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THE EXAMINATION OF METALLURGICAL DEBRIS AND OTHER TECHNOLOGICAL MATERIAL FROM ROMSEY, HAMPSHIRE.

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Summary

Metallurgical debris and other technologically related material excavated from four sites in Romsey was examined and a selection of it analysed qualitatively by energy dispersive X-ray fluoresence. The results suggest that bronze casting was carried out on, or near to, three of the sites in the Medieval or Post Medieval Periods. In at least one case the object cast was probably a cauldron.

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THE EXAMINATION OF METALLURGICAL DEBRIS AND OTHER TECHNOLOGICAL MATERIAL FROM ROMSEY, HAMPSHIRE

Introduction

Material excavated from four sites in Romsey between 1972 and 1979 and thought to relate to various technological activities was examined and a selection analysed qualitatively by X-ray fluorescence (XRF). Most of the material was metallurgical debris associated with copper alloy casting.

The metallurgical debris has been divided into three groups; fired clay mould fragments, casting waste (corroded splashes and dribbles of metal from the casting process), and accidental fuel ash (alkali silicate) slags which have incorporated traces of metal from the furnace environment. The distinction between casting waste and fuel ash slag is somewhat artificial since a range of slag types exist with widely varying alkali silicate and copper alloy contents.

Church Street

Several kilograms of material were examined from this site, the great majority of which was recovered from an area thought to have contained a 17th Century bronze foundry. The material consisted of copper alloy casting waste and fuel ash slag associated with copper alloy working, as well as fragments of fired clay mould.

Copper alloy casting waste and fuel ash slag were recovered from twenty-two contexts most of which were firmly associated with the 'bronze foundry'. A selection of this material was analysed by XRF. The results suggested that virtually all of the casting waste was bronze, although differences in composition were noted with respect to lead and tin content. It is unlikely that this compositional variation was intentional and it probably reflects a lack of precision in preparation of the alloy as well as differential corrosion in the burial environment.

Half of the contexts from which casting waste was submitted also produced fuel ash slag associated with bronze working and in six cases furnace lining material was also noted. The presence of this material provides some evidence for the operation of a bronze melting furnace in the area of the excavation, however it should be remembered that the volume of furnace lining and fuel ash slag recovered constitutes only a small proportion of that which would originally have been present in such a structure. A small piece of copper alloy bar ingot (from context 2099) was also analysed qualitatively by XRF and found to be a copper/lead alloy.

Almost 15kg of fired clay mould fragments were recovered from the Church Street site, almost all from contexts closely associated with the 'foundry', over 13kg of it coming from a single context (1019). Only a few of the more diagnostic fragments were

submitted to the Laboratory for examination. All of these fragments were of the same porous, low density, fabric originally tempered with finely divided vegetable matter. The majority of the pieces were oxidized fired towards the outer surface with a thick reduced fired band extending from the inner surface. In all cases the inner surface was coated in a fine white-firing clay "slip", presumably added to give a better finish to the casting.

Moulds constructed from material of this type were used to cast large objects ranging from bells to cauldrons and skillets to monumental plaques. Several of the mould fragments from Church Street are quite characteristic and suggest that at least some of the fragments recovered probably originated from a cauldron mould. Two fragments are particularly diagnostic and join to form a handle of circular cross section featuring a near right-angle bend. A further fragment is indicative of a roughly rectanngular leg attached to a bowl shaped vessel. A cauldron of similar form to those illustrated in Tylecote (1976,74) is suggested, however in this case the vessel cannot have been completed since the handle mould would have had to have been broken to free the casting. Two other fairly diagnostic fragments are both rims, one from the core (inner part) and one from the cope (outer part) of the mould. Both indicate a vessel with a rim diameter of about 20cm.

The surfaces of all of the mould fragments submitted were analysed by XRF to determine if possible the nature of the alloy cast. Unfortunately the survival of metal traces was poor and although it could be concluded that traces of copper alloy were present on all of the fragments only in one case, where the alloy was identified as a leaded bronze, was it possible to be more specific.

The pieces of mould examined were non-diagnostic with respect to the casting method. The method may have been similar to the lost wax technique described by Theophilus for Medieval bell casting (Hawthorne & Smith 1963). This involved the construction of the pattern in wax or tallow on top of a clay core. The cope was then constructed in clay over the pattern and strengthened with iron bands. Finally the whole structure was heated to remove the tallow prior to casting.

An alternative method of casting cauldrons, by the two piece mould with core technique, is suggested by Tylecote (1976). This would have allowed the pattern to be constructed in clay and merely greased with tallow. The technique involved the construction of flanged joints between the mould sections and none of the mould fragments examined displayed such joints. However the pieces examined constituted only a very small proportion of the mould so that the absence of such fragments cannot be taken as evidence for their non-existance.

A sample of semi-concreted red-brown residue from a 16th Century vessel was also examined. XRF analysis detected only normal soil constituents with a high iron signal. The material is probably an iron-rich sand, possibly formed as a result of iron panning due to drainage abnormalities within the vessel.

Osborne House, Church Street

A fragment from a large bowl-shaped vessel approximately 30cm in diameter, and containing a white deposit on its inner surface, was examined. The vessel was mineral and grog tempered, was oxidized fired, and was possibly originally used as a cooking pot. XRF analysis of the white deposit indicated the presence of large amounts of lead and microscopic examination revealed deposits of soft white metal. The vessel had probably been used for lead melting.

A lead glazed Albarello vessel was also examined and the rim analysed by XRF in order to attempt to identify any remaining traces of the contents. In particular it was thought that the vessel may have been used to store mercury. Only lead and normal pottery and soil constituents were detected. The interior of the pot could not be analysed, however traces of mercury are unlikely to have survived as mercury would only have been physically rather than chemically bound to the pot surface. There is no positive evidence that this vessel ever contained mercury. Recent work in the Ancient Monuments Laboratory on a group of similar vessels from Chelmsford gave very similar results; no mercury being detected on any of them.

Romsey Abbey

Copper alloy casting waste and a few small fragments of fired clay mould were examined from this site. Most of this material is thought to be residual in nature, however it was considered possible that it related to bell-founding, possibly associated with the Norman Abbey.

The few small pieces of copper alloy casting waste were analysed by XRF and the alloy identified as bronze in all but one case where the high zinc signals suggested that the alloy might be more appropriately classified as a gunmetal. XRF results suggested that most of the material contained some lead. One piece gave a particularly high tin signal.

The four small pieces of fired clay mould were very similar in apperence to those already described from Church Street. They were tempered with finely divided vegetable matter which had burnt out giving a porous structure. Two show a gradation of firing conditions similar to the Church Street fragments, however two of the Romsey Abbey fragments are oxidized fired on their inner surfaces. All of the fragments have a white-firing clay slip on their inner surfaces.

All of the mould surfaces were analysed by XRF for any surviving metal. Traces of Copper, lead, and zinc were detected on three of the fragments, however the weak XRF signals suggest that the survival of metal traces is poor and the nature of the alloy cast is not clear, although it was almost certainly a copper alloy.

The morphology of the mould fragments is non-diagnostic, althought the slight curvatures of the surfaces do suggest that

the fragments may have originated from both the core and the cope a fairly large mould.

Although it is possible that some of the material submitted from Romsey Abbey originated as a result of Medieval bell-founding, analytical results for the casting waste tend to indicate bronzes which are too low in tin and too high in lead to be bell-metal. Bell-metal is always high in tin (usually over 20% Sn) and the presence of anything more than trace levels of lead in the alloy would have a severely detrimental effect on the tone of the finished bell. Bronze alloys which were lower in tin and higher in lead were used to cast other large objects such as cauldrons and skillets and the form of the mould fragments recovered would be compatible with the casting of such objects.

Two small unstratified fragments from a copper alloy casting were also examined. They had a maximum wall thickness of 3mm and came from the rim of a small bell or vessel with a maximum diameter of about 60mm. XRF results suggest that the alloy is a high-tin bronze (bell-metal).

A sandy material containing small green waxy lumps and found as a deposit on the inner surface of a Purbeck mortar fragment (from context 139) was also submitted for examination. XRF analysis detected only normal soil constituents and slight traces of lead. The nature of the deposit remains unknown.

King John's House

Ten small fired clay mould fragments, recovered from two features interpreted as 18th Century casting pits, were examined. Again these were similar to the fragments recovered from Church Street being tempered with finely divided vegetable matter and fired to form a porous fabric. All are either reduced fired or display the gradation of firing conditions observed in the Church Street material. All have white-firing clay slips and two display small corroded metal droplets.

Morphologically none of the pieces submitted were diagnostic, although a number had slightly convex surfaces.

The surfaces of all of the fragments examined were analysed qualitatively by XRF, however the survival of metal traces was poor, even where corroded metal deposits were visible. Only traces of Copper, zinc, and lead were detected indicating that the metal cast was a copper alloy. As neither the shape of the object nor the alloy being used could be determined it is not possible to determine whether or not the object cast was likely to have been a bell.

A reduced fired clay fragment with an attached deposit of corroded copper alloy was also examined. XRF results suggest that this alloy is a high-tin bronze, however the material is from a Medieval context (44) pre-dating the house construction.

References

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