Bronze Age copper mining in mid Wales - fact or fantasy?

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Abstract

A current assumption is that mines in mid Wales dated to the Bronze Age were exploited for copper minerals. The possibility of Bronze Age mining of lead or lead/silver ores is explored. The possibility that the ores were not intended to be smelted to metal is also considered.

Introduction

Having been immersed, sometimes literally, in the old mines of mid Wales on and off for almost a lifetime, I have taken an active interest in discoveries concerning our Bronze Age ancestors in the region. However, the accepted view that the objective was at all times solely metallic copper is much open to doubt, and fundamental questions need to be asked. I suggested other possibilities in a chapter on pre-historic mining in *The Old Metal Mines of Mid Wales, Part 6* (Bick 1991, 53-61) and gave a short talk on the same topic to the HMS Conference in September 1998, of which this paper is an expanded version. It reviews the evidence and in particular points to strong indications of mining for lead ore in the Early/Middle Bronze Age. It also makes proposals to clarify the matter. Our understanding of this complex subject is as yet far from complete, but further fieldwork will in due course speak for itself. Mid Wales is the main region under discussion, although much of what follows could apply elsewhere, even abroad.

Not many years ago it was risky to attribute prehistoric origins to any mines in the British Isles. Some authorities could scarcely countenance any early mining without documentary evidence — rather like saying a man could not exist without a birth certificate. Others claimed it was obvious that subsequent workings must inevitably have destroyed any evidence. These armchair critics were eventually silenced, but the pendulum has now swung the other way, and by radiocarbon dating Early/Middle Bronze Age mines are almost too common. Due to the untiring efforts of Simon Timberlake (1988, 1992, 1994, 1995, 1996) and the Early Mines Research Group, at least five mines in mid Wales alone have now been assigned to this period — Cwmystwyth, Nantyreira, Llancynfelin, Nantyrarian and Tyn y Fron — and plenty more are suspected.

At the above sites, although lead ore is ever present along with copper ore, the orthodox view is that copper metal was the objective, no doubt encouraged by the prospect of elevating the metallurgical skills of the Ancient Britons to that of their Continental cousins. To quote Paul Craddock (1995, 11), it was 'the metal ... in fact being mined in antiquity', as if the matter was beyond question. But the presence of copper ore no more guarantees the claim than the discovery of Albert's cap proved he had been eaten by the lion. It merely raises one of several possibilities. We must also bear in mind that two or three products may have been sought at any one site, either concurrently or at different times. There is not, and perhaps never will be, a simple and certain answer.

Possible objectives for the Bronze Age miner were to extract copper ore for smelting, lead or silver/lead ore for smelting, or copper or lead ore for other purposes.

Copper ore for smelting

A number of objections must be overcome before this claim can be soundly established.

As far as records go, the five Bronze Age mines thus far proven have always been lead or zinc mines, with no tradition of copper mining (save one or two references to Copa Hill, Cwmystwyth), and no records of copper output even during extensive re-openings in the 19th century. Speaking of these sites in general, Timberlake (1995) admits that typically the copper ore 'is present only as a very minor constituent of the lead-zinc-silver veins of the area'. Earlier, he had wondered whether copper was always the goal (Timberlake 1988, 17) though latterly the doubt seems to have been dismissed.

But this paucity of copper ore presents no problem to one author, who in his anxiety to prove his case adopts an argument worthy of Lewis Carroll: 'clearly the lead was rejected ... the workings were picked clean [so] that no copper ore of any kind remains ... its absence from the tip suggests it was the mineral exploited' (Craddock 1989, 70). With such an argument you can prove anything - they

could have been gold mines. Any mining engineer will tell you that if no ore remains, it was never there in the first place. Even with modern technology, 100% recovery is impossible. However, nobody disputes that at all the five sites there is at least a little copper, so in this respect the author is pushing at an open door.

At Copa Hill, the only substantial Bronze Age mine yet discovered in mid Wales, the ancients did much work on copper/lead veins, but there is no real evidence of nicely defined ore-dressing areas as can be found at more historic sites. However, the ore must have been concentrated somewhere, unless it came solid out of the vein. As to the field evidence of what was sought, Timberlake and Jenkins (1997) admit that it 'could be interpreted in a variety of ways'. Nonetheless, they come down firmly in favour of copper.

Before leaving the issue of ore in mine waste, there does at times seem to be ignorance as to a characteristic of lode mining which is fundamental, and with important consequences. Broadly, there are two types of waste — development rock, which is mainly coarse barren material removed to reach the ore, and finer waste from the ore-dressing process itself. Usually, such waste-heaps are physically quite separate and distinct, and the difference must be recognised. Much depends on whether separation was a simple hand-sorting, perhaps in conjunction with some basic form of gravity concentration, either wet or dry. To learn something of the practical aspects of ore-dressing is the first essential (Bick 1989). But in trying to interpret waste dumps too minutely, there is always the danger of not seeing the wood for the trees. *Inter alia*, it must be borne in mind that the amount of ore discarded or left unworked could depend in great measure on the richness and reserves of the original lode and the value put on the ore. Unfortunately, these factors are virtually impossible to determine.

At this juncture it is worth devoting a few words to the important question of predicting how much ore, and of what quality, has been removed from prehistoric workings. Even in the rare cases where their extent is completely known and surveyed, such a quest is as futile as a stranger assessing what is missing from a burgled house. Nonetheless, many are willing enough to attempt it, and to conjure all sorts of scenarios from the results.

Due to glaciation in mid Wales having removed any rich secondary minerals, except for recent oxidation the only copper ore is copper-pyrites. But in this region it is generally low grade, about 5-10% of metal, and more difficult and complex to smelt than malachite. With a poor ore and little enough of it, would the ancients bother?

The absence of smelting hearths or slags is another hurdle, but one which cannot be said to apply to early iron-smelting. To remove the difficulty, the copper advocates have been driven to postulate smelting techniques which produce no slag. But how to achieve this with an ore heavily laden with iron is not explained, nor proven by experiment. William O'Brien (1997, 9), remarking on the absence of slag at a site in southern Ireland, has neatly dismissed the matter as 'not relevant ... as slags, furnaces and other such indicators of metallurgical processes have not been discovered in other Bronze Age copper mines ...' — a delightfully Irish solution to the problem. An obvious explanation, that the ores were never smelted, is rarely considered (Bick 1991). But in the desire to reach an answer it is natural to embrace what suits our opinions and to reject what does not. However, the approach is basically unsound and easily leads to false conclusions. It is also worth mentioning that iron and copper slags are not always easy to tell apart (Crew 1991).

Is there even one copper or bronze artefact that can be provenanced to a mid-Wales source?

Lead or silver-lead ore for smelting

It is now time to think the unthinkable — mining for lead or silver-lead in mid Wales in the Early/Middle Bronze Age. In the 1930s Oliver Davies thought that some at least of the sites were worked for lead, and he may yet be proved correct. Because of the abundance of its ore and the ease of reduction we may be sure that lead was the first metal smelted, though its potential was perhaps for a long time unrealised. In Mid-Wales such an industry continued for centuries into the present age, when copper ore was at best a minor by-product and rarely sufficient to justify working alone. Some authors have raised or pondered over the possibility of lead or silver/lead mining, but the idea has been cast aside as a heresy, and against current archeo-metallurgical orthodoxy. It is worth recalling that not many years ago the same rigid attitude applied to the concept of Bronze Age mining.

The evidence of Lewis Morris

Mine re-openings in the 17th century proved very profitable for silver (Boon 1981), and a hundred years later many of the workings were surveyed for the Crown by Lewis Morris, a man of great learning and ability. Some of his work has recently been published (Bick and Davies 1994) and is a valuable source material, as we shall see shortly. Morris quotes the richness of certain lodes as follows:

	oz/ton of metal
Blaen Cwmsymlog	70
Daren	40
Goginan	40-50
Twll y Mwyn	60

(These are troy ounces; 12 make 1lb troy, which weighs 373.24 g)

Such values are higher than those from deeper mining in the 19th century, perhaps due to enrichment in the upper parts of the lodes. In the Middle Bronze Age a content over 400ppm (about 13 troy oz/ton) was worth recovering, and thus the potential for silver, not to mention lead, is beyond question. Another very interesting question is the kind of ore-dressing the ancients employed, for it appears that dry dressing recovers much more silver than wet (Percy 1870, 96-7).

Morris was a very careful observer and had no doubt as to the antiquity of many of the workings, which he regarded as lead or silver/lead mines, not copper mines, and attributable to the Britons, *ie* pre-Roman. In particular, he recorded valuable details of a small open-working recently cleared out for inspection, called Twll y Mwyn, or mine pit, as follows (Bick and Davies 1994, 37):

'Twll y Mwyn ... not above nine yards in depth, where there is a rib of about an inch thick of the finest steelgrain'd silver ore, which produces about 60 ounces of silver in a ton of metal ... This mine seems to have been wrought in the beginning of times, and before the use of iron was found out, and when mankind knew the use of no tools but stones ...'

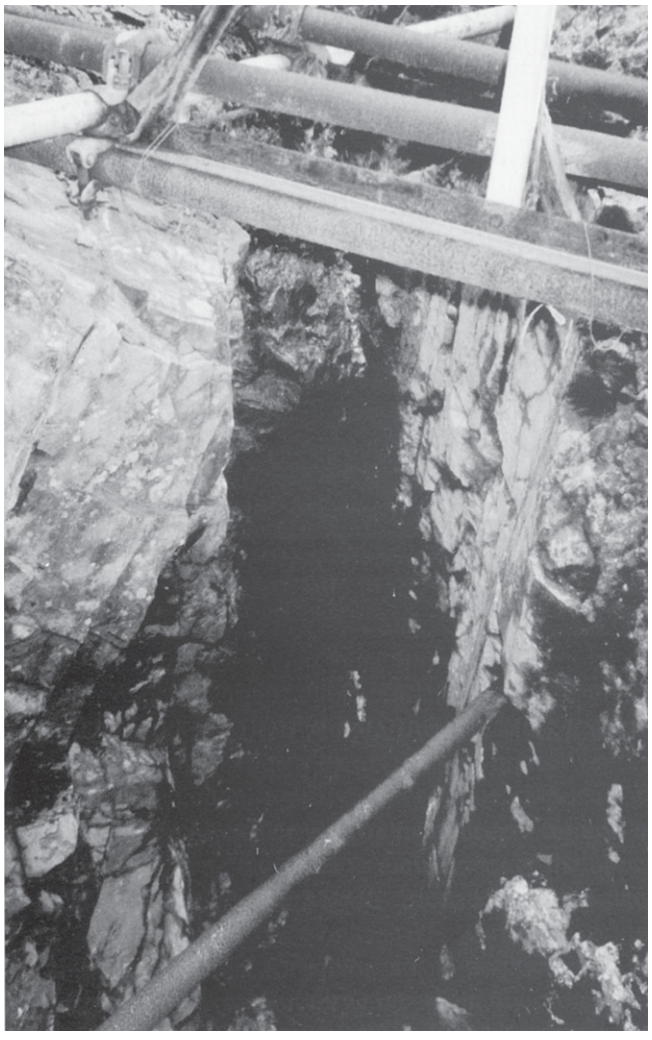

Figure 1: The forebreast of this stope in a Bronze Age mine at Copa Hill, Cwmystwyth, reveals a solid rib of galena from top to bottom, with every indication that it was the mineral worked. Note the smooth slickensided wall of the lode. (Excavation by the Early Mines Research Group)

The existence of the above source is well known, but unfortunately is rarely quoted or studied in full, which may go some way to excuse Craddock's statement: 'There is at present no evidence for lead mining in Britain coeval with the use of stone hammers ...' (Craddock 1995, 58). But short of finding a lead ingot in the workings, what better evidence could there be?

But if Craddock has erred, he has not converted lead mines into copper mines. One author feels able to state that Morris 'speculated that the stone hammers found in many *copper mines* [my italics] in mid Wales were used before there was knowledge of iron' (O'Brien 1996, 13). Another speaks of 'the primitive copper mine with stone tools at Twll y Mwyn' (Timberlake 1994). But Twll y Mwyn was a lead mine with no suggestion of copper, and the authority for this transmutation seems to be solely on the strength of an ancient copper mine nearby, Cwm Darren, as if by osmosis some of its ore would be sure to invade Twll y Mwyn. This is taking things too far, and is a further and perhaps unconscious instance of stretching evidence to suit a particular cause. The danger of such reporting is that having appeared a few times in print, the written word is taken for gospel, and passes for years and perhaps for ever as the truth.

As to the presence of stone hammers, in the British Isles they have proved uniquely associated with Bronze Age workings; however, this is not always the case abroad, and only time can tell if the rule is inviolable here.

The presence of galena

We have seen how galena on sites has been dismissed as a mineral clearly not wanted, but it seems impossible to deny that if copper ore suggests copper mining, then lead ore suggests lead mining. How could it be otherwise?

Turning now to lead ore *in situ*, at the Copa Hill Early/Middle Bronze Age site, the Early Mines Research Group has revealed by excavation a most significant feature, the importance of which appears to have been quite overlooked. It has every resemblance to a narrow stope in an old lead mine, in the form of a long rib of solid galena displaying itself, with no sign of copper, in the forebreast against the slickensided wall of a lode (Fig 1). Furthermore, a few feet to the south-west another vein with no trace of copper whatever has clearly been worked for galena; thus the conclusion seems inescapable that here we see lead veins worked and abandoned in antiquity. We

could hardly expect a better proof whether or not copper ore was worked at other places nearby.

Objections to lead or silver/lead mining

Objections seem to be mainly of a negative quality. Where are the smelting sites? But if such a question can be excused copper, why not lead or silver? In fact, several such sites in Mid-Wales have been attributed to the Romans, and may be older. One is at Dylife and another is at Cwm Buchan, several miles to the north. The exact sites need locating and urgent investigation (Bick 1977, 28; *Mining Journal* 1872, 685). But in any event, explanations are possible for a lack of smelting evidence:

- The lead was cupelled for silver, and the litharge so produced as a by-product could have been used for a red pigment or simply scattered.
- Lead is a substantial component of some Early/Middle Bronze Age bronzes, and if the galena was not smelted for the purpose, it may have been added directly to molten bronze, just as calamine was added to copper to make brass, and cassiterite added to produce bronze. It could be tried as an experiment.

As for artefacts, lead beads and votive axes of the period have come to light, but silver is very unlikely to survive 3,000 years or more in so damp a climate. The current belief that the Early/Middle Bronze Age is too early for lead or silver/lead ore mining in these islands is due for reappraisal.

Ore for other purposes

This has been the least considered option of all, but it cannot be dismissed, more especially for sites lost in the inhospitable and remote uplands of mid Wales. Indeed, as yet we have no proof that in prehistoric times the art and mystery of copper smelting had penetrated so far. Furthermore, it completely explains the absence of smelting evidence and slag at each and every site.

If not for smelting, the most probable uses for copper ore were for abrasives, pigments, cosmetics or decoration, perhaps connected in some degree with ritual. Galena, with its silver-like appearance, may also have had a role. The influence of ritual and superstition in pre-history was profound, although the matter is all too rarely addressed in relation to ancient mining. We need to remember that events not readily comprehended were explained by magic or the work of spirits or the gods. Thought processes were based much more on analogy than logic, as for instance, countless attempts to transmute brass into gold, purely on its superficial resemblance. Ignorance of the true nature of matter was total, Aristotle believing that metals were made of two vapours, one moist and the other dry. The degree to which strange ideas endured even in well-educated circles, is surprising. Lewis Morris was a firm believer in underground spirits or 'knockers', who 'have a language which we don't as yet thoroughly understand ... we only know they are our very good friends, and have actually discover'd us hidden Treasures ...' (Bick and Davies 1994, 6).

No archaeologist's education is complete without reading Sir James Frazer's *The Golden Bough* which deals at great length with the subject. But all too often in this age, logical reasons and scientific explanations are sought to the exclusion of all else. At heart, man is not, and never has been, a rational being. Other factors of a much more subtle kind must be given consideration, although such influences are notoriously difficult to prove (Budd and Taylor 1995). Above all, we must never suppose that primitive man thought and acted as an educated Englishman, or an understanding of our ancient ancestors will forever be denied us, no matter what wonderful new techniques science may provide.

Many years ago, Dr Adrian Boshier of the Museum of Man and Science, Johannesburg, published details of hematite mines in Africa more than 20,000 years old, worked on a very extensive scale solely for pigment, cosmetic and ritual purposes (Boshier 1969). The author also informs us that:

> 'Mining for ochre and other pigments and cosmetics such as specularite (shining hematite), galena, malachite and cimolite appears to have arisen from a spiritual awareness which developed in the middle Stone Age ... Man developed ceremonial occasions and employed pigments to paint his body, his weapons and also the walls of his caves.'

Boshier also states that the workings were backfilled to avoid offending the earth-spirits, and elsewhere we learn that stone hammers were found in turquoise mines of the ancient Egyptians, as early as the third Manethonian Dynasty (Evans 1872, 210). Nearer home, I read somewhere (the reference has been mislaid), that one of the bog-men disinterred in recent years was daubed not with woad, but with basic copper carbonate, or in other words, malachite. Also, according to Edric Roberts of the Great Orme mines, many stone hammers found on the surface have very defined wear lines suggesting a close fit between mortar and pestle for the purpose of grinding malachite to powder, perhaps for pigments or cosmetics. Azurite, which also occurs there, was widely used in the ancient world as an important colourfast blue pigment, and is still employed in paint-making. These two copper minerals are unknown in Mid-Wales except for secondary weathering, but copper-pyrites when finely ground also forms a pigment, of a dark green colour. Under the trade name 'Trent Sand' it has long been used in the jewellery quarter of Birmingham as an abrasive for polishing silver. And it is important to note that the authors of a paper on

Figure 2: Opencuts on a lead lode at Esgairmwyn. The mine is one of a number of workings not associated with stone hammers but nonetheless potentially very ancient, where detailed investigations could produce valuable evidence.

the subject warn that the presence of finely ground ore may not indicate preparation for smelting, but for polishing or similar purposes (Goodway and Constable 1995). The use of pigments derived from ores might also explain the rise of mining and its sudden inexplicable fall during the early/middle Bronze Age. Could a change in fashion or religion no longer have wanted them?

An acid test

We have seen above powerful evidence for the mining of galena in Bronze Age times, and altogether the case for reappraisal is overwhelming. Corroboration could be obtained as follows, based on observations by John Evans as long ago as 1872, that stone hammers are not only found at copper mines (Evans 1872, 208). The apparently unique association of stone hammers with Bronze Age mining, at least in these islands, is well known, and Pickin (1988) has listed eighteen sites where they occur in mid Wales, either by observation or report. This number has since been augmented and a diligent search is sure to reveal more. However, according to Pickin nearly all these mines contain lead ore, though often with some evidence of copper. But seven are solely lead or lead/zinc mines without copper: Esgairhir, Hafan, Nantycreiau, Esgairlle, Cwmsymlog, Rhiwrugos and Grogwinion.

It is obvious that if any of these lead mines turn out to be Bronze Age, the case for Bronze Age galena mining (for whatever purpose) is proven beyond all reasonable doubt, and that where both ores occur the case for copper alone is much open to question. But the copper lobby can still take heart because there are several mines — Nant Ricket, Parc Lodge, Panteidal — with stone hammers (thus presumably Bronze Age) and copper ore but little or no galena. Yet even here, their case rests on being able to prove the ore was smelted and not used for other purposes, which as yet seems an impossible task. Thus it can be seen that the more we examine it, the more complex the whole subject becomes.

At this point we return to Lewis Morris, and to a nineteen-page manuscript written with the object of attributing the origin of lead mining in Cardiganshire to pre-history (Morris 1744). Unfortunately it was never completed, but he includes a list of mines considered to be the most ancient: Esgairhir, Cwmsymlog, Grogwinion, Kaninog, Tal y Bont, Eurglawdd (Erglodd), Bryn llwyd (Bronfloyd), Darren, Cwmerfin, Bryn Pica, Pencraigddu, Cwmystwyth, Ystum Tuan, Keginon (Caegynon?) and Kennant (Ceunant). In historic times, nearly all these mines were solely lead producers, but Pickin records that stone hammers are linked with at least six — Esgairhir, Erglodd, Cwmsymlog, Darren, Cwmystwyth and Grogwinion. Clearly Morris was on the right track. (Esgairhir was supposed to have been a virgin mine opened in 1689, but there is strong evidence to suggest a loss of honour long before (Bick 1994), which again confirms Morris. He omits Esgairmwyn, another very ancient mine, but at that time it was not rediscovered).

Combining the evidence of Pickin and Morris, three purely lead or silver/lead mines stand out as prime candidates for the acid test of radiocarbon dating — Esgairhir, Cwmsymlog and Grogwinion — although Hafan, Nantycrieau, Esgairlle and Rhiwrugos are also high on the list. It is hoped this crucial investigation will soon be undertaken and at least one imponderable resolved. Furthermore, it would also be of great interest to investigate a few undoubtedly ancient mines where stone hammers have not been found. We are far from understanding the secrets of these ancient workings in the heart of Wales, but doubt is ever a stimulant to further revelations.

Finally, there is much scope for involving men of long experience of mining and ore-dressing in our endeavours, lest from our study or laboratory we lose touch with the hard practicalities of this ancient industry, where fundamentals have hardly changed at all.

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