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Summary

A late Iron Age/early Roman settlement site from which a number of important metalwork finds has been found by metal detector was excavated and 11kg of metalworking debris recovered. This showed that both iron smithing and the melting and casting of non-ferrous alloys had been carried out on the site. The production of salt may also have taken place.

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EXAMINATION OF SLAG AND OTHER METALWORKING DEBRIS FROM SAHAM TONEY, NORFOLK, 1995

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Introduction

Following the discovery, by metal detector, of a rich collection of late Iron Age or Romano-British finds, the site at Quidney Farm, Saham Toney was surveyed by magnetometer. Six trenches were then excavated by the Norfolk Archaeological Unit between January and February 1995. Pits and a large circular enclosure, revealed by the geophysical survey were confirmed by the excavation, along with other evidence of enclosures and structures. Pottery of mid to late 1st century date was reported to have been found in most of the excavated features. The finds included approximately 11kg of metalworking debris which was sent to the Ancient Monuments Laboratory for examination.

Non-ferrous metalworking evidence

The non-ferrous metalworking evidence at the site consists of 1217g of mould fragments and 122g of crucible fragments, mostly in small pieces. Much of the material labelled as 'crucible', particularly the wheel thrown fragments, shows no sign of high temperature use or metal contamination and may not be from crucibles.

The mould fragments are highly abraded and provide little evidence about the type of artefacts being cast; there are some fragments from the matrix for a curved artefact. The ingate areas of at least three moulds are extant. Investment moulds were normal in the Iron Age but not later (pers comm J Bayley). However, the Saham Toney material does not allow an unequivocal statement on whether investment or piece moulds were being used. No copper alloy traces were observed on any of the mould fragments, so analysis (*eg* by X-ray fluorescence (XRF)) is unlikely to be helpful.

The crucible fragments are from fairly thick walled vessels, with reduce-fired fabric and a small amount of white or reddish slagging inside. As far as can be determined from the small amount of material, these are comparable with the triangular types of crucibles known in the Iron Age, but which continued in use during the early Roman period. These were heated from the top. XRF of one of these fragments showed zinc, tin, lead and a small amount of copper. However, the apparently high zinc analysis does not imply large amounts of zinc in the alloy, but results from the high volatility of the element during melting.

The 2655g of fired clay and 'furnace debris' may have been produced in any of a wide range of high-temperature processes; there is no evidence to tie it in with either the ironworking or the copper-alloy melting and casting at the site. However it is possible that some of the rather bleached looking fragments could be briquettage from salt production.

Ferrous metalworking debris

9.5kg of 'metalworking debris' was examined, of which 7.5kg derived from a single context (54). Of this material a large proportion was diagnostic of the smithing (ie hot working) of iron. **Smithing hearth bottoms** are recognisable by their characteristic plano-convex form, often having a rough underside and a smoother, vitrified upper surface hollowed as a result of downwards pressure from the air blast of the tuyère. Compositionally, hearth bottoms are largely fayalitic (iron silicate) and result from high temperature reactions between the iron, iron scale and silica from either the sand used as flux or from the hearth lining. Further evidence for the smithing of iron was provided by small amounts of **flake-hammerscale** which had been retained in the soil in the finds bags. These micro-slags consists of fish scale like fragments of the oxide/silicate skin of the iron dislodged during hot working. Smaller amounts of fayalitic slag, although termed **undiagnostic ironworking slag,** probably also derive from the smithing of iron. It should be noted that the quantities of slag recovered are small, probably resulting from the smithing of several kilos of iron, therefore the evidence for iron-working at least may be restricted to very short-term activity.

A lesser proportion of the material was classified as either **vitrified heath lining** or **cinder**. However, this could have derived from either iron smithing or non-ferrous alloy melting or working. The former material forms as a result of a high temperature reaction between the clay lining of the hearth/furnace and the alkali fuel ashes or fayalitic slag and may show a compositional gradient from unmodified clay on one surface to an irregular cindery material on the other. **Cinder,** comprises only the lighter portion of this, a porous, hard and brittle slag formed as a result of high temperature reactions between the alkali fuel ashes and either fragments of clay which had spalled away from the hearth/furnace lining or another source of silica, such as the sand used as a flux during smithing.

Conclusions and potential for further work

Much of the material examined was morphologically diagnostic, allowing the nature of the high temperature technologies to be determined: The smithing of iron, the melting and casting of copper alloys and possibly the production of salt. Further analytical work on the debris is unlikely to provide significant information beyond this and it is therefore not thought to be justified, particularly given the small quantities of materials and lack of structural remains of any metalworking features.

Storage of slag

Ironworking slag, being predominantly fayalitic, is not prone to deterioration and requires no special storage treatment. It is recommended that all the slag and other material should be saved.