Ancient Monuments Laboratory Report 68/93

ASSESSMENT OF SLAG AND OTHER METALWORKING DEBRIS FROM ST STEPHEN'S LANE, IPSWICH, 1987-88

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Summary
Examination of a 10% sample from a large, predominantly late Saxon and early Medieval, assemblage of metalworking debris, produced evidence of both iron smithing and non ferrous metal working. Further, more detailed examination, is recommended.

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ASSESSMENT OF SLAG AND OTHER METALWORKING DEBRIS FROM ST. STEPHEN'S LANE, IPSWICH, 1987-88

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Introduction

In 1987/88 archaeological excavations were carried out by Suffolk County Council Planning Department in advance of redevelopment adjacent to St. Stephen's Lane, Ipswich. The site (IAS 3104), which covered an area of 4300m2 was centrally situated within the Middle Saxon town and was later the site of a Carmelite friary. Preliminary quantification and phasing of the "iron working waste" had suggested the following totals:

Middle Saxon	(c650-850)	66.9kg
Early Late Saxon	(c850-900)	173.5kg
Middle Late Saxon	(C 10th)	117.4kg
Early Medieval	(C11-12th)	146.6kg
Late Medieval	(C 13-15th)	69.5kg
Late Medieval Transitional	(lC15-16th)	35.0kg
Post Medieval		7.1kg
Total (including undated contexts)		973.9kg

Examination of the slags and metalworking debris was carried out to assess their potential for further analysis.

Due to the large quantity of metalworking debris recovered, only a small proportion of the assemblage, approximately 10%, was examined for the purpose of assessment. No records of contextual interpretation/phasing were available at the time of examination and material was randomly selected from the finds storage depot. The following contexts were examined, at least in part, and classified.

CONTEXT	DATE	DESCRIPTION	TOT.WT CONTEXT (g)	SLAG TYPES
378	Middle late Saxon	Fill from N.side of section.	595	Vitrified hearth/furnace lining (black glaze & green corrosion specks).
385	Early late Saxon	Layer of fill.	2010	Smithing hearth bottom.
390	Early Medieval	Pit.	160	Undiagnostic ironworking slag.
392	Contam-inated?	Layer directly above road surface 1590.	1165	Vitrified hearth/furnace lining, undiagnostic ironworking slag, cinder, ferruginous concretions.
467	Early late Saxon	Layer of fill below 646	260	Smithing hearth bottom.
481	Early late Saxon	Filling above road.	110	Vitrified hearth/furnace lining (black glaze).
496	Middle late Saxon	Pit.	1250	Smithing hearth bottom.
498	Early late Saxon	Sunken-featured building ?	8900	Vitrified hearth/furnace lining, iron rich cinder, cinder, smithing hearth bottom (low vesicularity).
1509	Early late Saxon	Pit.	2985	Vitrified hearth/furnace lining, ferruginous concretion.
1539	Early late Saxon	Square pit.	1080	Iron rich cinder.
2021	Early late Saxon	Pit.	24435	Vitrified hearth/furnace lining (some black glaze & green corrosion specks), cinder, undiagnostic ironworking slag.
2033		Layer, below 2012.	425	Vitrified hearth/furnace lining, iron rich cinder.
2037	Early Medieval	Pit fill.	1775	Cinder, iron rich cinder.
2047	Early Medieval	Filling above 2081.NE.quad of bldg.	3325	Vitrified hearth/furnace lining (black glaze, green corrosion specks), cinder, undiagnostic ironworking slag.
2049	Early Medieval	Building fill NE.quadrant.	1220	Dense ironworking slag, vitrified hearth/furnace lining, iron rich cinder.
2671	Middle late Saxon	Shallow rectangular pit.	33485	Vitrified hearth/furnace lining (not heavily attacked), cinder, prob. crucible fragments.
4047		Layer. Brown, sandy.	650	Vitrified hearth/furnace lining.
4049	Middle Saxon	Pit, bottom layer.	2825	Dense ironworking slag (low vesicularity) cinder (black glaze).
4052	Middle late Saxon	Pit.	575	Smithing hearth bottom.
4707	Middle saxon	Western half of 377.	125015	Ferruginous concretion, vitrified hearth lining (black glaze), crucible frags (light porous fabric)

The largest category of material in the assemblage was that identified as **vitrified hearth/furnace lining.** Some of this may derive from either iron smelting or smithing structures. The material forms as a result of high temperature reactions, between the clay lining of the hearth/furnace and the alkali fuel ash or fayalitic slag, and generally shows a compositional gradient from unmodified clay on one surface to an irregular cindery material on the other. However, much of the material from St Stephen's Lane is characterised by a thin, uniform, black glaze with occasional bright green corrosion specks on a well fired, but not overheated, clay fabric. This is indicative of the working of copper alloys rather than iron. Whilst it is possible that a blacksmith's hearth was used for occasional copper alloy working, the large quantities of this material, especially in contexts 2021, 4707 and to some extent in contexts 2671 and 2047 suggest copper alloy working to have been a major activity on this site. This conclusion is supported by the existence of crucible fragments, presumably from non-ferrous metal melting/processing, in contexts 2671 and 4707.

Cinder, comprises only the lighter portion of the vitrified hearth lining, 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. **Iron-rich cinder** is a similar material but contains a significant iron content, making it denser.

Material clearly diagnostic of iron working was found as **smithing hearth bottoms.** These are recognisable by their characteristic plano-convex form, having a rough underside and a smoother, vitrified upper surface often hollowed as a result of downwards pressure from the air blast of the tuyère. Compositionally, hearth bottoms are of largely fayalitic (iron silicate) composition 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. **Undiagnostic ironworking slag** is also of fayalitic composition but has an amorphous, blocky, form. However, as similar material can originate from either iron smithing or iron smelting (extraction of metal from ore) it cannot help to distinguish the nature of the ironworking activity on site. Two contexts contained slag of sufficiently low vesicularity to be classified as **dense ironworking slag.** These are more likely to represent the products of iron smelting, but, given the small quantities present and lack of supporting evidence in the form of ores or identifiable furnace structures, the evidence for on-site iron smelting is tenuous.

Finally, material described as **ferruginous concretions** forms as a result of the redeposition of iron hydroxides. This "iron panning" is a common natural phenomenon, although the process may be enhanced by the surrounding archaeological deposits, particularly where iron artefacts or iron working debris are present.

Conclusions

The slag assemblage from St. Stephen's Lane, Ipswich contained a variety of metalworking debris, the large quantities of which reflect the importance of the metalworking crafts in the town from the middle Saxon to early Medieval periods. Of the diagnostic ironworking slags, those associated with smithing, i.e. hot working of iron rather than the primary smelting of iron from its ore, predominated. It is therefore likely that the undiagnostic slags also derive from smithing. No soil samples were available for hammer-scale evaluation which might have helped to more accurately locate the scene of the ironworking activity. The examination of iron artefacts, currently being undertaken elsewhere, may provide further evidence of the nature of the ironworking activity (in the form of tools, partially finished objects and scrap such as bar ends). Unfortunately, because context details were not available at the time of examination, no slags from the putative "iron smelting complex" 3052 were examined and it is not possible to provide further support for this interpretation.

In addition to the ironworking debris it was found that considerable quantities of material derived from non-ferrous metalworking. The initial, visual, examination was, however, unable to determine either the specific processes or metals involved, although the bright green corrosion products on some fragments suggested that the latter included copper alloys.

Potential for further work

The large scale of the metalworking debris assemblage on the St Stephen's Lane site, and the implied importance of the metalworking trades in the interpretation of the site justify a more thorough investigation of the material. The entire assemblage should be examined, the technological processes identified and their waste products quantified. This information would allow the spatial and chronological distribution to be studied with respect to other finds groups, particularly the ironwork, and any structures which might be associated with metalworking activities.

A particular concern at present is that the non-ferrous metalworking debris is not being studied as a whole. It would seem highly desirable that the non-ferrous slags still in Ipswich be examined with the crucibles currently in the A.M.Lab. at Fortress House.

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 should be saved.