Cameron Quarry, Cornwall

[SW 704 506]

Introduction

The small, disused Cameron Quarry, is situated to the west of St Agnes Beacon (see (Figure 7.30)). The quarry lies at the south-west end of the St Agnes–Cligga Head granite ridge and provides an exposure of the contact between country rock ('killas) and the St Agnes Granite. The quarry is situated within the St Agnes copper and tin ore-field, and consists essentially of highly contorted, somewhat arenaceous hornfelses of Devonian age, intruded in Permo-Carboniferous times by a granite cupola. This high-level magmatic intrusion led to development of a local but clearly defined metamorphic aureole. The igneous mass exposed in Cameron Quarry is a porphyritic granite. A quartz-feldspar porphyry ('elvan') dyke lies to the north of the quarry, and its ENE–WSW trend corresponds approximately to that of the major tin and copper lodes of the district. The igneous mass has experienced extensive greisenization, and although much of the cassiterite- and sulphide-bearing greisen has been removed by mining and quarrying activity, excellent sections are still available for study.

Description

Within Cameron Quarry porphyritic granite is partly covered by biotite-tourmaline hornfels, originally sedimentary rocks of Devonian age. The hornfels has been further intruded by granitoid veins, an elvan dyke, and quartz-cassiterite-bearing veins. Almost all of the visible igneous rock has been converted to a pervasive grey-green 'gilbertite' (muscovite) greisen, but near the hornfels contact red-pink and white potash feldspar megacrysts occur, which have been greisened and later argillized to varying degrees. The site provides an excellent example of endogranitic greisenization associated with the Cornubian Batholith granite(see Alderton, 1993).

Although mineralization is not prolific it is of importance to the understanding of ore genesis in the area. At various places in the east wall of the quarry, within the silicified greisen, small voids are partially filled with cassiterite or tourmaline, whilst in the west wall similar voids contain sphalerite and chalcopyrite. This small quarry is elongated in a NNE–SSW direction. At the north-eastern end, the degree of greisenization, although strong, is at a minimum, the rock being argillized, which may be of supergene origin. Voids in the rock variably contain tourmaline, apatite, cassiterite, wolframite and some copper-bearing sulphides. In the hornfels of the northern part of the quarry there are some cassiterite-bearing veins, which have been followed below surface by a small prospecting shaft. At the southern end of the quarry there are a number of late, steeply dipping veins, each less than 1 cm in width.

Mineralization and mining in the general area has been described by Dines (1956). Although not specifically referenced, Cameron Quarry lies on the edge of the Wheal Coates ore sett. The interpretation below is based on the detailed study of Cameron Quarry by Hosking and Camm (1985) (see (Figure 7.31)).

Interpretation

Field evidence clearly demonstrates that the quarry is sited on part of a cusp of porphyritic granite, emplaced at high level and from which granite veins and dykes invade the overlying hornfels. Jointing and marked fracturing allowed for fluid access, causing reddening of feldspars, and also greisenization of the whole rock. A set of microfractures to the south of the quarry permitted further mineralizing solutions to invade the rocks, causing extensive silicification, and tourmalinization. This was followed by a period of deposition of cassiterite, a little wolframite and some sulphides and fluorite. At a much later stage quartz and quartz-fluorite veins were emplaced. Supergene activity probably caused the relict feldspar to be argillized. From the available evidence in Cameron Quarry it appears essentially to be a small stockwork within a greisened porphyritic granite.

The massive greisen may be due to ponding of greisening agents under the impermeable hornfels. The important difference to the Cligga Head GCR site greisen is that there is no major joint-system, which is so characteristic of the Cligga Head outcrop. At Cameron Quarry a system of open, but very narrow, irregular fractures may have been important.

Hosking (1964) first presented a paragenetic sequence for mineralization at Cameron Quarry. He considered it to be similar to large hypothermal, complex mineral lodes, but which at Cameron Quarry were 'telescoped' into a vertical distance of a few metres. Hosking and Camm (1985) provided evidence that greisenization was followed by silicification, metallic mineral deposition and finally quartz-fluorite veins. Tourmaline is present as a magmatic mineral (as a brown variety) and is sometimes overgrown by a hydrothermal blue variety.

Hosking and Camm (1985) proposed that the greisen spread by a series of randomly orientated microfractures in the granitic cupola, caused by cooling and the increasing vapour pressure of the residual magma. The main feature of the greisen is that it is almost completely pervasive. It seems that the first stage of alteration of the porphyry resulted in the conversion of white feldspar to reddish feldspars. The feldspars of the cusp were replaced wholly or in part mostly by quartz and 'gilbertite'.

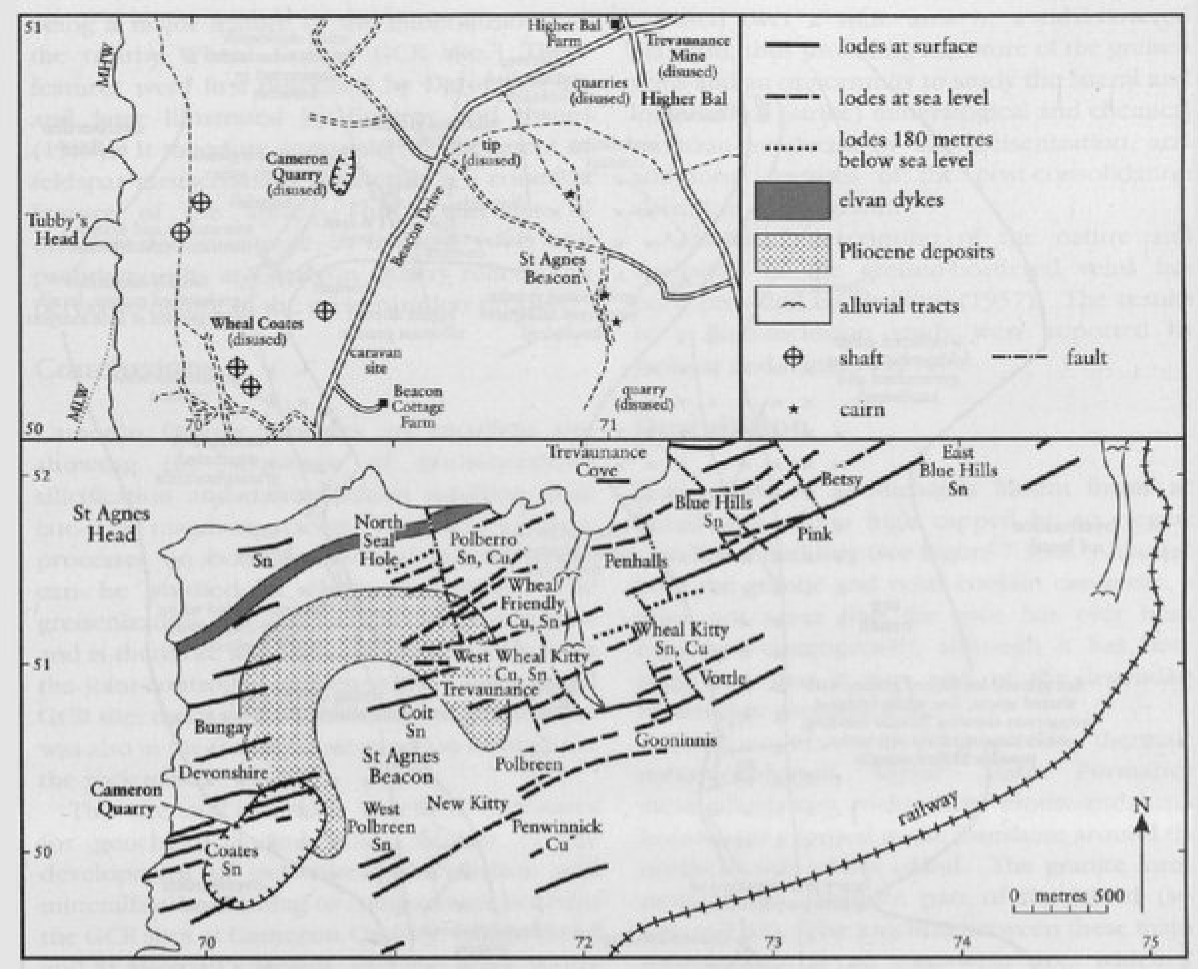
One of the most interesting features of the quarry is the degree of greisenization or alteration of the feldspars. It was Coon (1933) who described the occurrence of pseudomorphs of cassiterite after feldspar, thisbeing a major feature of the mineralization of the nearby Wheal Coates GCR site. These features were first described by Davey (1832), and later illustrated by Embrey and Symes (1987). It therefore seems that replacement of feldspar megacrysts by cassiterite is a common feature of the area. The occurrence of disseminated cassiterite in feldspar voids and pseudomorphs at Cameron Quarry reflects the pervasive nature of the greisenization process.

Conclusions

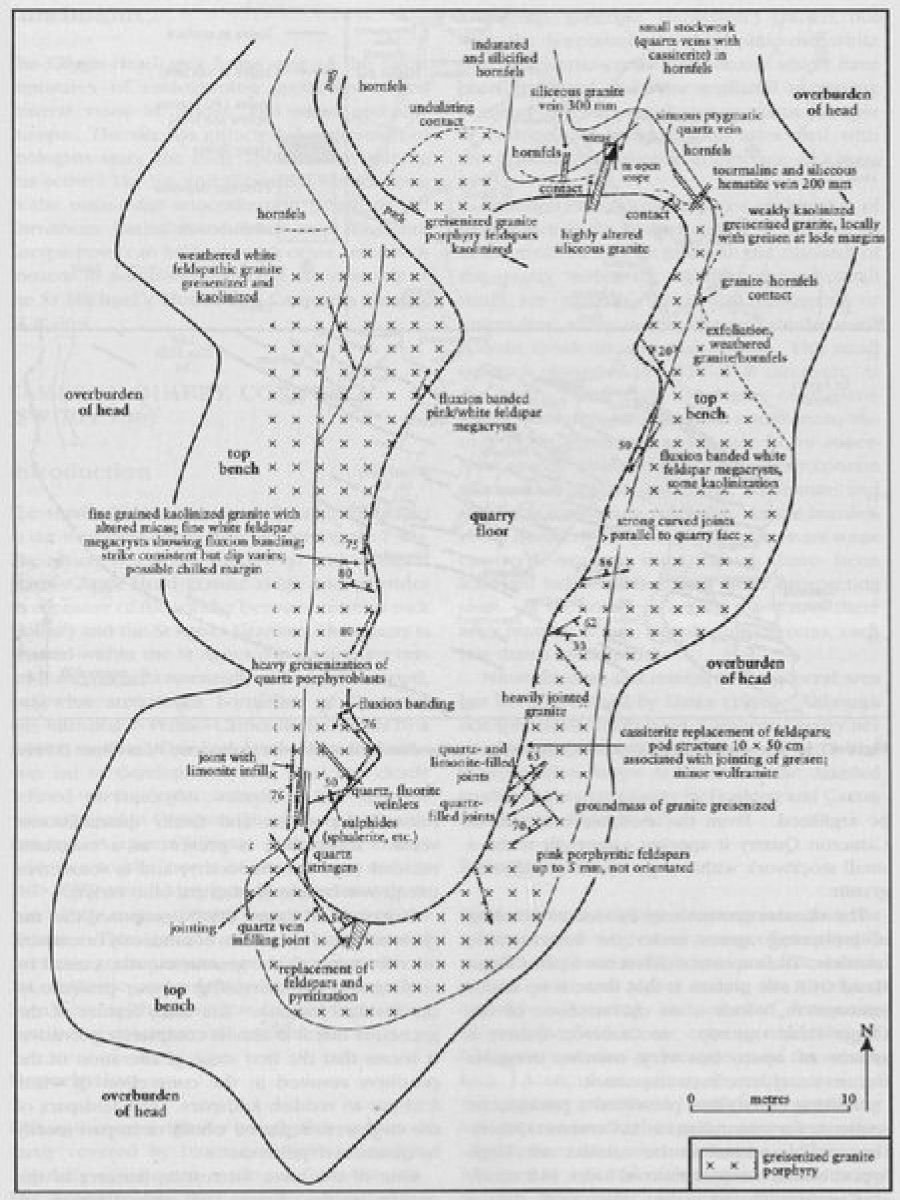
Cameron Quarry provides an excellent site showing the sequence of greisenization, silicification and mineralization resulting from late-stage magmatic activity. The effects of these processes on both granite and country rocks can be studied in close proximity. The greisenization at Cameron Quarry is pervasive and is therefore markedly different in style from the joint-controlled greisen at the Cligga Head GCR site; much of the subsequent mineralization was also in the form of dissemination throughout the rock mass.

The site still provides excellent exposures for geochemical and other studies of the development of pervasive greisenization and mineralization, leading to comparisons between the GCR sites at Cameron Quarry, Cligga Head and St Michael's Mount, and also other Southwest England greisens.

References



(Figure 7.30) Location map of Cameron Quarry showing the distribution of lodes in the area. After Dines (1956).



(Figure 7.31) Structure and mineralization in Cameron Quarry. After Hosking and Camm (1985).