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Ancient Monuments Laboratory Report No 4646

Examination and analyses of Roman brooches, scrap metal and slag from Wicklewood, Norfolk

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August 1985

The brooches were all examined and analysed qualitatively by energy dispersive X-ray fluorescence (XRF). The analyses not only identified the nature of any surface plating but also allowed the bulk metal of each brooch to be described in broad terms, though their exact composition could not be determined. The brooches were also seen by Sarnia Butcher who has supplied the typological descriptions as well as the details of their likely date and source.

The scrap metal was also all examined and grouped into types. Fifty selected pieces were analysed by XRF and the results are presented in Table 3.

The slag was all examined and identified. Most of it was smithing slag though some pieces of fuel ash slag and hearth lining were also noted; these too could well have been produced in a blacksmith's hearth. There was one piece of fuel ash slag with a copper alloy lump embedded in it which really belongs with the scrap metal rather than with the slag. A few of the slag lumps were actually corroded lumps of metallic iron.

I would like to thank Sue Wilthew for analysing the scrap metal and Brian White for analysing most of the brooches.

The brooches

The brooches all appear to be complete, finished objects though some have been damaged, either in use or while buried. There are no part-made or unfinished objects; in fact many of them are highly decorated with enamel and/or metal plating.

The collection covers the usual span of brooch production in Britain in the Roman period, ie with the majority dating to the first and second centuries and a few later

examples. It is rather limited as to types however, with no representatives of some very common brooches such as the one-piece Colchester or the trumpet. Some types are represented by several examples, and these are all of British origin. This may suggest local manufacture but the collection does not provide direct evidence of this; there are no identical or even very closely similar brooches amongst the groups.

There is a rather high proportion of decorative plate brooches and this might suggest that the brooches were being used as votives; several of them have parallels on religious sites elsewhere.

Analytical results for the brooches

The results are presented in Table 1 and then summarised in Table 2. Most of the objects contained detectable amounts of tin, zinc and lead in addition to copper but the proportions varied widely. Those elements present in significant amounts were identified and on this basis an alloy name assigned to each object. Bronzes contain mainly copper and tin, brasses copper and zinc, while gunmetals contain significant amounts of both tin and zinc in addition to copper. Lead may be present in any concentration up to about 25%; alloys described as leaded contain at least several percent of the metal. Where more than one alloy name appears in Table 1 it is because the object was of an intermediate composition or because there was uncertainty in the analytical results. It should be noted that there are no hard and fast divisions between different alloy types as any mixture of the component metals is possible. The difference between eg leaded gunmetal and leaded bronze may only be a few percent more or less zinc and so too much weight should not be placed on these sorts of divisions, especially when, as in this case, they are only based on qualitative analyses.

As has already been pointed out, there are only a few examples of most of the brooch types represented here, so it is not possible to look at the results and say which alloys are typical of which brooch types. The results can however be compared with those for the thousand or so brooches already analysed in the A.M. Lab and a better idea obtained as to whether the Wicklewood brooches are of the compositions normally expected for their types.

Most Rosette and Langton Down brooches are brasses but they usually contain more than a trace of tin too, so these examples are probably just from rather extreme examples from within the normal distribution. Hod Hill brooches are also earlier first century types and probably also have a continental origin; they too are normally brasses though both gunmetals and bronzes are known.

Colchester 'B', Colchester derivative and Polden Hill types are normally leaded bronzes though bronzes and leaded gunmetals, as here, are not unknown. Here the low lead or lead-free alloys are used for brooches with a separate, sprung pin which date to the mid first century while the later variants with hinged pins are mainly of leaded alloys.

The headstud brooches are a mixture of brasses and bronzes, both of which are unusual as these types are normally heavily leaded bronzes, particularly in south-west Britain where they are commonest. These unusual alloys could indicate a source or intended market away from the normal areas but typologically the brooches are perfectly standard.

The flat, enamelled disc brooches are all leaded alloys, either bronzes or gunmetals. They are far less common than bow brooches so there are fewer analyses with which to compare them, and those that there are display a wide range of compositions. Many of these brooches show traces of tinning on the reserved metal next to the enamel fields. This was probably once an almost universal feature of these brooches though where the surface has been lost through corrosion it does not survive.

Brooch 31, which is decorated with beaded silver wire and silver rosettes, is made of brass. This type of decoration is relatively commoner on bow brooches, usually Knee or Trumpet types, and where it is present, the brooch is almost invarily made of brass.

The final group of brooches to be considered are the gilded plate brooches, Nos 5, 24, 28 and 52. These are variously described in Table 1 as 'mercury gilded', 'leaf gilded' and 'gilded'. Mercury as well as gold was detected on the mercury gilded brooches while on the leaf gilded brooch no mercury was found although the levels of gold detected were sufficiently high that mercury would have been detectable had it been present. The

'gilded' brooch was so well covered with iron panning that only traces of gold could be detected so mercury would not have been detectable, whether it was there or not. Brooches 28 and 52 almost certainly originally contained a conical black glass 'stone' in the setting. This is a well known third or fourth century type, and both circular and oval examples are known. None of them are made of leaded alloys as it is not possible to mercury gild on these metals. It is interesting that both bronzes and brasses are known, though only occasionally gunmetals, and more surprising, that the oval brooches are normally brass while the otherwise identical circular ones are most commonly bronze. The other two gilded plate brooches appear to be of a related type though there is a raised central moulding rather than a setting to receive a 'stone'. The lead-free metal, in both cases bronze, would have been required in order that they could be gilded.

The fragment labelled as brooch No 44 is almost certainly not a brooch; the shape is wrong and it is made of unalloyed copper which is not normally used for making brooches, except for the occasional penannular.

Notes on individual brooches

The numbers quoted are those following the code 43.983.

4 The three spots of enamel are yellow and the main fields red. The rivet was not part of the original design.

6 Traces of enamel survive in the lozenge-shaped and triangular fields in the bow. Their colour cannot be determined with any certainty but may originally have been white or turquoise.

11 No enamel survives although the fields on the bow would originally have contained it.

12 The enamel is badly decayed. At the base of the field it generally looks translucent turquoise although in a few areas it is opaque red. This colour may be due to the corrosion of the underlying metal or may be the remains of a thin layer of red enamel which could have acted as an adhesive, holding in place the main contents of the field.

13 The 10 lozenge-shaped fields down the centre of the bow contained turquoise enamel while the triangular fields contained enamel that is now very decayed but was probably originally red. There was probably enamel in the stud at the

head but this is now obscured by ironpanning.

14 The spots in the field of turquoise enamel are of reserved metal with rosettes of repousse silver foil attached to them with lead-tin solder. Silver was also soldered onto the rim of this brooch.

15 Enamel survives in only some of the fields of this brooch. The outer band of decoration comprises 14 shield-shaped fields with smaller triangular fields between them. The larger fields contained either yellow or blue enamel, the yellow fields being positioned approximately at the cardinal points. The central area was also decorated with two shpes of fields which alternated; yellow enamel is visible in one of them.

16 The rim, the reserved metal spots and the inner ring of metal are all tinned while the radial metal divisions are not. All the enamel is turquoise. The central field does not contain enamel and was probably covered by a tinned metal cone and so never did.

17 Very similar to No 16 except that the enamel is blue and the tinning does not survive as well.

21 There are two rings of triangular cells with 14 in each, filled alternately with red and blue enamel. The blue cells appear to have a red border but this is probably due to copper corrosion products diffusing into the enamel and staining it.

22 Traces of tinning survive on the rim, most of the 17 reserved metal spots and on the inner of the two metal rings. The two outer fields contain turquoise enamel; the central one may not have been enamelled.

28 Probably originally had a black, conical glass 'stone' in the centre though this is now lost.

30 The original colours of the enamel in the triangular and lozenge-shaped cells cannot be determined.

31 This brooch is decorated with a ring of beaded silver wire around the central boss and outside it a ring of rosettes made of repousse silver foil. Traces of rosettes survive in the centre too.

40 The face of this brooch is divided into three zones. The concentric metal rings and the rim are all tinned but the radial metal divisions in the outer field do not appear to be. The outer field has blue enamel in all the divisions while the inner annular field now looks black. The central field probably never contained any enamel and is now full of an orangey-buff, powdery deposit.

43 The rim, reserved metal spots and metal ring are all tinned. The design is very roughly executed. The enamel in the outer field is blue. The central field was probably never enamelled.

45 The rim, reserved metal spots and metal bands are all tinned. The outer field contains black enamel while the field with the spots is opaque green. The centre probably never contained enamel.

49 The enamel outside the zig-zag metal band is now all lost but traces of it survive in the field containing the reserved metal spots. It is now dark coloured and may originally have been black, green or red. The centre probably never contained enamel.

52 Probably originally had a black conical glass 'stone' in the centre though this is now lost.

55 The disc contains two concentric fields of blue enamel.

56 The main, lozenge-shaped field contains a trace of pale green enamel and the centre spot now looks dark green, which may not be its original colour.

Analytical results for the scrap metal

Only a proportion of the scrap metal was analysed as there were well over a hundred pieces in total. The bags containing the metal have been annotated with numbered blue spots as they had no existing number sequence that uniquely identified them.

Some of the pieces of metal could be positively identified as casting jets (also known as casting sprues), the metal that solidifies in the in-gate of a mould. Other pieces were blobs or dribbles of spilt molten metal which can be interpreted as further evidence for metal working although they can also form when a metal object is accidentally melted. A few of the pieces appeared to be fragments of objects and one (No 29) was part of a casting that had failed; the metal had not flowed to all parts of the mould before solidifying. There were three pieces (Nos 11,14 and 51) that appeared to be fragments of bar ingots, metal cast roughly to shape either as a preliminary to smithing it or as a convenient form for storage.The spherical lumps (Nos 9, 46 and 47) must have been deliberately made but most of the miscellaneous lumps could be waste from metal working.

The analytical results for these pieces are given in Table 3. The general notes on alloy composition and nomenclature given above in relation to the brooches apply here too. It can be seen that the whole range of copper alloys are represented, both leaded and unleaded. In a way this is to be expected if the pieces are the remains of an extensive metal working industry as leaded alloys are often used for casting while lead-free alloys are more commonly associated with wrought metal work. The two white metal blobs were impure silver and some of the pieces thought to be lead were in fact lead-tin alloys. These can be considered either as pewter, which was widely used for making vessels in later Roman times, or as solder, which could have been used in joining multi-part objects made from eg copper alloys.

Interpretation of the finds

Because these objects were found with the aid of metal detectors they do not represent the whole range of materials normally found in association on Roman sites but only those which are 'seen' by the detectors.

There is definite evidence for metal working, of both iron and a range of non-ferrous metals. The scale of the operations cannot be quantified as the proportion of the existing material that has been recovered is completely unknown. The slag is not a large collection, weighing only a few kilogrammes in total, so one could guess that what has been found is evidence of the small scale blacksmithing which is normally associated with any settlement at this period.

The evidence for non-ferrous metalworking is far more tantalising as both the range of alloys and the quantity of the scrap metal is larger than is found on most metal working sites. What is needed to complete the picture are the non-metallic finds normally associated with this sort of activity, the crucibles and moulds in particular. By their very nature these are not likely to be found using a metal detector; the only way in which a full and true picture of the industrial activity here could be obtained is by controlled archaeological excavation.

The question was posed as to whether the large number of brooches indicated that they were being manufactured on site. Their range in both type and date make this unlikely and the fact that no unfinished ones were found is a further counter-

indication. Miss Butcher has noted the high proportion of decorative plate brooches and suggested that this might indicate they were being used as votives. Without knowing the true nature of the site, which can only be discovered by controlled excavations, it is not useful to speculate further on the reasons for their presence.

Recommendations

Taken as a whole, this is a valuable collection of material and it is desirable that it be made as complete as possible. If excavation is out of the question for the present, any further metal detector finds that become available should, if possible, be acquired. This would permit confirmation of the trends suggested by the existing collection - such things as the presence or absence of various types of objects.

Table 1: Analytical results for the brooches

Number	Brooch type	Alloy	Decoration
4	(Roundel)	Leaded bronze	Enamel
5	Umbonate disc	Bronze	Mercury gilding
6	cf. Headstud	Brass	Enamel
7	?Colchester deriv.	Leaded bronze/gunmetal	
8	Colchester deriv.	Bronze	
9	Colchester deriv.	Bronze	
10	Rosette	Gunmetal	
11	Headstud	Brass	(Enamel)
12	Plate-on-bow	Leaded gunmetal	Enamel
13	Headstud	Bronze	Enamel
14	Disc	Leaded bronze	Enamel Applied silver
15	Umbonate disc	Brass/gunmetal	Enamel
16	Disc	Leaded bronze	Enamel
17	Disc	Leaded bronze	Enamel
18	Colchester deriv.	Leaded gunmetal	Tinning
19	Colchester deriv.	Leaded bronze	
20	Fan-tailed	Leaded bronze	
21	Umbonate disc	Leaded bronze	Enamel
22	Disc	Leaded bronze	Enamel
23	Umbonate disc	Leaded gunmetal	
24	Umbonate disc	Bronze	?gilding
25	Hod Hill	?Gunmetal	
26	Polden Hill	Bronze	Tinning
27	?	Leaded gunmetal	
28	Oval disc	Brass	Leaf gilding Tinning on back
29	Colchester deriv.	Leaded bronze	
30	Headstud	Bronze	Enamel
31	Disc	Brass	Applied silver
32	Colchester deriv.	Bronze	Tinning
33	Hook Norton	Bronze	
34	Headstud	Brass	(Enamel)
35	?	Leaded bronze	
36	Colchester deriv.	Bronze	
37	Trumpet deriv.	Gunmetal	
38	Colchester deriv.	Leaded bronze/gunmetal	
39		Leaded bronze/gunmetal	
40	Disc	Leaded gunmetal	Enamel
41	Colchester deriv.	Leaded gunmetal	

Number	Brooch type	Alloy	Decoration
42	Horse and rider	Leaded bronze	Enamel.Tinning
43	Disc	Leaded bronze	Enamel
44	(?not a brooch)	Copper	
45	Disc	Leaded gunmetal	Enamel
46	?Langton Down	Gunmetal	
47	Colchester deriv.	Leaded bronze	
48	Colchester deriv.	Bronze/gunmetal	
49	Disc	Leaded gunmetal	Enamel
50	Fan-tailed	Gunmetal	
51	Colchester deriv.	Leaded gunmetal	
52	Oval disc	Brass	Gilding
53	?	Leaded bronze	
54	?	Brass	
55	? not a brooch	Leaded gunmetal/brass	Enamel
56	? not a brooch	Leaded gunmetal/brass	Enamel

Table 2: Summary of brooch analyses

Brooch type	Alloy type				
	Bronze	Leaded bronze	Leaded gunmetal	Gunmetal	Brass
Rosette				1	
?Langton Down				1	
Fan-tailed		1		1	
Hook Norton	1				
Hod Hill				1	
Colchester 'B'		1			
Colchester deriv	5	4	3		
Polden Hill	1				
Headstud	2				3
Trumpet deriv				1	
Plate on bow			1		
Horse and rider		1			
Disc		5	3		1
Umbonate disc	1	1	1		1
Oval disc					2

Table 3: Scrap metal analyses

Analysis No	Object description	Major Elements Cu	Zn	Pb	Sn	Ag	Au	Alloy
1	Casting jet	+	+	+	+			Leaded gunmetal
2	Casting jet	+	+	+	+			Gunmetal
3	Lump			+	+			Pewter
4	Lump			+	+			Pewter
5	Dribble			+	+			Pewter
6	Run	+	+					Brass
7	Dribble	+		+	+			Leaded bronze
8	Lump	+			+			Bronze
9	Dribble	+	+	+	+			Leaded gunmetal
	Spherical lump	+			+			Bronze
10	Blob	+			+			Bronze
11	Bar ingot frag ?	+		+	+			Bronze
12	Fragment	+	+		+			Gunmetal
13	Dribble	+		+	+			Bronze
14	Bar ingot frag ?	+		+	+			Bronze
15	Iron slag							Iron
16	Iron slag							Iron
17	Lump	+	+	+	+			Gunmetal
18	Lump	+	+	+	+			Leaded gunmetal
19	Lump		+					Lead
20	Lump		+					Lead
21	Lump	+	+		+			Gunmetal
22	Dribble	+		+	+			Leaded bronze
23	Dribble	+		+	+			Bronze
24	Blob	+		+	+			Leaded bronze
25	Casting jet	+	+	+	+			Leaded gunmetal
26	Casting jet	+	+	+	+			Leaded gunmetal
27	Casting jet ?	+						Copper
28	Lump	+	+	+	+			Leaded gunmetal
29	Failed casting	+		+	+			Bronze
30	Cauldron foot ??	+		+	+			Leaded bronze
31	Blob	T			T	+	T	Debased silver
32	Casting jet ?	+	+	+	+			Gunmetal
33	Dribble	+	+		+			Gunmetal
34	Lump	+		+	+			Bronze
35	Lump	+		+	+			Bronze
36	Casting jet	+		+	+			Bronze
37	Lump	+	+					Brass
38	Dribbble	+		+	+			Leaded bronze

Analysis No	Object description	Major Elements Cu	Zn	Pb	Sn	Ag	Au	Alloy
39	Dribble	+		+	+			Leaded bronze
40	Flow	+		+	+			Bronze
41	Dribble	+	+	+	+			Leaded gunmetal
42	Sheet	+	+	+	+			Leaded gunmetal
43	Flow	+		+	+			Leaded bronze
44	Lump	+			+			Bronze
45	Blob	T	+		+	+		Debased silver
46	Spherical lump	+	+		+			Brass/gunmetal
47	Spherical lump	+	+		+			Gunmetal
48	Dribble	+		+	+			Bronze
49	Lump	+	+	+	+			Brass
50	Dribble			+				Lead
51	Bar ingot frag ?	+						Impure copper

Key to table:- + = element present in significant amounts
T = trace of element detected
(only recorded for silver)