

ARCHAEOLOGY DATASHEET 101

The archaeology of metalworking sites: an introduction to the field evidence



Summary

Evidence for past metalworking survives in the archaeological record in a number of different ways. Many of the larger metalworking sites survive as distinct landscape features due to the construction of structures, as well as the excavation and movement of large volumes of soil and rock. Archaeological excavation frequently recovers features and structures associated with metalworking as well as the associated durable residues and waste materials.

General issues

The mining, smelting and working of metals will leave traces, both as above ground features and as buried remains, which can be detected and analysed by archaeologists. In very general terms earlier mining or metalworking will leave relatively slight traces while later activities (especially those carried out since the beginning of the 18th century) will often dominate the local landscape long after the metalworking ceased. Mining will often have the greatest impact on a landscape and will leave the most tangible archaeological features. Metal production, especially smelting, can leave significant physical remains but the scale of these is variable. The working of metals will usually have the least impact on the landscape and archaeological record. Nevertheless, some post-medieval metalworking industries have had a dramatic impact on the landscape (e.g. brass working in Bristol and the steel tool industries of Sheffield).

The scale of the archaeology of metal mining and working can also vary depending on the metal(s) in question. Iron mining and smelting will often have the most impact while non-ferrous industries, and precious metal industries, the least. The nature of the archaeological evidence for metal mining and working varies depending on geological and geographical context. Mining only takes place where suitable ores outcrop at the surface (or are accessible from the surface). Smelting may take place close to the mine site or may be transported to sites closer to a fuel source or to a source of power for the bellows (e.g. suitable river valleys). The working of metals may occur in almost any context, however, some of the substantial remains from the Industrial Revolution are found along river valleys where water power was available and close to urban centres where labour was plentiful.

Landscape features

Metal mining and working will leave varying archaeological remains but in some cases these may be so substantial that they will survive as significant landscape features. This is particularly apparent in upland regions, where human settlement and agriculture have not removed other landscape features. In lowland areas, such features are much more likely to have been

obscured by later activity. The entrances to most mines are fairly small and, once they have ceased production, these entrances have usually been sealed up. Some quarries and open-cast mines may survive as large landscape features, although some may have been used as convenient places to dump refuse. The use of water for driving mills and other equipment, as well as for prospecting (hushing) and washing ore, can often be detected through the earthworks constructed to collect and distribute water.

Mining will often involve the excavation of substantial volumes of earth and rock. Waste rock (gangue) will sometimes be dumped in heaps around the mine and these can dominate the local landscape. In many cases where a mine has been closed for some time, attempts will have been made to restore the landscape to something like its pre-mining state. Unless undertaken carefully and with suitable archaeological recording, such landscape remediation may destroy evidence for early mining.

Field evidence for metalworking also takes the form of purpose-built structures. These may include structures directly linked to mining, such as buildings which housed plant such as pit-head gear, winding engines and drainage pumps, as well as offices, baths and other ancillary structures. Buildings and structures associated with the processing of ores may also be found close to metal mines. The improvement of ores by the removal of some gangue (beneficiation) can include crushing and washing. Direct evidence for hand crushing is difficult to recognise but machine-powered stamping and crushing mills will leave more tangible evidence (especially where these are water powered). Washing would tend to remove the lighter gangue and concentrate the denser metal-bearing rock and can be detected through the survival of tanks and channels.

The smelting of ores took place in hearths or furnaces of different sizes and shapes depending on the nature of the ore and metal as well as the period of use. In addition, the nature of the ore exploited will have placed smelting constraints in terms of the temperatures and redox conditions required, and these process parameters will affect the nature of the structure as well as its durability. In broad terms, early metal smelting hearths or furnaces will be small with limited superstructure using mostly clay and so often not particularly durable while later furnaces tend to be larger, made of stone or refractory brick and so more robust. Later furnaces employing water power for the bellows will be sited next to a suitable source of water and be associated with dams, leats and other features used to manage that water.

Archaeological features

All of the earthwork and built structures and features described so far in this datasheet can also be encountered as archaeological features. Their identification and

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appropriate recording should make use of the best available archaeological techniques but the quality of the data acquired will be significantly enhanced by access to expertise in the particular metal industry in question. This expertise needs to be relevant to the archaeological context, in particular the right time period. The changes in metalworking technologies over the past millennia are fundamental in some cases, for example expertise in iron bloomery smelting (HMS Datasheet 301) is likely to be of rather limited use in understanding a site devoted to the Bessemer process (HMS Datasheet 302).

Process residues

Almost all metallurgical processes will tend to generate waste materials or process residues. Depending on the nature of the metalworking site this may include crushed gangue, slag, refractory materials from furnaces and crucibles, as well as fuels ashes and other materials. In some cases these process residues will be *in situ* but in most cases the need to manage the accumulation of waste will mean that such materials have been moved and are now *ex situ*. In extreme cases (especially for more recent industries), the very large volumes of a process residue produced will have meant that they were almost all removed from the metalworking site. *Ex situ* dumps of process residue may form substantial made ground deposits on sites with no known metallurgical history.

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