

Ancient Monuments Laboratory
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AN ASSESSMENT OF METALLURGICAL
DEBRIS FROM DRAGON HALL,
NORWICH

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Summary

Assemblages of copper alloy, lead working debris and ferrous metal working debris from Dragon Hall, Norwich were examined and where necessary analysed. The evidence for copper alloy metallurgy proved to be inconclusive although there is evidence for lead working and iron smithing having been practised at the site.

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ANCIENT MONUMENTS LABORATORY REPORTS SERIES

An assessment of metallurgical debris from Dragon Hall, Norwich.

Roger C.P. Doonan

Introduction

Archaeological excavations of the block to the rear of Dragon Hall, King Street, Norwich, conducted between October 1997 and March 1998 by N.A.U uncovered evidence for metal-working activities. Metalworking debris found at the site dates between the 11th and 19th centuries and suggests that lead, copper and iron metallurgy were being practised. This short report aims to detail these finds and to assess their research potential.

The metal working debris.

Metallurgical debris relating to copper, iron and lead working was recovered from excavations at Dragon Hall. Debris relating to these different metals will be dealt with separately.

Copper alloy debris.(13th-18th century)

Twenty seven pieces of copper alloy were submitted for assessment and analysis. Table One shows the results of qualitative XRF (X-ray fluorescence) analysis for these finds. All the samples examined here were nondescript heavily corroded copper alloy fragments. Although some copper alloy fragments resemble spillages of metal, there is no evidence for crucible slags or indeed crucible fragments suggesting they may not derive from a metalworking tradition.

Based on the results of XRF analysis it is apparent that the predominant alloy used at Dragon Hall was leaded tin bronze. Such alloys are well suited to casting but perform poorly when fashioned using hammering techniques.

Evidence for lead working. (11th to 19th century)

Thirteen bags of lead waste weighing a total of 1664g were examined. All but one sample (SF 727) were small dribbles or spillages of lead. Because of the low melting point of lead it is difficult to attribute lead spillages to metallurgical operations as lead melts easily and an accidental fire could easily produce similar results. However, Small Find 727, described as a lead ingot (weight=1216g), is important as it is metal that has cooled in the bottom of a hearth or crucible and as such is diagnostic of deliberate lead-melting. Qualitative analysis of this find and others confirmed that the only major element present is lead, thus ruling out the possibility of pewter manufacture. The presence of this lead crucible/hearth bottom suggests that lead-working was carried out on the site. It is probable that lead had a variety of uses associated with the construction and maintenance of the building. Such activities may have included fenestration, roofing or plumbing.

Ferrous metal debris.

The ferrous samples could be divided in to four categories (see Table Two). There were a number of ferrous concretions which provide no evidence for ironworking. The slag and coke do suggest some iron smithing was carried out using coal as a fuel. This is unusual in collections of medieval smithing debris. No definite hearth bottoms could be identified and much of the slag, especially 10330, had an abnormal form. The slag finds from 10330 weigh a total of 7368g and most likely represent a short period of intense smithing since this slag derives from a single context. Smithing hearth slags form when very hot iron oxidises and the oxides then react with fluxes from the fuel ash and with the hearth lining; the slag then collects in the bottom of the hearth. The abnormal form of the slag from Dragon Hall is perhaps due to the fact that the fuel used was coal and/or coke. Large pieces remain embedded in the slag and in addition there seems to be heavy contamination with shale. Much of the shale is vitrified and covered in a slag layer which gives the smithing slag a rather unusual platey appearance.

Conclusions

Copper alloy debris

This material does not add substantially to the interpretation of the site. Although the possibility of copper metallurgy being practised there remains, the lack of crucible slag and crucibles makes this unlikely. No further work is recommended.

Lead working debris

This material is evidence that lead was used for tasks associated with the construction and maintenance of the building. No further work is recommend on this material.

Ferrous Metal debris

Slag excavated from Dragon Hall suggests that iron smithing was practised at the site. However, it is notable that the slag finds did not contain any 'typical' hearth bottoms, normally considered diagnostic of smithing activity. The abnormal form of these smithing slags was because coal or coke being used for fuel. No further work is recommended on this material.

Summary

Assemblages of copper alloy, lead working debris and ferrous metal working debris from Dragon Hall, Norwich were examined and where necessary analysed. The evidence for copper alloy metallurgy proved to be inconclusive although there is evidence for lead working and iron smithing having been practised at the site.

Small find No	Description	Identification	Cu	Pb	Sn	Zn
557	Cu alloy	spillage?	+++	+	+	nd
505	Cu alloy	spillage	+++	+	+	nd
673	Cu alloy	fragment	++	+	++	tr
691	Cu alloy	fragment	++	+	++	nd
773	Cu alloy	spillage?	+++	++	++	nd
934	Cu alloy	object?	+++	++	++	nd
512	Cu alloy	spillage	+++	++	++	nd
588	Cu alloy	?	++	+	++	tr
944	Cu alloy	object?		+	tr	nd
591	Cu alloy	object	+++	+	++	nd
	Cu alloy	fragment	+++	++		
1103	Cu alloy	fragment	+++	+	++	tr
600	stone	stone	nd	nd	nd	nd
952	Cu alloy	Object?	+++	+	++	tr
955	Cu alloy	fragments	+++	+	++	nd
967	Cu alloy	fragment	+++	++	+	nd
1066	Cu alloy	fragment	+++	+	+	nd
521	Cu alloy	fragment	+++	++	nd	nd
641	Cu alloy	fragment	+++	++	+	nd
272	Cu alloy	fragment			++	tr
592	Cu alloy	spillage	+++	++	+	nd
616	Cu alloy	fragment	+++	++	+	nd
643	Cu alloy	fragment	+++	+	nd	nd
711	Cu alloy	fragment	+++	++	nd	nd
712	Cu alloy	fragment		+	nd	nd
713	Cu alloy	fragment	+++	+	tr	tr
957	Cu alloy	fragment	+++	++	nd	nd
1194	Cu alloy	fragment	+++	++	++	tr

Table One: XRF results for the copper alloy pieces from Dragon Hall.
(+++=strong, ++=medium, +=weak, tr=trace, nd=not detected)

Category	Ferrous concretion	Possible Object	Coke	Slag
Find No's	5026, 1170, 1131, 5007, 452, 662, 1362, 10242, 10060, 10345	1051, 1058, 733	438, 10147	10053, 10544, 10699, 12007, 10049, 10272, 5009, 5010, 604, 1182, 1281, 10104, 10530,

Table Two: Various categories of finds amongst the debris of iron smithing.