, associated in places with traces of bismuthinite, and microscopic amounts of cassiterite have also been found recently in the Groverake ore. The presence of these minerals is consistent with the view that Groverake lies above an 'emanative centre' of north Pennine mineralization.

Although developed as a moderately successful lead mine by the Beaumont Company early last century, shallow mining at Groverake probably began much earlier. It was the demand for fluorspar for metallurgical and chemical use, which arose late last century, which provided the mine with its twentieth-century success. Fluorspar mining started here in 1897 and has continued intermittently under a succession of owners. To date in excess of 700 000 tons of crude fluorspar have been produced. The oreshoot on the Groverake Vein is one of the largest known in the Pennines. It has been worked almost continuously from the Lower Felltop Limestone at the surface down to the base of the Nattrass Gill Hazle. Iron-rich 'flats', similar to those at West Rigg, were worked adjacent to the vein in the Lower Felltop Limestone east of the road.

On the south side of the valley about 1.6 km west of Groverake, other extensive iron-rich 'flats', also in the Lower Felltop Limestone, were worked both opencast and underground from the conspicuous overgrown excavations known as Frazer's Hushes [NY 884 445]. These flats are adjacent to the Greencleugh Vein, which is today being worked for fluorspar from the relatively new Frazer's Hush and Greencleugh mines, the former connected underground with Groverake Mine. A short distance west of Frazer's Hushes note the reservoir of Corbitmere Dam, one of several built last century to provide water to drive machinery at Allenheads Mine.

Continue west to Allenheads. The last 0.8 km of the road follows the valley excavated along the course of one of the main veins, the Old Vein, of Allenheads Mine. Several overgrown shaft dumps may be seen adjacent to the road.

#### **Locality 5, Allenheads village [NY 860 453]**

Allenheads village [NY 860 453] is a splendid example of a north Pennine lead mining settlement developed around the Allenheads Mine. Many of the original mine buildings remain, including the workshop (now partly converted for use as small business premises) and numerous miners' cottages. Gin Hill Shaft, one of the main accesses to the mine, lies immediately adjacent to the road junction opposite the Allenheads Estate Office. It has recently been excavated and partly restored with a metal grille covering it. Like most mines in the orefield Allenheads relied heavily on water power. Waterwheels and other machinery both above and below ground were supplied from the numerous reservoirs on the hills around the village. A magnificent hydraulic engine built by the famous Newcastle engineer William Armstrong is preserved at the Allenheads Heritage Centre next to the Allenheads Inn.

Allenheads Mine was opened early in the eighteenth century and enjoyed a long working life, finally closing in 1896 with an estimated production of 260 000 tons of lead concentrates to its credit, making it the single most productive lead mine in the orefield. The modern stone buildings on the mine site, opposite the Inn, are all that remains of the 1970s attempt to reopen the mine for fluorspar production. This unsuccessful venture was perhaps the most expensive failure in northern Pennine mining history.

From Allenheads continue south along the B6295 road to Cowshill and then turn sharp right along the A689 to Killhope Lead Mining Centre.

#### **Locality 6, Killhope Lead Mining Centre [NY 826 430]**

The site of Park Level Mill and its treatment works has in recent years been restored by Durham County Council to create a most successful open-air museum. The spectacular overshot waterwheel is once again in working order (Figure 14.2) and nineteenth century ore dressing equipment can be seen on the dressing floors. The site is today an excellent reconstruction of a nineteenth century Pennine lead mine. A visit to the museum is highly recommended. Details of the site are interpreted in excellent sign boards and leaflets, and enthusiastic staff are on hand as guides.

Leave the museum and continue west along the road. On the north side of the road west of the museum entrance is a fine exposure of the Great Limestone, one of the main host rocks for mineralization, underlain by the rather friable Tuft Sandstone.

### **Locality 7, Old Moss Vein [NY 820 433]**

Old Moss Vein, one of many veins known at Killhope, is well-exposed in the Great Limestone in the bed of Killhope Burn. The vein and its altered wall-rock here carries galena, sphalerite, siderite and purple fluorite. The coral-rich Frosterley Band is exposed immediately downstream of the vein. ***This site is an S.S.S.I. Please do not hammer the outcrop or attempt to collect from it.***

Continue west along the B6293 noting the superb views of Cross Fell, Great and Little Dun Fells on the southwest horizon from Killhope Cross at the Durham/Cumbria boundary.

### **Locality 8, Nenthead village [NY 781 436]**

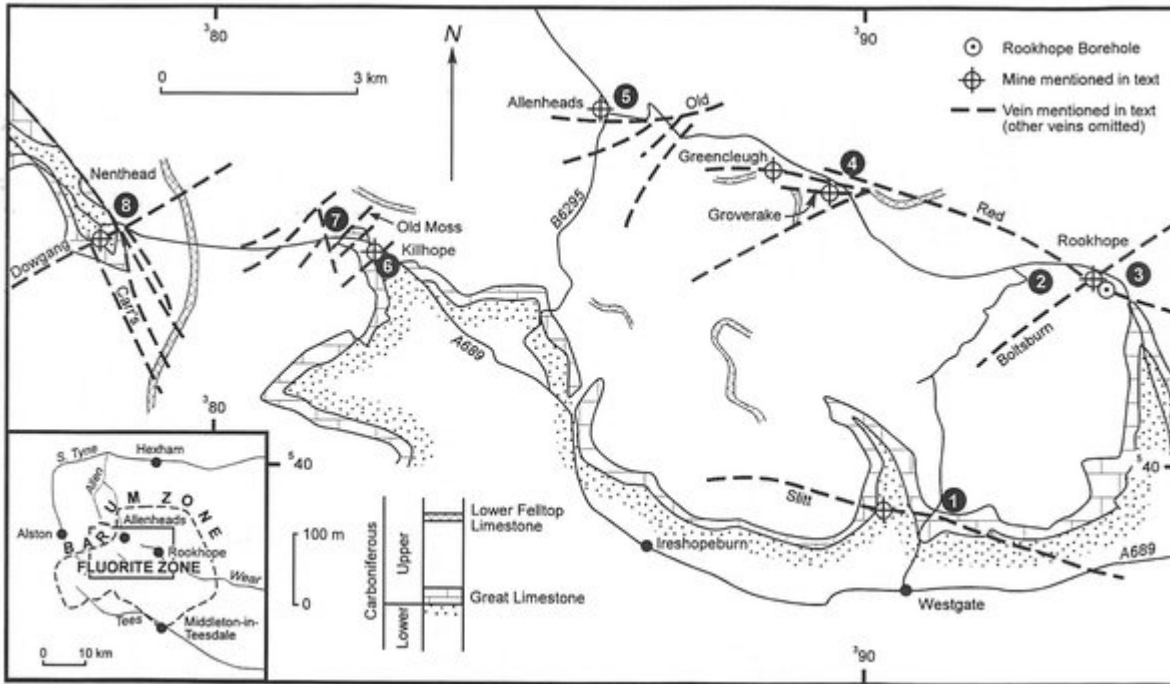
Park at the main village car park, built on the site of the Rampgill Mine dressing floors. Nenthead village was built in the eighteenth century by the London Lead Co., a Quaker company who were one of the principal mining and smelting companies in the orefield. Many veins occur in and around Nenthead and these, and numerous associated 'flats', proved extremely rich. Originally important as lead producers many of these deposits became significant sources of zinc ore in the late nineteenth and twentieth centuries. The principal zinc ore at Nenthead is sphalerite which is extremely abundant in these deposits in a zone intermediate between the fluorite and barium zones. It had hitherto been regarded as a troublesome waste product by the lead miners.

The village abounds in reminders of the heyday of lead mining. The North Pennine Heritage Trust and Cumbria County Council have recently erected interpretive signs and guide leaflets are available. Note particularly the miners' reading room, village drinking fountain, and the large building, now a bus garage, which housed a large ore-dressing plant which served several local mines. This plant recovered many tons of zinc concentrates from mine spoil during World War II. Before leaving the car park note the large wooded valley of Dowgang Hush to the south above the twin stone-arched entrances to Capelcleugh Mine. This 'hush' is in part a man-made valley excavated by repeatedly releasing torrents of water from a dam high on the hillside to rip through the loose rock along the course of the Dowgang Vein.

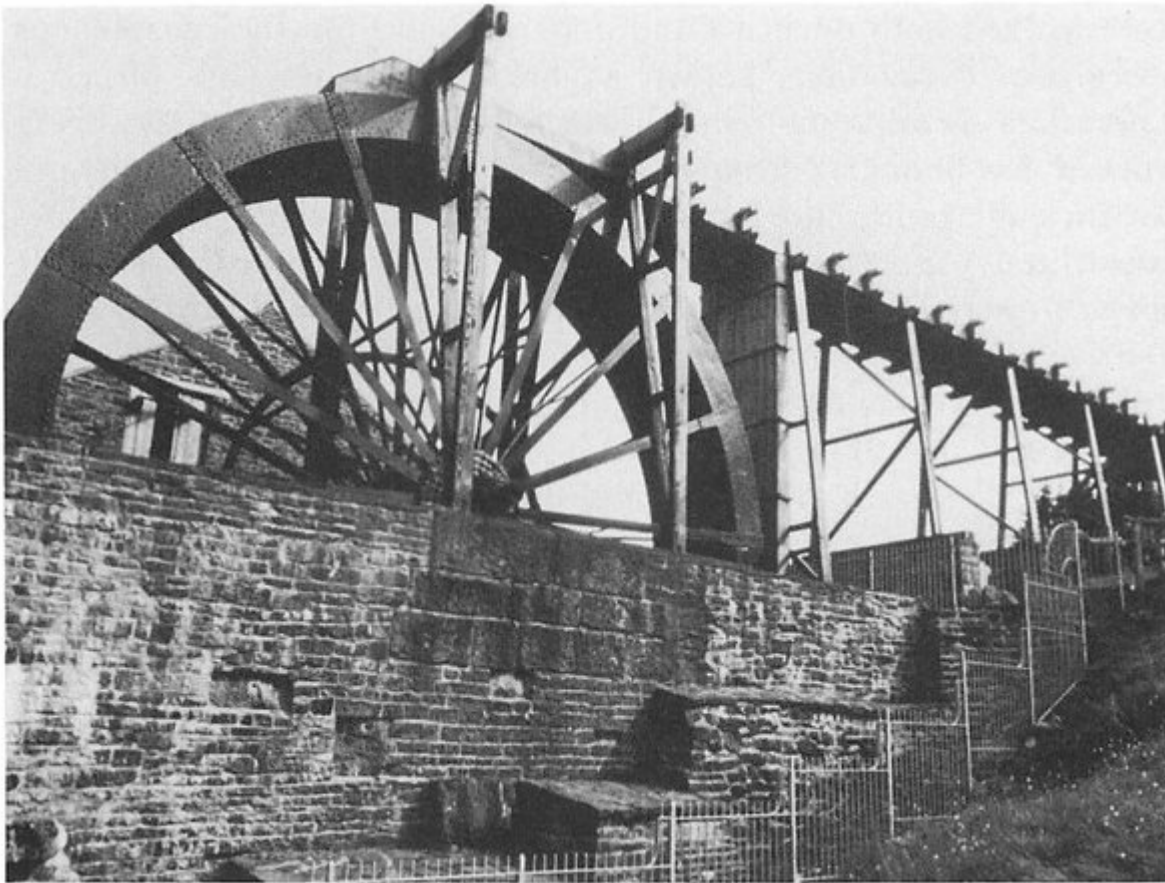
Walk southeast along the track, passing the stone buildings, formerly the workshops of Rampgill Mine. Pass through the gate by a white-washed cottage and examine the well preserved assay house and smelt mill ruins. Smelting ended here late last century.

Follow the stream up to a small waterfall [NY 787 429]. The rock here is the Great Limestone adjacent to a north-northeast–southsouthwest trending fault known as Carr's Vein. Within the northern Pennine orefield, faults with this trend are comparatively rarely mineralized and are known as 'cross veins'. In the Nenthead area, however, they clearly acted as major channels for mineralization as the Great Limestone adjacent to them is commonly altered to give extensive flat deposits which in this area carry abundant galena and sphalerite in a matrix of ankeritized limestone. The limestone here at the waterfall is a fine example of such a flat. Note the presence of galena filling cavities. The dumps from the many workings near this locality contain excellent specimens of sphalerite, galena, ankerite, quartz and calcite.

### **[Bibliography](#)**



(Figure 14.1) Map of the Weardale–Nenthead area showing localities mentioned in the text.



(Figure 14.2) Restored overshot wheel, Killhope Lead Mining Centre, Weardale. Photo: P. Nixon.