Snailbeach Mine, Shropshire

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Introduction

Snailbeach Mine was the largest and most significant single mine within the West Shropshire Orefield, which occurs within an inlier of folded Cambrian and Ordovician rocks that are faulted against or unconformably overlain by Silurian and Carboniferous rocks to the north, west and south, and by Neoproterozoic Longmyndian Supergroup rocks to the east (Figure 4.32). Lead-zinc-barium mineralization occurs in E–W and ENE–WSW-trending faults that cut resistant horizons within the Lower Ordovician (Arenig) Mytton Flags Formation (Dines, 1958; Dunham *et al.,* 1978; Gradstein *et ed.,* 2004). Dines (1958) describes the geology in detail; the Mytton Flags Formation are about 1000 m thick, dipping at 50° WNW overlying the Stiperstones Quartzite Formation and underlying the Hope Shale Formation (Figure 4.32). At the present time (2008), the visible traces of mining are dominated by spoil heaps (Figure 4.33).

The West Shropshire Orefield is zoned, with the zinc ore mineral sphalerite at greatest depth, then sphalerite and galena at shallower depths, and barite and calcite closest to the surface. According to Dunham *et al.* (1978), between 1845 and 1913 the orefield overall produced 250 000 tons of lead ore, no more than 25 000 tons of zinc ore, and 500 000 tons of barite (mainly from Huglith Mine, see GCR site report, this chapter). Silver production from Snailbeach was not significant because of the low silver content of the galena ('1/2 ounce of silver per ton of lead'; Dines, 1958). Wall-rock alteration in the orefield associated with the mineralization has been dated at 355 Ma (meson and Mitchell, 1975), corresponding to an early Carboniferous age.

Description

Snailbeach Mine is the most recent of the Shropshire mines to close (in 1919), and dates back probably to the 12th and 13th centuries (Smith, 1922). There is evidence of Roman mine-workings at or near this location, as a Roman pig of lead was found in Snailbeach Mine (Dines, 1958). The mine won most ore from a lead vein ('Main Vein' or 'Snailbeach Vein') that reached thicknesses of over 7 m, most usually 3 m, with 'ore-shoots' of galena extending for up to 50 m along the length of the vein. As the mineralization occurs within the more competent sedimentary units, ore-shoots follow these down-dip (Dines, 1958). The vein itself dips at 60° S at depth, and is near-vertical close to the surface (Carruthers *et al.,* 1916). Workings extended for approximately 1 km along the length of the east-west vein, and to depths of 500 m below the surface (Smith, 1922). Parallel veins to the south ('South Vein') and north ('Black Tom Vein') were also mined (Dines, 1958). In addition to galena, sphalerite and barite, the barium carbonate mineral witherite is reported by Smith (1922), together with pyrite and minium (lead oxide — a weathering product). Calcite (Figure 4.34) and quartz are the gangue minerals. The ore raised at Snailbeach was crushed with some sorting and handpicking (of galena and witherite) on site, leading to extensive surface operations and spoil-heaps (Carruthers *et al.,* 1916). After picking, the ore was transported by rail to Minsterley.

Interpretation

The origin of the Snailbeach mineral deposits is constrained by geochemical as well as geological information which demonstrates a strong lithological control on the mineralization. The West Shropshire Orefield has yielded bitumens associated with the mineral deposits, in some respects similar to those reported for Windy Knoll (see GCR report, this chapter). Carruthers *et al.* (1916) reported the presence of mineral oil that 'oozes from cavities' in barite in the upper levels of Snailbeach Mine, and this observation is repeated in later descriptions of the mine (e.g. Dines, 1958).

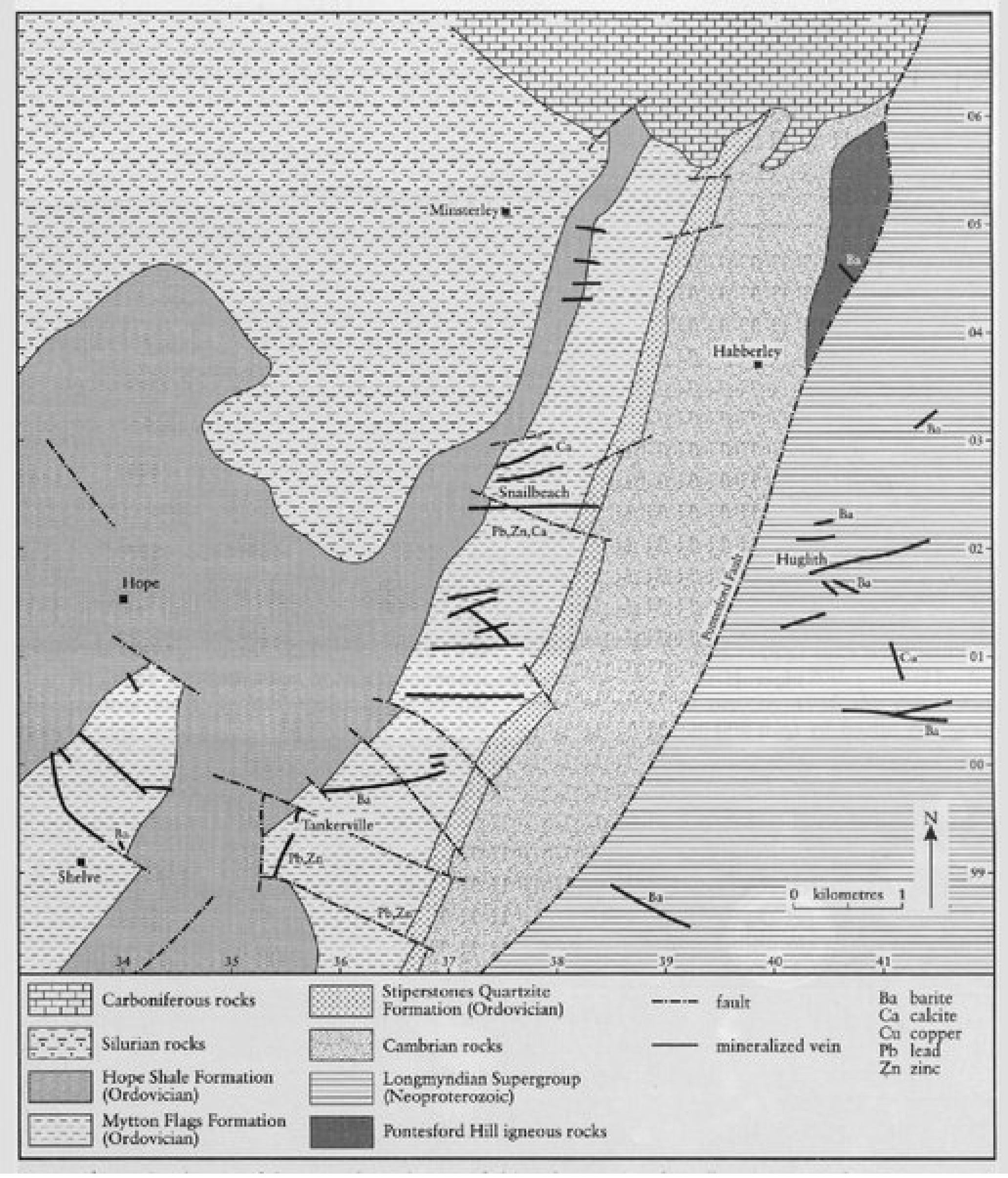
Parnell (1983) discussed the origin of the Snailbeach hydrocarbons in the context of the occurrences of these materials within the Shropshire region, concluding that the bitumen was formed from hydrocarbons that entered the fractured mineral vein system from Carboniferous source rocks to the north, and that what has been observed in the mine workings is a relic of a Carboniferous petroleum reservoir system. Using organic geochemical techniques, Robinson *et al.* (1986) confirmed a 'conventional' biogenic source for the bitumens, and Parnell *et al.* (1991) used biomarker evidence to demonstrate that the Snailbeach bitumens are associated with the English Midlands Carboniferous-sourced petroleum province, whereas other bitumens in south Shropshire and farther south are associated with Ordovician source rocks.

Other geochemical information that bears on the origin of the Snailbeach mineral deposits includes sulphur isotope data for mineral deposits of this age from across the British Isles (Pattrick and Russell, 1989). Although the precise locations of samples reported in this study are not given, data for 'west Shropshire' almost certainly include samples from Snailbeach. In any case, Pattrick and Russell (1989) commented that the $\delta^{13}S$ values for the West Shropshire Orefield are very similar, with galena having an average value of 6.1‰, sphalerite 9.65‰ and barite 17.81‰ (all relative to Canyon Diablo Troilite). These values are very similar to those of the mineral deposits of the Tyndrum Main Mine GCR site (Scotland), suggesting a similar origin. Sulphide was derived from underlying rocks whilst sulphate was derived from groundwater or surface water, precipitating barite in the upper levels of the mineralizing system.

Conclusions

Snailbeach Mine is an example of mineralization within Lower Palaeozoic rocks that has a complex subsequent history overprinted by the impact of a Carboniferous petroleum system. The distribution of the metal ore minerals is clearly controlled by wall-rock lithology, with sulphur derived from underlying formations. Barite mineralization is related to the charateristics and geochemistry of younger rocks, and may genetically be associated with petroleum reservoir processes.

References



(Figure 4.32) Sketch map of the West Shropshire Orefield in the vicinity of Snailbeach Mine. After Dines (1958).

(Figure 4.33) Spoil heaps at Snailbeach Mine. (Photo: J. Aumonier.)

(Figure 4.34) Calcite on spoil heaps at Snailbeach Mine. (Photo: J. Aumonier.)