Dry Gill Mine, Cumbria

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Introduction

An E–W-trending vein exposed in the bed and north bank of Dry Gill, a tributary of the Carrock Beck, has been worked opencast and underground at Dry Gill Mine. The mine is of particular mineralogical interest for the abundance of the lead arsenate mineral mimetite, much of which occurs in the distinctive form. known as 'campylite' (Figure 2.19).

Unlike many of the mines on the Caldbeck Fells the workings at Dry Gill appear to date only from the middle of the 19th century. Cooper and Stanley (1990) recorded that although the site is known to have been yielding fine specimens of mimetite as early as 1830, the first recorded mining dates from 1846. Subsequently the mine was worked in a small way by a number of operators bui was abandoned in 1869. The mine is almost certainly unique in having been worked for mimetite, known by the miners as 'coloured lead ore'. Although several hundred tons of this were sold to the glass-making industry (Ellis, 1851) the mine was never a commercial success.

Dry Gill Mine has long attracted geological interest. The site occupies a structurally complex area in which an inlier of Upper Ordovician mudstones, referred to as the 'Drygill Shales', is preserved between outcrops of the Ordovician Eycott Volcanic Group and parts of the Carrock Fell Intrusive Complex (Ward, 1876a,b; Nicholson and Marr, 1877; Marr, 1892, 1900; Elles and Wood, 1895; Green, 1917; Eastwood *et al.,* 1968). Dry Gill Vein is of considerable interest for the abundance within it of mimetite and other supergene minerals. Descriptions of the mine and minerals include those by Eastwood (1921), Eastwood *et al.* (1968), Shaw (1970), Young (1987a), Adams (1988), and Cooper and Stanley (1990).

The site lies within the area in which mineral collecting is controlled by a permit system administered by the Lake District National Park Authority.

Description

The Dry Gill Vein occupies a major E–W-trending fault which separates the Upper Ordovician Drygill Shales on the south from the Ordovician Eycott Volcanic Group to the north. The structure of the Dry Gill area is complex, and the Dry Gill Vein is offset by several N–S-trending faults, at least one of which is a northward continuation from the fault system occupied by the veins of Carrock Fell Mine to the south.

In the vicinity of Dry Gill Mine, the Dry Gill Vein comprises a quartz vein up to 1.5 m wide, hading north at between 10° and 15°, which crops out as a conspicuous ridge along the northern bank of the stream (Figure 2.20). It has been worked both opencast and from short levels driven from the stream banks. These levels are today in a generally dangerous and locally water-logged condition although until recently they were frequently entered by mineral collectors and dealers.

Much of the quartz at Dry Gill is massive, although well-formed pyramidal crystals are present and, in addition, pseudomorphs and epimorphs after tabular or 'cockscomb' barite occur. In places the vein contains concentrations of coarsely crystalline white barite.

The Dry Gill Vein is remarkable and best known for the occurrence of the phosphatian variety of mimetite known as 'campylite' which derives its name from the Greek 'Καμπ■λος meaning 'curved', in allusion to its distinctive rounded crystals. Much of the lead within the Dry Gill Vein is present in this form, and the deposit has been cited as one of the world's most remarkable deposits of this mineral (Cooper and Stanley, 1990). Galena appears to have been scarce (Shaw, 1970). Eastwood's (1921) comment that galena was the main ore worked is almost certainly incorrect. The mine is known to have been worked last century for mimetite or 'coloured lead ore' as it was then known. The mineral was employed in glass-making, not as an ore of lead.

According to Cooper and Stanley (1990) the description of 'arsenate of lead' by Allan (in Phillips, 1837) may be the earliest published reference to Dry Gill 'campylite', although the occurrence was first figured by Kurr (1858). The occurrence of striking crystals of 'campylite' at Dry Gill has subsequently been quoted in most mineralogical text books. Specimens from here are prominent in most of the world's major mineralogical collections. Several very fine examples are figured by Cooper and Stanley (1990). Although the 'campylite' variety is especially common at Dry Gill, mimetite also occurs here in a number of other morphologies, including tabular and short to long prismatic forms. In all of these forms the mineral is usually a pale to dark orange-brown colour, although yellow, greenish-yellow and various shades of green are also common. In many specimens colour-zoning of crystals is conspicuous. Crystals of the mineral are usually up to 10 mm across, although examples over 30 mm across are known. Some arsenic-free pyromorphite is also present at Dry Gill, although this mineral cannot be distinguished visually from the more abundant mimetite. Dry Gill Mine is also noted for excellent specimens of plumbogummite (Cooper and Stanley, 1990).

In most exposures of the vein, and in most specimens of veinstone on the dumps, black manganese oxides are common. Whereas much of this material has been described as pyrolusite (Goodchild, 1885) or 'psilomelane' (e.g. Greg and Lettsom, 1858; Goodchild, 1882; Eastwood, 1921), and at least some of this is now known to be romanèchite (Cooper and Stanley, 1990), a considerable amount of the black manganese oxide here has been shown to be the unusual lead manganese oxide mineral coronadite, for which the site was the first British locality (Hartley, 1959).

Full lists of all minerals recorded from Dry Gill have been given by Young (1987a), and Cooper and Stanley (1990).

Ryback *et al.* (2001) have demonstrated that the late A.W.G. Kingsbury falsified the localities of numerous rare mineral species, including many from the Lake District, especially in the Caldbeck Fells. Although no conclusive proof has been established of deception relating to specimens from this site, great care should be exercised when considering claims by Kingsbury which have not been substantiated or duplicated by subsequent collectors.

Interpretation

Lead mineralization within the Dry Gill Vein is almost exclusively in the form of mimetite with smaller amounts of pyromorphite. Galena, although recorded, is scarce in the levels of the vein exposed within the Dry Gill workings. Mimetite and pyromorphite, the two end members of the mimetite-pyromorphite series, are common minerals found in the supergene zones of many lead veins. Their great abundance here, typically in very large and well-formed crystals, and the great scarcity of galena, suggests either that Dry Gill Vein has undergone intense supergene alteration over a greater vertical interval than usual or, as suggested byFirman (1978a), the mimetite and pyromorphite may be of primary origin. In their classification of Lake District mineralization Stanley and Vaughan (1982a) suggested a Jurassic age for the supergene alteration of the Caldbeck Fells veins. The arsenic and phosphorus necessary for the formation of these minerals may have been derived both from the wall-rocks and from the alteration of arsenic- and phosphorus-bearing primary minerals within the Dry Gill Vein.

Manganese oxide minerals are very common in many of the veins on Caldbeck Fells, including Dry Gill. The abundance of manganese in these deposits may be an expression of the halo of manganese mineralization which Hitchen (1934) suggested surrounded the Carrock Fell tungsten veins.

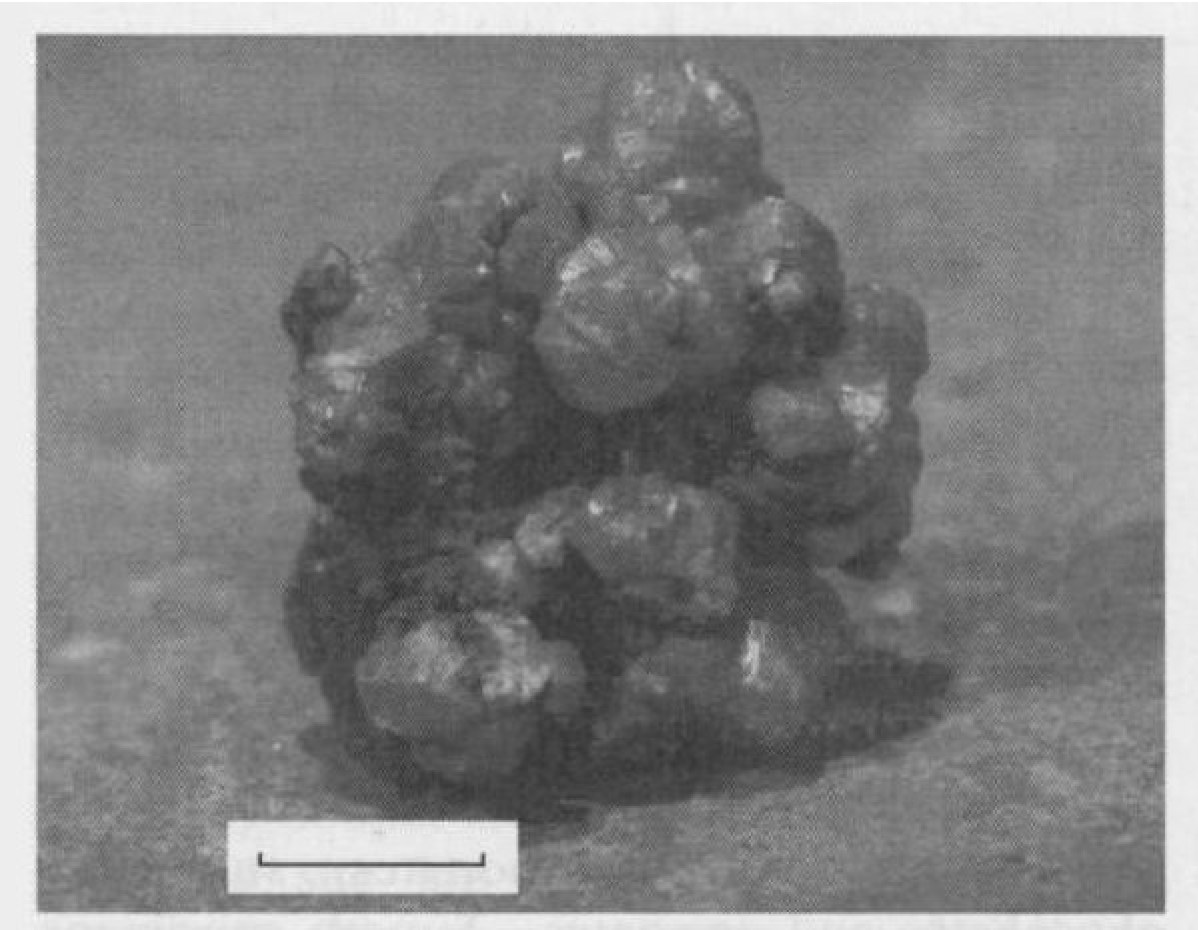
The variety of minerals recorded from Dry Gill Mine (Young, 1987a; Cooper and Stanley 1990) clearly includes many whose supergene origin is clear. Supergene processes have thus been important in producing the mineral assemblage seen today at Dry Gill, as well as at many of the mines on the Caldbeck Fells for which Stanley and Vaughan (1982a) have proposed a Jurassic age, at least in part. Whereas the suggestion of a primary origin for the mimetite is an interesting possibility it cannot be established with certainty.

In addition to the abundance of lead arsenates and phosphates, the Dry Gill Vein carries local concentrations of barite. The presence here of pseudomorphs and epimorphs in quartz after barite suggests that this mineral may formally have been more abundant within the vein. Similar evidence for the greater abundance of barite in many of the lead-bearing veins of the Caldbeck Fells suggests the widespread removal of this mineral and its replacement by quartz, although evidence for the timing of this process is not available.

Conclusions

The remaining exposures of the vein at Dry Gill, combined with an abundance of veinstone within the spoil heaps, provides a unique opportunity to study a vein in which the lead mineralization is mainly in the form of arsenates and phosphates. The abundance of these minerals, normally regarded as typical of supergene alteration, may at least in part here be a result of primary precipitation. The site also contains a variety of other unusual minerals of typical supergene origin. The site has great research and educational value. Despite being the focus of intense collecting activity over more than a century the vein exposures and remaining dumps at Dry Gill Mine remain an important source of specimens of the unique variety of mimetite known as 'campylite'.

References



(Figure 2.19) Specimen of rounded crystals of 'campylite' at Dry Gill Mine. The scale bar is 10 mm. (Photo: T. Bain, BGS No. MNS 4492, reproduced by permission of the British Geological Survey, © NERC. All rights reserved. IPR/116–33CY.)

(Figure 2.20) Dry Gill Mine. View eastwards along Dry Gill Vein which here crops out as a prominent quartz-rib on the north side of Dry Gill. (Photo: B. Young.)