# Wet Swine Gill, Cumbria

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## Introduction

A small antimony-bearing vein which cuts rocks of the Ordovician Skiddaw Group is exposed in Wet Swine Gill, a left bank tributary of the River Caldew, near the head of Mosedale. The mineralization demonstrates a progression from an early Sb-Fe-As association characterized by stibnite and berthierite, to a later Sb-Pb assemblage with zinkenite and rare semseyite and fülöppitefülöppite. A variety of supergene antimony minerals occurs. The vein may be an expression of the nearby early Devonian W–As mineralization at Carrock Fell Mine.

## Description

The Wet Swine Gill Vein is exposed in the bed and banks of Wet Swine Gill, although its continuation beyond the stream cannot be determined. The vein cuts hornfelsed silty mudstones of the Kirk Stile Slates of the Ordovician Skiddaw Group (Jackson, 1978), within the aureole of the Skiddaw Granite. The vein is up to about 0.5 m wide in the stream, where it strikes north-east-south-west and dips steeply to the south-east. The site lies about 1 km southwest of the workings of the Carrock Mine–Brandy Gill GCR site.

The Wet Swine Gill Vein is unusual in the Lake District in having been discovered only within the past few years. There are no signs of any excavations or trials on it.

The veinstone typically consists of fine- to medium-grained quartz in which are scattered irregular patches of fine-grained ore minerals. Fortey *et al.* (1984) provided a detailed description of the vein and its mineralogy. The principal ore minerals include, in order of abundance, stibnite, zinkenite and berthierite. In addition, jamesonite is present in small amounts accompanied by very small quantities of native antimony, semseyite and filloppite, the latter reported here for the first time from a British locality. More recently, Green *et al*. (2005b) have presented analyses of equant, subhedral crystals of fülöppite. A little sphalerite and arsenopyrite occur within the ore assemblage. Weathered surfaces of the vein-stone are encrusted with supergene antimony minerals including yellow bindheimite, greyish-white stibiconite and traces of senarmonitite and kermesite.

Rare supergene species found at Wet Swine Gill include antimonian claudetite (Leppington and Green, 1998), and scorodite, pharma-cosiderite, beudantite and valentinite, in addition to parasymplesite, reported here for the first time from a British locality (Neall and Green, 2001a).

In recent years the outcrop of the vein has been considerably excavated by mineral collectors and much of the richer ore-bearing parts of the vein have been removed or damaged. However, substantial amounts of ore-bearing material remain in and around these excavations. The site lies within the area in which mineral collecting is controlled by a permit system administered by the Lake District National Park Authority.

## Interpretation

Fortey *et al.* (1984) showed that the earliest mineralization at Wet Swine Gill comprises two generations of vein quartz. The ore mineral assemblage demonstrates a progression from an Sb-Fe-As paragenesis consisting of stibnite, berthierite, jamesonite, native antimony, antimony-rich arsenopyrite and sphalerite to an Sb-Pb paragenesis consisting of zinkenite, fülöppite and semseyite.

In their studies of this mineralization Fortey *et al.* (1984) drew attention to several points of similarity with the deposits of the tungsten-bearing veins of the nearby Carrock Fell Mine, where small amounts of antimony minerals have also been recorded (Kingsbury and Hartley, 1956a). They concluded that the early quartz and Sb-Fe-As assemblages at Wet Swine

Gill were synchronous with the early sulphide mineralization within the Carrock Fell veins and thus of early Devonian age. The identification of wolframite and scheelite in panned concentrates from Wet Swine Gill and adjacent streams may be significant in suggesting that hitherto undetected mineralization related to the Carrock Fell deposits may be present in this area (Appleton and Wadge, 1976). A small jamesonite-bearing quartz vein, on strike with the Carrock Fell veins, described briefly by Fortey *et al.* (1984) may offer further evidence of a genetic association between the Wet Swine Gill and Carrock Fell veins.

Small antimony-rich veins have been reported from elsewhere in the Lake District, including that formerly worked for antimony at Robin Hood Mine, near Bassenthwaite several kilometres west of Wet Swine Gill (Posdethwaite, 1913; Young, 1987a). There are, however, few descriptions of these occurrences, or of the mineral assemblages present, and relatively little is known of their place in the evolution of Lake District mineralization and metallogenesis. In their classification of Lake District mineralization Stanley and Vaughan (1982a) placed these deposits in a separate category of uncertain age. If the Wet Swine Gill Vein is genetically related to the Carrock Fell tungsten deposits it is possible that at least some of the other Lake District antimony veins may also be the result of early Devonian mineralization.

Elsewhere in the Lake District lead-rich veins, generally regarded as of early Carboniferous age, typically contain an abundance of antimony minerals as minute inclusions in, or associated with, galena (Stanley and Vaughan, 1982a). Fortey *et al.* (1984) have suggested that the later Sb-Pb-rich assemblage within the Wet Swine Gill Vein may result from a remobilization of earlier deposited antimony by lead-rich fluids during this early Carboniferous mineralizing episode.

The crusts of supergene minerals in the Wet Swine Gill Vein are almost certainly the product of oxidation since the vein was exposed to weathering.

## Conclusions

The Wet Swine Gill Vein provides the finest example of an antimony-bearing vein exposed within the Lake District. The work of Fortey *et al.* (1984) suggests that the earliest ore mineral assemblage in the vein is genetically linked with the early Devonian sulphide-rich mineralization in the nearby Carrock Fell tungsten veins. The vein is thus important in the understanding and interpretation of these deposits. The presence of a separate, later phase of lead-rich antimony mineralization provides evidence for remobilization of previously deposited antimony by early Carboniferous lead-rich mineralizing fluids.

**References**