



Metalworking Evidence and the Management of Archaeological Sites

This datasheet is aimed at field workers in the early stages of projects, when the possibility of finding the remains of metalworking activity should be considered. The value of forward planning is stressed; where metalworking has been a significant activity on a site, then postponing identification of the evidence until the post-excavation phase is unacceptable. The advice is sequenced for different stages of the project so that requirements can be considered in advance, training implemented and contact with specialists arranged. For further guidance on the contribution that can be made by an archaeo-metallurgical specialist, the English Heritage Guideline (Bayley et.al.2001) is recommended. Specific procedures are covered in more detail in other datasheets of this series and the reader is directed to these.

Archaeological sites frequently produce evidence of metalworking in the form of structures, tools or, most commonly, slag and other debris. However, such evidence can be difficult to interpret; it appears to offer little reward in return for much effort and is too frequently overlooked or inadequately investigated. In fact much debris is diagnostic, allowing identification of processes as fundamental as iron smithing or as specialised as silver refining. It can provide evidence for both the nature and scale of a series of mining, smelting, refining and metal fabrication trades and aid understanding other structural and artefactual evidence found on the site. Furthermore it may be crucial in understanding the economy of a site, the technological capabilities of its occupants and their cultural affinities.

It is vital that metallurgical remains

are identified and dealt with efficiently and appropriately, so that important assemblages are fully investigated, while excessive time and resources are not wasted on material that does not warrant detailed attention. Archaeo-metallurgy is barely covered in many university archaeology degrees and, with few other opportunities for training, it is not surprising that many archaeologists lack confidence in this field. These datasheets are intended to provide a quick briefing for field workers, with practical advice in an readily available format. They do not remove the need for specialist input, but will provide field workers with a better understanding of the nature of metalworking remains and guidance on when a specialist should be called in.

Project planning

When significant metalworking evidence can be predicted in a fieldwork project, it is essential that metalworking specialists are consulted in planning these. Their advice should be incorporated into both the objectives and the methodology of the planning design (and into the brief or specification where applicable). If the site is thought to have been primarily metallurgical in function, then archaeometallurgical provision should be a major factor in the project design. Even when a site is not thought to be primarily metallurgical, some contact with the specialist is desirable. Many aspects of metal production have received remarkably little archaeological attention (English Heritage 1991).

As well as these datasheets (keep a set in the finds hut) and other literature, the HMS runs occasional 'slag days'

which combine talks with hands-on examination of debris from some of the most frequently encountered processes.

Prior to excavation, **desk based studies** may indicate the likelihood of metallurgical activities on site. Investigation of the local **geology** may identify metal ore deposits.

Documentary and **place-name evidence** may be highly informative, particularly for medieval and later sites, though earlier sites may be implied by less specific names such as 'Blackland field'.

Field survey

A range of techniques may provide evidence for metallurgical activity (Datasheets 4 & 9). Operations involving heating may reveal themselves as fuel or ash-stained soils, visible through aerial photography and field walking. Surface collection should at least record the presence of charcoal, coal, ore, slag and other debris.

Geophysical survey (Datasheet 4), especially using magnetic techniques (such as magnetometry and magnetic susceptibility) is particularly suited to detecting the remains of high-temperature processes, but ensure that you are not only supplied with plots that have been 'filtered' or 'de-spiked' to suppress the visual impact of highly magnetic components.

Excavation

Many kinds of metallurgical structures and debris are distinctive in appearance, but may not always be recognised without prior familiarisation and the implementation of a systematic routine for recovering and processing the material (Datasheet 9). When a site is known to be of metallurgical

significance then using staff who already have relevant experience is better than learning on the job.

Whilst slag, ores, crucible and furnace fragments are large enough to be easily recognised, some of the more important evidence in the form of hammerscale from iron smithing (Datasheet 10), is too small to be noticed during trowelling. A bar magnet provides a quick and easy means of checking exposed deposits and identifying this material in flotation/sieve residues. Other inexpensive equipment includes a ceramic streak plate to identify fayalitic slag and a hand lens to assist in the recognition of small fragments of material. Heavy grade plastic bags or tubs will be required for packing bulk slag.

The metalworking specialist will be able to suggest appropriate sampling strategies, put together a site reference collection for the field workers and advise on cleaning and packaging procedures. The ideal would be to keep all excavated bulk material and to take frequent soil samples. In reality, space, time and money often prohibit this policy. The approach will be different for a primary production site where very large quantities of waste can be expected, compared to a secondary working site where debris will normally be on a more modest scale. The scale of metallurgical operations is also likely to vary greatly with the date of the site. Advice on this area is covered in greater detail in Datasheet 9. Early consultation with a specialist, generally as a site visit, should help to minimise delays and cost, whilst providing an opportunity to gain an early understanding of the nature of the evidence.

Assessment of potential for analysis of the material

Assessment needs to be carried out by a suitably experienced person. On sites where little evidence of metallurgical activity is present, the assessment may be the final opportunity to examine the material. More complex and important assemblages may be assessed in far less detail, with the expectation that an analysis phase will follow. Such an assessment will examine only a sample of the material, providing an overview of its importance based on this sample and recommending procedures for further work. The specialist undertaking the assessment should be aware of the nature of the excavation, including any relevant structural evidence, and should be provided with details of the contexts where the debris was found. Associated metal and ceramic artefacts may be of considerable relevance to the interpretation of waste and debris. This applies particularly to ingots, bar stock, unfinished artefacts, metalworking tools, crucibles and moulds. Where other specialists are involved with related materials such as the analysis of metal or ceramic artefacts, it is important that they are encouraged to communicate.

Analysis and report writing

As well as examining material with a trained eye, the specialist will very often need to use physical and chemical analytical methods of varying complexity and cost. It is essential that good communications between the metallurgical specialist, excavator and other specialists working on the project are maintained to ensure that analytical results are meaningful and time and money are not wasted.

Publication

The results of analytical work should be included in the excavation report, but it may be considered appropriate to list some supporting data in appendices, on CD, or even for it to remain in archive. In addition it may also be appropriate for work with a primarily archaeometallurgical interest to be published on its own. The needs of each readership have to be kept in mind and publications should include definitions of terms and classifications, particularly as the latter may vary between specialists. Close links between the specialist and the editor, including opportunities to comment on the final edited text, should ensure clarity in the final publication.

References

Bayley, J, Dungworth, D & Paynter, S. 2001 *Archaeometallurgy* London; EH (Centre for Archaeology Guidelines 2001/01).

English Heritage 1991 *Exploring our past: strategies for the archaeology of England*, Historic Buildings and Monuments Commission for England.

David Starley
Royal Armouries Museum, Leeds

May 2002