Buckbarrow Beck, Cumbria

[SD 137 907]

Description

A narrow quartz vein, exposed in the west bank of Buckbarrow Beck, Corney Fell, carries abundant chalcopyrite and scheelite with smaller amounts of ferberite. A number of rare supergene copper, tungsten and bismuth minerals, including cuprotungstite and russellite, are locally abundant. Traces of scheelite have been seen in a handful of other small veins a short distance upstream. All of these veins cut the Eskdale Granodiorite, the southernmost part of the Eskdale Intrusion.

Small trials, of unknown date, have been made on a small copper-bearing vein roughly parallel to the tungsten-bearing vein, on the opposite bank of Buckbarrow Beck. The tungsten-bearing vein was discovered during the mapping of the Eskdale Intrusion by the British Geological Survey in 1984.

The Eskdale Intrusion, which hosts this small vein, has been the subject of investigations by Dwerryhouse (1909), Simpson (1934), Trotter *et al.* (1937), Firman (1978b), Rundle (1979, 1981), Ansari (1983), O'Brien *et al.* (1985), Firman and Lee (1986), Young (1985a), and Young *et al.* (1988). The mineralogy of the tungsten-bearing vein has been described by Young (1985b), Young *et al.* (1986, 1991), and Neall *et al.* (1993).

Description

The Buckbarrow Beck veins lie within the Eskdale Granodiorite, close to where its southeastern contact dips beneath hornfelsed andesites of the Borrowdale Volcanic Group. The granodiorite is the southern part of the Eskdale Intrusion, the largest surface expression of the largely concealed Lake District Batholith. There is evidence that the granodiorite is the older part of this intrusion (Young *et al.,* 1988).

Buckbarrow Beck is crossed, about 200 m upstream from the bridge on the Ulpha to Bootle road, by a NNE–SSW-trending vein in granodiorite (Figure 2.15). In the west bank of the stream the vein is barren and consists of a 1 m-wide belt of soft kaolinized granodiorite, locally showing staining by iron and manganese oxides. This type of argillic alteration is common locally in the Eskdale Granodiorite, although Buckbarrow Beck is one of the few sites at which it is seen to be associated with obvious mineralization (Young, 1985b). On the eastern bank of the stream, a level, the entrance of which is now collapsed, has been driven on the vein. The small dumps show abundant massive quartz in which occur abundant specks of chalcopyrite together with encrustations of malachite, chrysocolla and goethite.

A sub-parallel vein up to 10 cm across, and dipping steeply to the north-west, is exposed on the west bank of the stream about 10 m west of the previously described vein. Massive quartz is the main constituent, with local conspicuous concentrations of chalcopyrite and goethite. Although superficially resembling the veinstone on the dump from the trial level on the opposite bank, this vein is distinguished by containing abundant scheelite, together with small amounts of ferberite. The scheelite occurs as pale-fawn, rather friable masses and more continuous bands up to 3 mm thick on each wall of the vein, or as irregular pockets up to 8 mm wide within the vein, and is in places patchily replaced by ferberite. Ferberite occurs sparingly as groups of crystals up to 4 mm long embedded in quartz on the margins of the vein. Young *et al.* (1986) reported that the composition is considerably more ferroan than the wolframite from the Carrock Fell tungsten deposit in the north of the Lake District (see Carrock Mine–Brandy Gill GCR site report, this chapter).

The vein outcrop is deeply weathered and contains abundant crusts of a variety of supergene minerals (Young, 1985b; Young *et al.,* 1986, 1991; Neall *et al.,* 1993). Perhaps most conspicuous because of their colour are crusts of malachite, chrysocolla and goethite. Cuprotungstite, for which Buckbarrow Beck is the first recorded British locality, has been found on a few specimens as vivid grass-green crusts on scheelite. More abundant are bright-yellow, earthy coatings and patches, up to 6 mm across, of bismutoferrite, commonly associated with patches of dark-brown earthy goethite.

Russellite is also locally abundant within the vein. It commonly forms thin (< 1 mm), pale-buff to greenish-yellow, discontinuous crusts up to 10 mm across on joint- and fracture-surfaces of quartz. In places, these coalesce to form circular spherulitic masses up to 1 mm across in which a faint radiating crystalline structure and colour banding is apparent. Open joints have yielded specimens which consist of complete hemispherical masses of spherules up to 0.3 mm across (Figure 2.16). Young *et al.* (1986, 1991) compared analyses of the Buckbarrow Beck russellite with that of russellite from the type locality at Castle an Dinas, Cornwall and from Poona, Western Australia. They showed that the Cumbrian mineral exhibits differences in the relative proportions of W, Bi and O, and concluded that this appears to confirm the variability in composition of this mineral suggested by Hey and Bannister (1938). Buckbarrow Beck is only the fourth world locality known for this mineral. Other rare supergene minerals identified from the Buckbarrow Beck Vein include namibite, also reported here for the first time from a British locality, eulytite, bismutite and mixite (Neall *et al.,* 1993).

The threat to this rather small and sensitive site from mineral collectors prompted the then Nature Conservancy Council to collaborate with the land owner and the British Geological Survey in arranging the rescue collection of representative samples of veinstone from the outcrop (Nature Conservancy Council, 1987). The material collected is held by the British Geological Survey and is available to *bona fide* research workers.

Interpretation

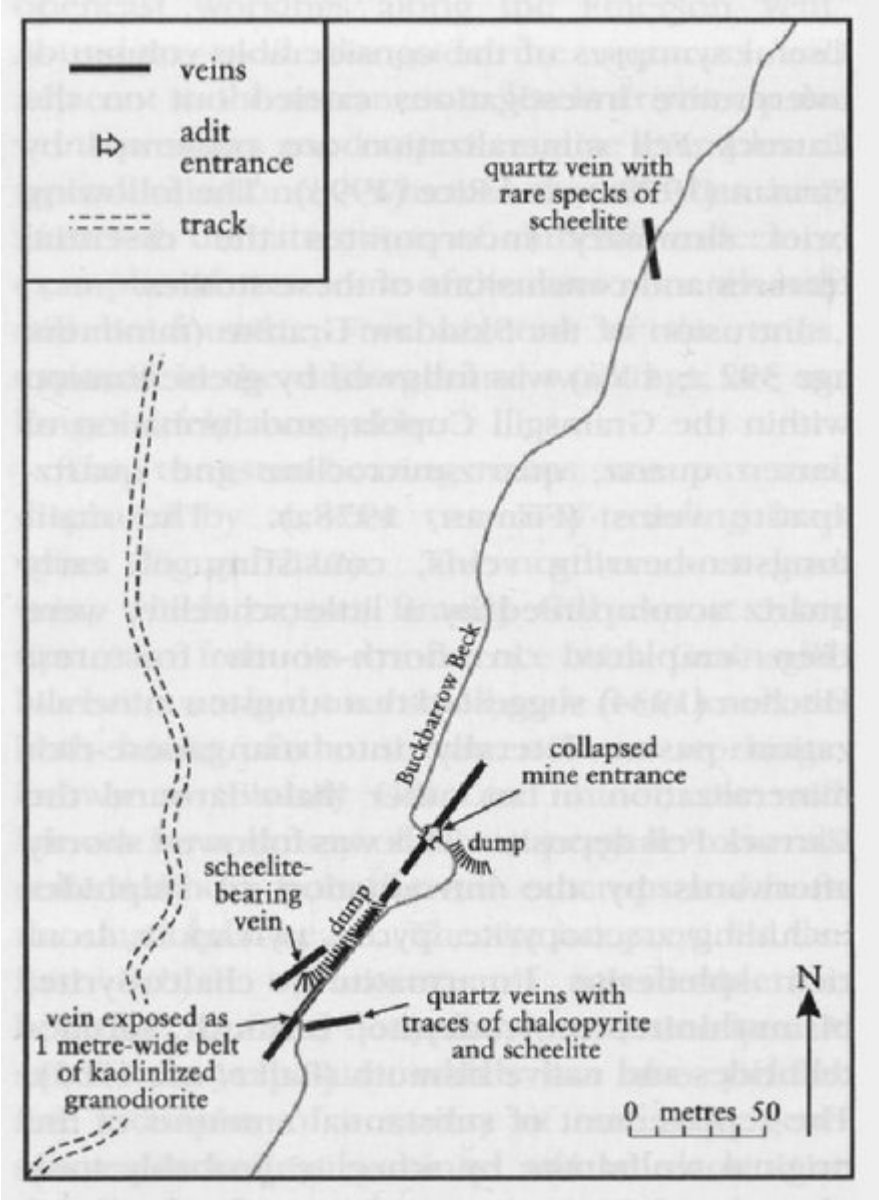
Tungsten mineralization is well known in the Lake District in the veins at Carrock Mine–Brandy Gill (see GCR site report, this chapter). Traces of scheelite have been found in drusy cavities in the Shap Granite (Firman, 1953, 1978a), and there are unsubstantiated reports of tungsten minerals at Scar Crag and Force Crag, near Keswick (Greg and Lettsom, 1858; Kingsbury and Hartley, 1957a). The Buckbarrow Beck Vein is the first record of tungsten mineralization from the granitic rocks of the western Lake District.

Greisens occur around the margins of the Eskdale Granite (Young, 1985a; Young *et al.,* 1988). The topaz-greisen at Water Crag (see GCR site report, this chapter) locally contains concentrations of arsenopyrite-bismuthinite-molybdenite-fluorite mineralization (Young, 1985b). In addition, enhanced levels of tin and tungsten have been recorded from these greisens (O'Brien *et al.,* 1985; Ansari, 1993). In their review of Lake District mineralization Stanley and Vaughan (1982a) provided evidence for a Lower Devonian age for the tungsten mineralization at Carrock Fell and the widespread copper mineralization throughout the Lake District, although Millward *et al.* (1999) have suggested that at least some of this mineralization may be significantly older. Young *et al.* (1986) explored the possibility that the Buckbarrow Beck mineralization may be genetically related to the emplacement of the Eskdale Granite. If this were so, a late Ordovician or early Siluripn episode of mineralization is implied. However, in view of the evidence that the Eskdale Granite was subjected to hydrothermal alteration during the end-Silurian to early Devonian period, these authors concluded that the Buckbarrow Beck mineralization is more probably of late Silurian to early Devonian age.

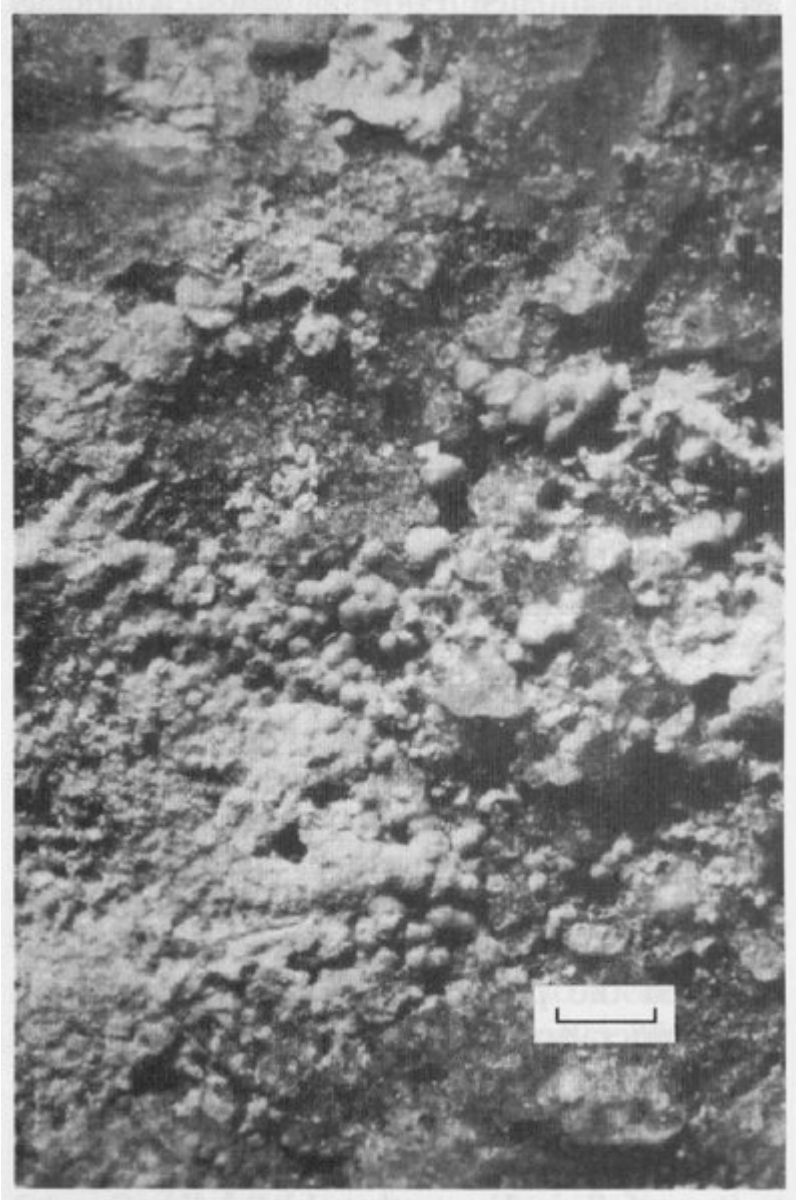
Conclusions

The Buckbarrow Beck Vein is the only known occurrence of tungsten mineralization within the granitic rocks of the western Lake District. In addition it affords a unique opportunity to study a wide range of rare supergene minerals. The site is one of only four world locations for russellite and is probably the only known site at which this mineral may today be seen *in situ.* In addition the site offers important scope for research into mineralization associated with the Lake District Batholith.

References



(Figure 2.15) Sketch of Buckbarrow Beck showing the distribution of the main mineral veins. After Young (1985b).



(Figure 2.16) Spherules of russellite on quartz from the tungsten vein at Buckbarrow Beck. The scale bar is 1 mm. (Photo. F. McTaggart, BGS No. P244159, reproduced with permission of the British Geological Survey © NERC. All rights reserved. IPR/116–33CY.)