Early Metal Mining and Production

Paul Craddock

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Review by Dr David Dungworth

The first generation of textbooks specifically dedicated to ancient metallurgy and typified by those of the late Ronnie Tylecote (1962; 1976; 1986; 1987) were produced over a quarter of a century ago and have dominated the subject until now. Paul Craddock's new book is the first of a 'second generation' which provides summaries of the current state of research. Such a summary is especially welcome for the period of the earliest copper smelting, a subject which has undergone radical reappraisal in the last decade. Craddock's position as head of metals research at the British Museum makes him well placed to assess such developments.

In eight chapters, this book covers the history and methodology of archaeometallurgy, mining and smelting (mostly of copper), and the processing of lead and silver, iron and steel, and volatile metals. The first chapter provides a useful discussion of early approaches to ancient metallurgy and the various scientific methods of investigation which have been developed since. The second chapter discusses early mining. It commences with a concise description of ore geology and proceeds to describe the ways in which ancient miners extracted ore. This benefits greatly from recent excavations at early mining sites in Wales and Ireland. In almost all cases, early mining is characterised by an economy of excavation: 'tunnels' and 'shafts' are simply emptied ore veins.

The third chapter explores the early use of native metals. Such naturally occurring metals, especially iron and copper, which do not require smelting or even melting, are obvious candidates for the earliest sources of metal. They are however rare and would have been insignificant sources once smelting was developed.

The fourth chapter on the origins of copper smelting is by far the most important. Over a decade ago, Craddock (1986) pointed out that the persistent lack of smelting debris at Bronze Age mining and habitation sites implied that the technology of extraction was radically different to the fluid slag smelting of more recent times. The disparity between the assumed use of this technology and actual evidence has since become compelling, due to the excavation of the limited metallurgical debris present at early Bronze Age mining sites and increased experimental work on alternative extraction processes. Craddock has gathered together archaeological and scientific evidence from a range of foreign language journals, excavation reports and conference proceedings and argues convincingly for a subtly different 'slagless smelting' process in the early Bronze Age.

The fifth chapter details ore processing operations (roasting, sorting and crushing) and the 'classic' fluid slag smelting process, which has been identified in many areas of the world from the late Bronze Age onwards.

Lead and silver are often discussed together (as they are in chapter six) because lead ores have frequently been the most significant source of silver. An interesting suggestion of
Craddock's is that the principal lead ore used in antiquity may have been the carbonate (cerussite) rather than the sulphide (galena).

The seventh chapter covers the smelting of iron ores, the production of wrought iron and the ways in which this can be converted into steel. Craddock’s inclusion of a curiously-shaped furnace from Sri Lanka illustrates the perils of reconstructing ancient furnaces from negative features (and of constructing typologies based on this limited evidence).

The final chapter summarises the processes used in the production of volatile metals, i.e. those which, at the temperatures required to reduce them, are present as gases.

*Early Metal Mining and Production* provides a clear summary of the present state of knowledge of many aspects of ancient metal technology. It is largely free from technical terms and concepts and so is accessible to general readers. Nevertheless, it will be of particular interest to students of archaeometallurgy.

This book, however, does suffer from two drawbacks: the focus on technology to the exclusion of other social factors and its overall scope. Technology is treated as an entity separate from social and economic issues. As a result, the 'really big' questions (why did people start to use metals, why does technology change ?) are not explored. Only when technology is placed within its social, economic and symbolic context will such issues be addressed. It also does not cover the production of all metals in all areas of the world, although such a book would be very long and perhaps beyond the competence of a single author. The early iron and zinc industries of China and India are covered but copper is not. The use of native copper in North America is explored in some detail but the smelting and alloying technology of South America is barely mentioned. The criteria for choosing which areas, metals and eras were dealt with is not made clear.

*Early Metal Mining and Production* is a welcome summary of recent research on archaeometallurgy, especially the chapter on the earliest smelting technology in the Old World, and is sure to become a classic text. The book is written in a plain style which will make it accessible to non-specialists.

**References**


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