Ancient Monuments Laboratory
Report 2 /87

ANALYTICAL RESULTS FOR THE ROMAN BROOCHES FROM BRAUGHING, HERTS

Justine Bayley

Ancient Monuments Laboratory Report 2/87

ANALYTICAL RESULTS FOR THE ROMAN BROOCHES FROM BRAUGHING, HERTS

Justine Bayley
January 1987

Summary

A total of 94 brooches and fragments were analysed qualitatively by XRF and 33 were also analysed quantitatively by AAS. The results are compared with those for comparable objects from other sites.

This report supersedes A M Lab Report 3895.

Author's address:

Ancient Monuments Laboratory
Historic Buildings and Monuments Commission
23 Savile Row
London W1X 2HE

01-734-6010 x524

ANALYTICAL RESULTS FOR THE ROMAN BROOCHES FROM BRAUGHING, HERTS

A total of 94 brooches and brooch fragments were found. About half of them had previously been seen and analysed (Bayley 1983) and the remainder were dealt with more recently. All the objects were analysed qualitatively by X-ray fluorescence (XRF) and those that were large and solid enough were sampled and analysed quantitatively by atomic absorption spectroscopy (AAS) using essentially the method described by Hughes et al (1976). The analytical results are presented in the Table. Some of the brooches had some form of applied decoration and this is also noted in the Table.

One of the brooches was made of iron, the rest of various copper alloys. Most of these contained detectable amounts of tin, zinc and lead, but in widely varying proportions. The names given to the different alloys are indicated in the Figure which also shows the lack of sharp dividing lines between them; it is, to some extent at least, an arbitrary decision which alloy name to assign to an object, particularly if it is of an intermediate composition. In most cases however the most appropriate alloy name is obvious, though it should be born in mind that each one represents a range of compositions, albeit a limited one. Where there are difficulties in interpreting the analytical results, the uncertainty is shown by assigning more than one alloy name to an object.

It has previously been shown that there is a positive correlation between typology and the metal alloy used to make brooches (eg Bayley and Butcher 1981, Bayley forthcoming). In general, one particular brooch type or group of types is made of one particular alloy. As with any generalisation there are exceptions, but they should not be seen as seriously weakening the case for positive selection of a specific alloy for each individual object.

Comparative analytical data

The analytical results for the Braughing brooches were compared with data from some 1650 other analyses, over 1000 of them quantitative, of late Iron Age and Roman brooches from over 50 sites carried out at the Ancient Monuments Laboratory. Interim summaries of parts of this work have been published (Bayley, Butcher and Cross 1976, Bayley and Butcher 1981, Bayley and Butcher forthcoming, Bayley forthcoming) and some groups of analyses from individual sites have appeared in the relevant excavation reports. For most of the larger typological groups at Braughing the comparative data represents a summary of around 100 analyses though for some less common types the sample was far smaller.

The one La Tene III brooch was made of bronze as are over 90% of comparable objects. This would appear to be the normal alloy for these brooches.

Copper alloy Nauheim derivative brooches are 60% bronzes, 25% brasses and the balence mainly gunmetals. The proportions here are similar but although none of the brooches are described as gunmetals it can be seen from the Table that more than traces of both zinc and tin were detected in several examples. At Baldock (Bayley 1982) there appeared to be some correlation between composition and typological variants within this group though at other sites no correlation has been noted.

Over 90% of Simple Gaulish and one-piece Colchester brooches are brasses (Bayley 1985) and the results here correspond to the general pattern with only a single bronze brooch (SF 1030). Interestingly though, the non-brass examples are not randomly spread across the country but concentrate at a few sites, most notably Richborough which has 8 non-brass brooches of this type out of a total of 28 (Bayley and Butcher 1981, Fig 5).

Langton Down, Thistle and Rosette brooches are normally brass but usually contain up to 2-3% tin in addition to the zinc. Some 25% of XRF results for these types have been interpreted as indicating gunmetals rather than brasses but this is most probably a reflection of the impurity of the brass; it does not suggest two distinct alloys were being used in the manufacture of these brooches. This is a good example of the problem of where to draw the arbitrary line in a compositional continuum and is well illustrated by SF 514 where the XRF analysis was interpreted as indicating a gunmetal while the AAS result suggests the brooch is a brass with over 2% tin.

Colchester derivative (two-piece Colchester) brooches are normally leaded bronzes (Bayley 1985), with 15% being leaded gunmetals and 5% bronzes. The unleaded examples are not evenly distributed on all sites but are concentrated at a few sites as here and at the Temple site in Chelmsford (Bayley 1986). It should be noted however that even the "unleaded" bronzes here contain more lead than any of the other Braughing brooches analysed by AAS. Compositionally typical Colchester derivatives contain over 10% lead and many have around 15% lead as does SF 459.

Very few strip bow brooches have been analysed so no reliable comparative data is available for SF 886.

Aucissa brooches are almost without exception brasses, and normally contain only negligible amounts of tin and lead as here. In this they contrast with the Langton Down and related types.

About 70% of Hod Hill brooches are brasses, the remainderr being almost equally divided between bronzes and

gunmetals. There is no apparent correlation of composition with typological variations. Some of the brasses are fairly pure but others are verging on being reclassified as gunmetals (eg SF 943 here). Traces of tinning (but never silvering) survive on many Hod Hill brooches and most if not all were probably originally decorated in this way. In some cases it can be seen that only part of the object was originally tinned. The group of Hod Hill brooches from Braughing are compositionally unremarkable.

Some 70% of knee brooches are leaded alloys and only about 10% are brasses. The brasses are almost completely restricted to a single sub-type which is quite unlike SF 88 which makes its composition even more unexpected.

Plate brooches are far more typologically diverse than bow brooches and are also less common finds so the analysed sample of any one type is seldom more than a few examples (Bayley and Butcher forthcoming). The same generalisations as have been made for bow brooches are therefore inappropriate though some parallels can be offered for the Braughing plate brooches.

The three early plate brooches (SF 646, 149 and 606) are all tinned and two are brasses and the other a gunmetal though some of the extra tin detected may come from the plating. Two of the four comparable brooches from Richborough are brasses while the other two are described as brass/gunmetal. A related, but not identical, brooch from Baldock was also brass (Bayley 1982). The rectangular plate brooch (SF 760) is made of brass with an openwork bone plaque rivetted to its upper surface. Although the design is rather different, the use of bone for decoration can be parallelled on a plate brooch from Sheepen, Colchester where the base metal was again brass (Niblett 1985, Fig 76, 43).

The oval enamelled brooch (SF 283) is a leaded gunmetal but 6 of the 7 similar brooches that have been analysed are leaded bronzes (Bayley and Butcher forthcoming). The other enamelled brooch (SF120) is a brass and can be parallelled by a brooch from Nor'nour (Hull 1968, Fig 22, 205) which is a brass/ gunmetal.

Penannular brooches are made of all unleaded copper alloys so bronzes, gunmetals and brasses are found almost equally. There is no apparent correlation of typological variants with composition.

Discussion of results

One immediately obvious point arising from the analyses is that well over half these "bronzes" are actually brass - a warning against the indiscriminate use of bronze as a generalised descriptive term when it has a specific metallurgical meaning.

The widespread use of brass for brooches in the earlier 1st century AD raises the question of the origin of the metal and the date and place of its introduction for the manufacture of objects such as those discussed above. It is intriguing that many of the brooch types that are normally made of brass are thought to be imports from the continent, eg Rosette, Aucissa, Hod Hill and Simple Gaulish brooches, and indeed the few continental brooches of these types that have been analysed are also brasses (eg Rabeisen and Menu 1985). This raises the spectre of a simple equation between the use of brass and a continental origin. Reality however is more complex as most one-piece Colchester brooches (which are thought to be of British manufacture) are also made of brass and the three unfinished examples from Baldock provide good evidence to show that some at least were indeed made here. These unfinished brooches have been analysed and shown to be brass since their initial publication as "bronze" brooch-blanks (Stead 1975).

It has been shown that brass brooches were being made at Alesia in eastern Gaul in the first half of the 1st century AD (Rabeisen and Menu 1985) so there is evidence for brooch manufacture in this alloy both in England and on the continent. One is then reduced to debate whether the brooches of continental types found in England were actually made abroad or here in England, perhaps by immigrant or itinerant craftsmen or even by local craftsmen copying an actual import. The metal for the English-made brooches may have been imported though there is now some evidence that brass was being made in this country, at least by the mid 1st century AD (Bayley 1984).

The sudden popularity of brass in the earlier 1st century for brooches is not matched by its use for other objects. The temple site at Hayling Island produced over 100 brooches, 34% of which were brass, but only 6% of the other 350 copper alloy objects were brass (Bayley forthcoming). Excavations at Sheepen were less prolific; brass accounted for nearly 80% of the 42 brooches but only 40% of the other 51 objects analysed (Bayley in Niblett 1985). These brass objects were mainly military fittings which, apart from coinage and brooches, appear to be the only class of objects regularly made of brass. Could the metal have been an imperial monopoly so objects made from it acquired added significance as status symbols, hence its use for display items like brooches?

Analysing the brooches may have created more problems than it solves, but at least it provides an accurate and objective description of the objects and provides an extra dimension to their typological study which may in time lead to answers rather than just hypothyses about their place (and date) of manufacture.

References

Bayley, J (1982) Analyses of the brooches from Baldock, Herts. Ancient Monuments Lab Report No 3781. [Publication forthcoming in Ian Stead's excavation report]

Bayley, J (1983) Analyses of some brooches from Braughing, Herts. Ancient Monuments Lab Report No 3895.

Bayley, J (1984) Roman brass-making in Britain. Historical Metallurgy 18(1), 42-3.

Bayley, J (1985) Brass and brooches in Roman Britain. Masca J 3(6), 189-91.

Bayley, J (1986) Qualitative analysis of some brooches from Chelmsford temple. Ancient Monuments Lab Report No 4845.

Bayley, J (forthcoming) Roman brass. In: P Craddock (ed) 2000 years of zinc and brass. BM Occ Pap ?

Bayley, J and Butcher, S (1981) Variations in alloy composition of Roman brooches. Revue d'Archeometrie, supplement, 29-36.

Bayley, J and Butcher, S (forthcoming) Romano-British plate brooches: their composition and decoration. Jewellry Studies 3

Bayley, J, Butcher, S and Cross I (1976) The analysis of Roman brooches from Richborough Fort, Kent. In: E A Slater and J O Tate (eds) Proc 16th Internat Symposium on Archaeometry.

Hughes, M J, Cowell, M R and Craddock, P T (1976) Atomic absorption techniques in archaeology. Archaeometry 18(1), 19-37.

Hull, M R (1968) The Nor'nour brooches. In: D Dudley, Excavations on Nor'nour in the Isles of Scilly, 1962-6. Arch J 124, 28-64.

Niblett, R (1985) Sheepen: an early Roman industrial site at Camulodunum. CBA Res Rep 57.

Rabeisen, E and Menu, M (1985) Metaux et alliages des bronziers d'Alesia. In: Recherches gallo-romaines I, 141-81. Notes et documents des Musees de France, 9.

Stead, I (1975) A Roman pottery theatrical face mask and a bronze [sic] brooch-blank from Baldock, Herts. Antiq J 55, 397-9.

Table: XRF and AAS analytical results

Key:-
+ = detected
++ = present in minor amounts
+++ = major alloying element

Cat No	S F No	Alloy	XRF Analysis Zn	Pb	Sn	Decoration/repairs	AAS Analysis (%) Cu	Zn	Sn	Pb	As
La Tene III											
1	342	bronze	+	+	+++		76.44	.12	10.18	.43	.04
Nauheim derivative											
2	1036	brass	+++	+							
3	453	bronze	+	++	+++						
4	225	bronze	++	++	+++						
5	433	bronze		+	+++						
6	276	bronze			+++						
7	974	bronze	+	+	+++						
8	774	bronze		+	+++						
9	356	bronze	+	+	+++						
10	564	brass	+++	+	+						
11	904	brass	+++	+	++						
12	29	iron									
13	1025	bronze	+	+	+++						
14	106	bronze	++	++	+++						
15	496	brass	+++	+	+						
16	1103	bronze	+	+	+++						
17	954	bronze	+	+	+++						

Cat No	S F No	Alloy	XRF Analysis Zn	Pb	Sn	Decoration/repairs	AAS Analysis (%) Cu	Zn	Sn	Pb	As
Simple Gaulish and one-piece Colchester											
18	1099	brass	+++	+							
19	1027	brass	+++								
20	1117	brass	+++	+							
21	1029	brass	+++	+							
22	1052	brass	+++	+			68.81	19.95	.69	.23	.16
23	1043	brass	+++	+			83.40	16.39	.84	.42	.19
24	114	brass	+++	+	+		70.34	19.36	.00	.07	.04
25	388	brass	++	+	+		73.86	21.59	.00	.39	.03
26	369	brass	+++	+			79.86	19.68	.69	.00	.16
27	1030	bronze			+++	?repaired					
28	272	brass	+++	+	+		73.01	22.12	.44	.13	.05
29	1166	brass	+++			?repaired	73.61	25.00	.56	.00	.00
30	874	brass	+++	+			78.07	22.59	.44	.11	.13
31	798	brass	+++	+	+		81.84	18.87	1.89	.47	.12
32	26	brass	+++	+	+						
33	359	brass	+++	+							
34	541	brass	+++								
35	511	brass	+++	+	+						
36	516	brass	+++	+	++		73.75	14.50	1.50	2.43	.40
Lanston Down											
37	434	brass	+++	+	+		77.98	22.94	.94	.11	.07
38	514	brass/gunmetal	+++	+	+++		72.08	17.86	2.59	.32	.13
39	824	brass	+++	+	+	tinned in grooves	82.50	16.25	2.00	.25	.20
40	396	brass	+++	+	+						
41	921	gunmetal	++	+	++						
42	1069	brass	+++	+	+		87.50	15.28	1.67	.28	.08
43	1045	brass	+++	+	+	solder ?repair	79.17	20.83	1.39	.28	.06
Thistle											
44	1059	brass	+++	+	++		77.83	18.16	1.89	.71	.12

Cat No	S F No	Alloy	XRF Analysis Zn	Pb	Sn	Decoration/repairs	AAS Analysis (%) Cu	Zn	Sn	Pb	As
Colchester derivative											
45	685	bronze	+	+	+++		88.13	1.04	7.71	2.50	.17
46	655	bronze	+	+	+++		87.50	.68	9.55	2.05	.00
47	251	bronze		++	+++		76.83	.24	8.78	4.59	.05
48	459	leaded bronze		+++	+++		72.22	.19	6.71	13.66	.08
49	368	leaded bronze/ gunmetal	++	+++	+++						
50	610	bronze		+	+++		90.83	.00	10.56	.83	.08
51	987	bronze		++	+++						
Strip bow											
52	886	bronze	+	+	+++		85.65	.81	9.26	.69	.23
Aucissa											
53	512	brass	+++	+			77.56	17.56	.00	.10	.03
54	862	brass	+++	+							
55	625	brass	+++	+	+						
Hod Hill etc											
56	556	brass	+++	+	++	tinned					
57	1105	brass	+++	+	+	tinned	83.73	17.92	2.36	.47	.00
58	943	brass	+++	+	++		80.19	12.66	4.55	1.30	.00
59	64	brass	+++	+	+	tinned	82.24	17.98	1.10	.23	.18
60	401	gunmetal	+++	++	+++						
61	697	brass	+++								
62	585	brass	+++	+	+		80.13	18.91	2.88	.32	.26
63	659	brass	+++		+		76.69	18.20	1.21	.00	.00
64	348	bronze		+	+++	tinned					
65	409	brass	+++	+	+	tinned	71.60	21.36	.73	.22	.04
66	687	brass	+++	++	++	enamelled	80.55	9.52	4.76	7.94	.00
Knee											
67	88	brass	+++	+							

Cat No	S F No	Alloy	XRF Analysis Zn	Pb	Sn	Decoration/repairs	AAS Analysis (%) Cu	Zn	Sn	Pb	As
Plate											
68	646	gunmetal	+++	+	+++	tinned					
69	149	brass	+++	+	++	tinned					
70	606	brass	+++	+	++	tinned					
71	283	leaded gunmetal	+++	+++	+++	enamelled					
72	120	brass	+++	++	++	enamelled	83.33	15.48	1.90	3.33	.00
73	760	brass	+++	+	+	applied bone plate					
Penannular											
74	914	bronze	++	++	+++						
75	342	bronze	++	++	+++						
Fragments											
76	361	bronze/gunmetal	++	+	+++		78.54	4.16	8.50	.11	.04
77	1	brass	+++	+							
78	39	brass	+++	+							
79	946	brass	+++	+							
80	846	brass	+++	+							
81	341	bronze		+	+++						
82	535	bronze	+	++	+++						
83	1102	brass	+++	+							
84	208	brass	+++	+	+						
85	380	brass	++	+							
86	394	bronze	++	++	+++						
87	46	bronze		+	+++						
88	250	brass	+++	+							
89	521	bronze	++	+	+++						
90	376	gunmetal	+++	+	+++						
91	805	bronze	+	++	+++						
92	1158	brass	++	+							
93	1127	brass	+++	+	++						
94	861	bronze		+	+++						

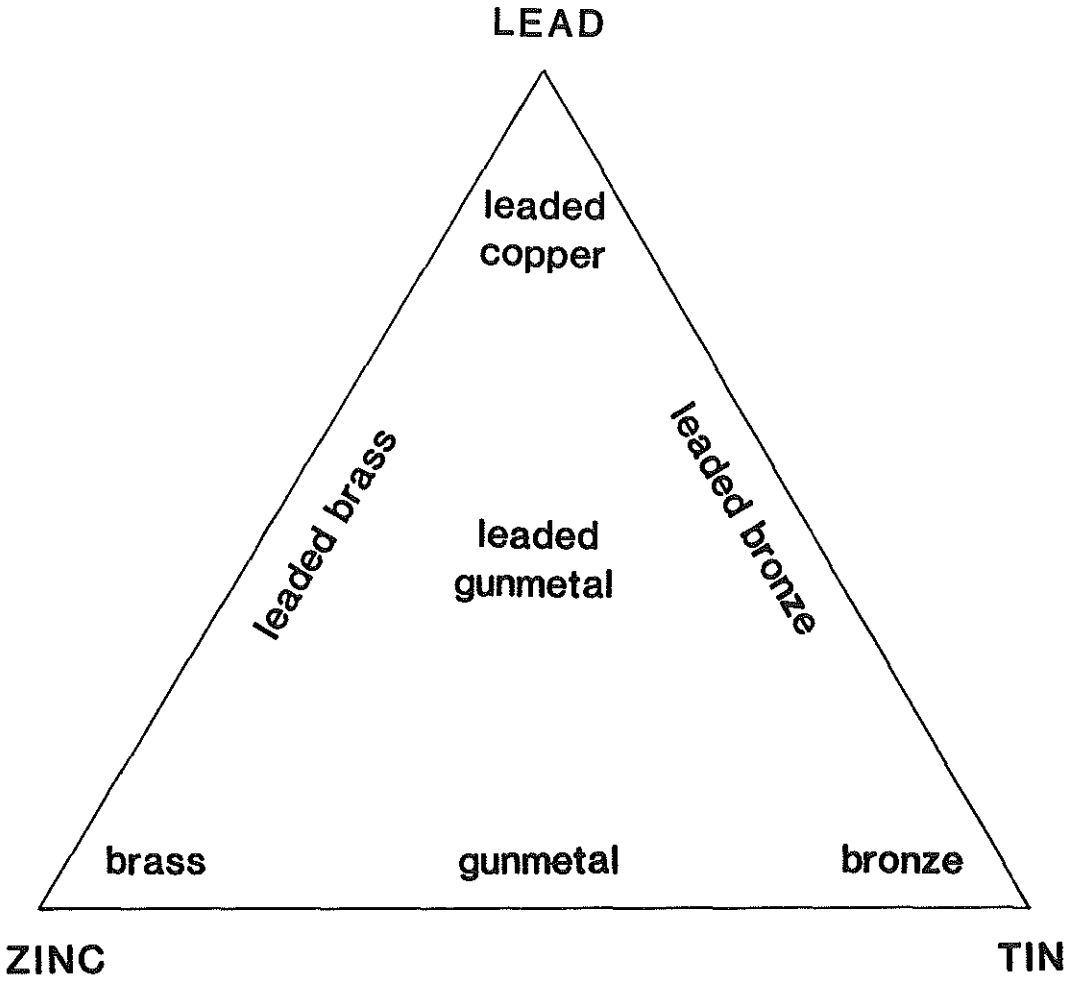

Diagram showing the relationship between composition and alloy name