An early medieval lead-smelting bole from Banc Tynddol, Cwmystwyth, Ceredigion

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ABSTRACT: Excavations in 2002 at Cwmystwyth, in Central Wales, found an ancient lead smelting site. There are remains of the medieval and the Roman periods. This paper describes in brief the excavation of the medieval lead bole (Timberlake 2002a) but also provides an archaeological reconstruction of this and details of an experimental lead smelt carried out at the site in 2003 (by ST). The analytical study (by LA) is of the medieval metallurgical debris excavated in 2002, mostly slag, but also ore and lead. The aim was to understand the raw material, the metal produced and the smelting process. The ore smelted was predominantly galena but with no detectable silver, showing it was probably exploited to produce lead. The extremely high sulphur content of the slag indicates that the ore was not roasted before smelting. It is argued that the medieval activity was small-scale, smelting a very rich ore. The furnaces apparently did not require much capital investment, enabling a short-lived and/or exploratory smelting operation.

Background

Geology and mineralogy
The hydrothermal ore veins in the area of Cwmystwyth in Central Wales have intermittently sustained a metal production spanning thousands of years, from the Early Bronze Age up to the recent past. The whole area is intersected by a large system of faults; mineralization occurred along ENE-WSW trending normal faults and breccia zones that cut across folds of early Devonian age in Lower Silurian turbidites and sandstones. The normal faults have 10- to 30m-wide, laterally impersistent, breccia zones. Dating suggests that the mineralization occurred in the Upper Palaeozoic (Dobson 1995).

At the Cwmystwyth Mines the main Cwmystwyth Fault, which post-dates the emplacement of the mineral lodes, runs parallel to and along the floor of the Upper Ystwyth Valley, and most of the old workings are in the hillside to the north of the fault. The fault itself is a conspicuous and major feature of the landscape in that it has influenced the course of the River Ystwyth and its U-shaped glaciated valley. The mineral workings, which extend for more than a mile along the north side of the valley, consist of the Mitchells, Pugh’s and Kingside (Level Fawr) Mines, and Copa Hill. Smaller workings abound, such as the Penguelan Mine immediately to the north of Banc Tynddol and the valley road. The principal mineralization involves lead and zinc (galena and sphalerite) with some copper (chalcopyrite), but nickel and antimony are also present in trace amounts. The following minerals have been recorded: galena, sphalerite, chalcopyrite, malachite, marcasite, native copper, pyromorphite, cerussite, hemimorphite, brochantite, dolomite (ankerite), quartz and linarite (Dobson 1995).

Prehistoric mining
The site is best known amongst archaeologists for its prehistoric copper mine, the Comet Lode Opencast, the latter exploiting a rich shoot of lead and copper (chalcopyrite) ore at the point where this vein outcrops at 426 metres OD on the side of Copa Hill (Timberlake 2003; Mighall et al 2000). Abundant stone hammers and massive spoil heaps containing some 5000 metric tonnes of prehistoric mine waste bear testimony to the large-scale nature of the operation, whilst archaeological excavations carried out here have proved the presence of wooden drainage launders, antler tools, withy handles, rope and basketry dating from the Early Bronze Age.