Roughtongill Mine, Cumbria

[NY 304 344]

Introduction

Roughtongill Mine is one of the largest abandoned mines in the Caldbeck Fells, in the northern part of the Lake District. Included in the site to be described are the nearby much smaller mines of Silver Gill and Mexico. Together these mines have yielded copper, lead and zinc ores with some barite and 'umber', an ill-defined soft earthy mixture of iron and manganese oxides.

Like most mines on the Caldbeck Fells, those at Roughtongill have enjoyed a long history of exploration and production. The most comprehensive accounts of the history of mining here are those by Shaw (1970), and Cooper and Stanley (1990). Shaw (1970) suggested that working here may date from the 12th century. There are fine examples of ancient hand-cut 'coffin levels' in the higher parts of the mine and traces of old smelting hearths are known (Postlethwaite, 1913). The mines were worked vigorously by the Elizabethans, and according to Cooper and Stanley (1990) Roughtongill may have been the principal Elizabethan working on the Caldbeck Fells. Little more is known of the mines until the beginning of the 18th century when working is recorded in the Silver Gill area. Mining continued intermittently throughout the 18th and 19th centuries, with copper, lead and in later years some zinc ores being raised. Some of the lead ore is reputed to have been notably argentiferous, although reliable figures for silver content are not available. During the latter part of the 19th century the mine raised barite and 'umber'. Complete production figures are not available for the various minerals worked commercially from Roughtongill, although Eastwood quoted figures for 19th century outputs of copper, lead and zinc ores.

The chief interest of Roughtongill lies in the great wealth of supergene minerals found in the veins. Magnificent specimens of many of these, mostly obtained while the mine was working, are prominent in major mineralogical collections. Despite the attentions of mineral collectors for almost a century, the extensive dumps still contain appreciable quantities of most of the species for which the site has long been famous. 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 surface geology and pattern of veins is shown in (Figure 2.17). Most published descriptions of the Roughtongill mines (e.g. Postlethwaite, 1913; Eastwood, 1921; Dewey and Eastwood, 1925; Cooper and Stanley, 1990) refer to two principal, generally NE–SW-trending, veins. Shaw (1970), and Adams (1988) noted the presence of at least two other veins, and recent detailed mapping by the British Geological Survey has revealed a more complex structure than hitherto supposed, with at least four roughly parallel mineralized veins (Figure 2.17). The veins occupy substantial faults which juxtapose rocks of the Ordovician Eycott Volcanic Group against a variety of intrusive rocks of the Carrock Fell Intrusive Complex and, in the extreme west, rocks of the Skiddaw Group. No good plan is known of the underground workings at Roughtongill. However, from limited contemporary records and observations made whilst parts of the workings were still accessible, Eastwood (1921), and Shaw (1970) commented on the relationship of the wall-rock lithology to the productivity of the veins. The veins were worked from a number of cross-cut adits. Whereas some of these today remain accessible in part, none gives access to any vein sections. Surface exposures of the veins can be seen locally.

Eastwood (1921) reported that the veins at Roughtongill are typically filled with broken country rock together with abundant quartz and chalcedony. Calcite and barite are also locally common. The main sulphide ores are, in order of abundance, galena, chalcopyrite and sphalerite. Supergene minerals are especially abundant, and pyromorphite, cerussite and malachite are thought to have been worked commercially.

The most extensive workings appear to have been in the Roughtongill South Vein. According to Shaw (1970) the best orebody occurred where granophyre, recognized by the most recent British Geological Survey mapping as the 'Iron Crag

Microgranite', formed the footwall, with gabbro on the hangingwall. Eastwood (1921) recorded that in places the vein reached up to 9 m in width in an area known as the 'Great Bunch', in which copper and lead ores occurred in a predominantly calcite gangue. Eastwood (1921) noted that the galena in this part of the vein had a relatively low (> 10 oz of silver per ton of lead) silver content. Elsewhere in the workings this vein carried large quantities of pyromorphite, malachite and cerussite.

Eastwood (1921) commented that the Roughtongill North Vein resembles the Roughtongill South Vein in its composition, although noted that veinstone on the dumps near the foot of Silver Gill suggests that galena and sphalerite may have been rather more abundant. Previous authors, including Eastwood (1921), and Cooper and Stanley (1990), have regarded Roughtongill North Vein as the eastward continuation of the Silvergill Vein, worked at the head of Silvergill. The Silvergill Vein is known to have carried substantial amounts of argentiferous galena and appears to have been exhausted by about 1700 (Cooper and Stanley, 1990).

The veins at Roughtongill have long been celebrated for the great variety and abundance of supergene minerals found within them. Spectacular examples of many of these are prominent in most of the world's major mineralogical collections. Most abundant are supergene lead and copper minerals. Especially well-known are beautiful examples of pyromorphite (Figure 2.18), mimetite, plumbogummite, hemimorphite, linarite, leadhillite, anglesite, cerussite, brochantite and tsumebite. Fine examples of several of these are figured by Cooper and Stanley (1990). In recent years the site has yielded examples of the comparatively new species matthedleite (Cooper, M.P. *et al.,* 1988), scotlandite (Green, 1989), and arsentsumebite (Tindle *et al.,* 2006), and workings at Silver Gill have yielded specimens of the newly described hydrated copper sulphate mineral redgillite ($Cu_6(OH)_{10}(SO_4).H_20$) (Pluth *et al.,* 2005). Lists of species recorded from here, with appropriate literature references, can be found in Young (1987a), Cooper and Stanley (1990), and Green *et al.* (2005a). The few exposures of the Roughtongill veins which may be seen locally today carry little metalliferous mineralization. An excavation, known as 'Barstow's Trench', excavated in the 1990s on the Roughtongill South Vein above Mexico Mine, exposed a rich pocket of well-crystallized pyromorphite. This is now mostly backfilled and rather overgrown, although a few fragments of the veinstone may still be found in the spoil. Parts of the Roughtongill South Vein, including sections containing small amounts of pyromorphite and manganese oxides, are exposed locally on the steep slopes of Iron Crag, and interesting vein-stone from this outcrop may be found on the scree slopes along the foot of the crag. The Roughtongill South Vein, and its associated structures, are exposed locally in the higher reaches of Roughtongill on the southern flank of Balliway Rigg. The extensive dumps contain substantial quantities of veinstone in which examples of most of the primary sulphides and many of the supergene species can be studied.

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

Roughtongill Mine worked deposits typical of the lead- and copper-bearing veins of the Caldbeck Fells. Like the veins worked at the nearby Red Gill Mine GCR site, these exhibit a comparatively complex primary mineralogy and are likely to be the products of several mineralizing episodes, each the products of 'hydrothermal cells' driven by heat flow through the largely concealed Lake District Batholith (Moore, 1982; Stanley and Vaughan, 1982a; O'Brien *et al.,* 1985).

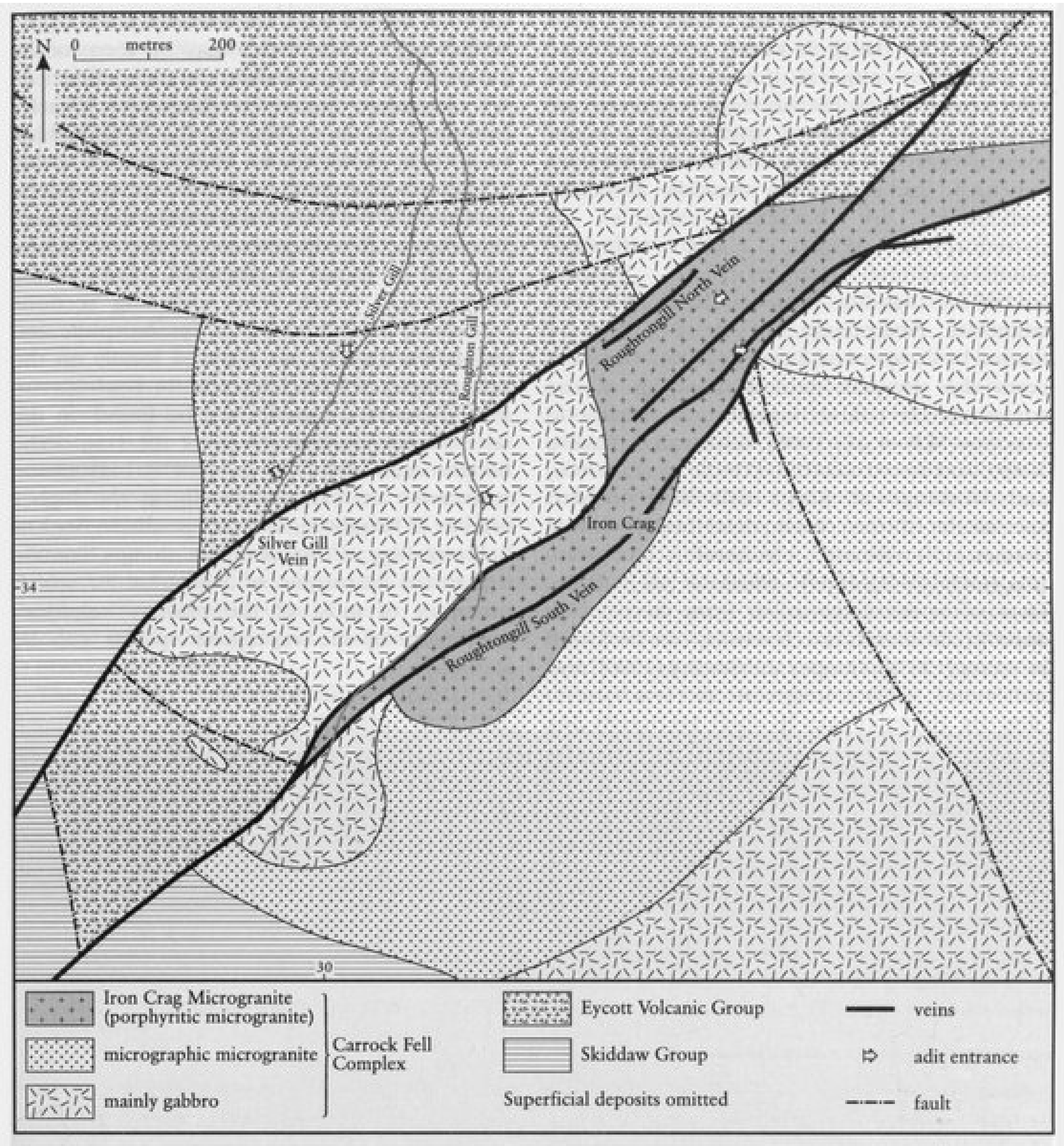
The main mineralogical interest at Roughtongill, like the Red Gill Mine GCR site, lies in the great wealth of supergene minerals. Most prominent are carbonates, sulphates and phosphates of lead and copper. Zinc minerals, notably sphalerite and the supergene species smithsonite and hemimorphite, are conspicuous at Roughtongill. The abundance of arsenates in the Roughtongill deposits contrasts markedly with their scarcity at the Red Gill Mine GCR site. Their abundance here may be due to the presence of early Devonian mineralization which, elsewhere in the Lake District, is characterized by an abundance of arsenic. The great variety of supergene species no doubt reflects the very varied chemistry of both the primary mineralization and the wall-rocks (Cooper and Stanley 1990). Whereas supergene alteration at Roughtongill has obviously been intense, the inaccessibility of the vein workings precludes any study of supergene mineralization *in situ*. It is therefore difficult or impossible to suggest the extent or depth of this alteration within the veins. The date of this alteration is unknown, although clearly it reflects a prolonged period of circulation of oxygen-rich groundwaters within the upper parts of the veins. Stanley and Vaughan (1982a) have suggested a Jurassic age for at least some of the supergene alteration of the Caldbeck Fells veins.

The supergene assemblage at Roughtongill, like that at the Red Gill Mine GCR site, has much in common with that present in some of the deposits of the *Leadhills-Wanlockhead* GCR site area, in southern Scotland, where similarly complex primary assemblages have been subject to intense supergene alteration.

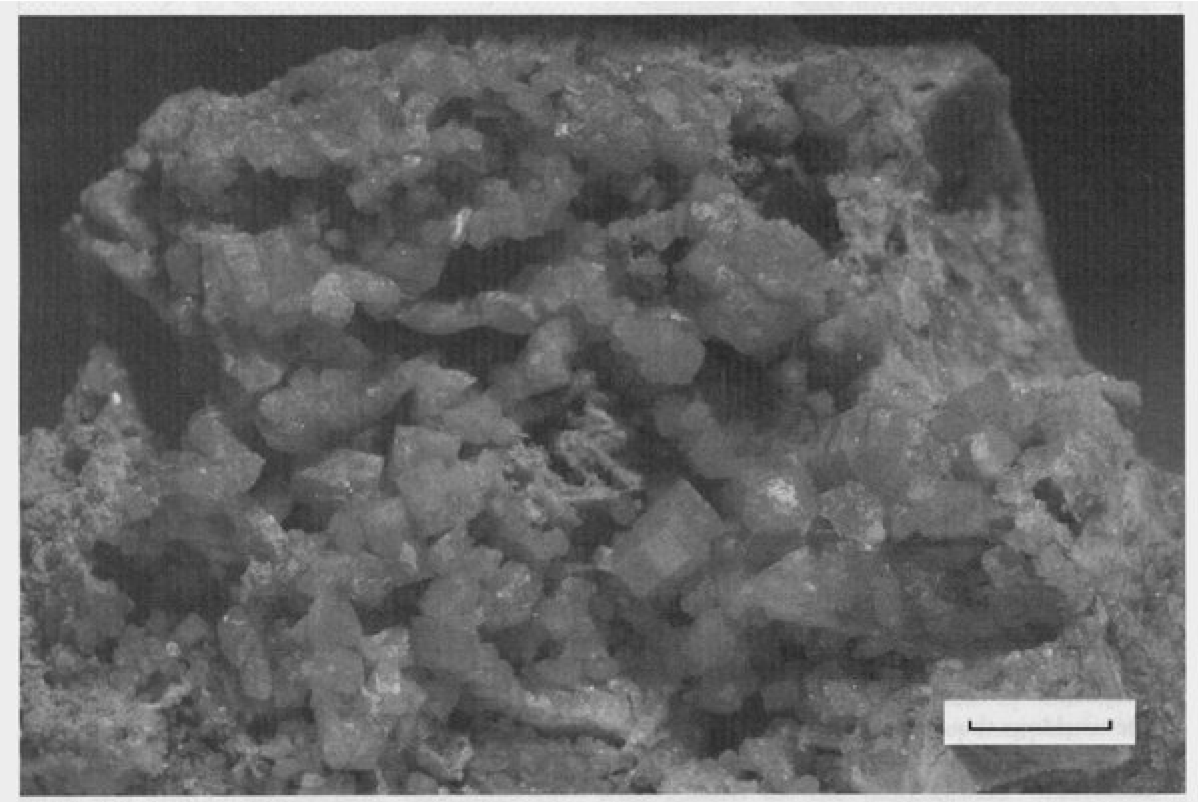
Conclusions

Roughtongill Mine has long been famous for a great variety of supergene minerals, conspicuous amongst which are lead-, zinc-and copper-bearing carbonates, sulphates, phosphates and arsenates. Superb specimens collected from this site over many years are prominent in most major museum mineralogical collections. Whereas no significant metalliferous mineralization is exposed in *situ* at the site today, and although the extensive dumps have attracted the attention of mineral collectors and dealers over many years, significant amounts of mineralized veinstone remain and provide excellent opportunities to study a variety of unusual and rare supergene species. Interesting and important finds of rare minerals are still, from time to time, reported from the site.

References



(Figure 2.17) Geological sketch map of Roughtongill Mine.



(Figure 2.18) Specimen of hexagonal prisms of pyromorphite from 'Barstow's Trench' at Roughtongill Mine. The scale bar is 10 mm. (Photo: T. Bain, BGS No. MNS 4480, reproduced by permission of the British Geological Survey, © NERC. All rights reserved. IPR/116–33CY.)