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ANALYSES OF COPPER ALLOY OBJECTS FROM HEYBRIDGE, ESSEX

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Sixty six objects or fragments were analysed, of which forty four came from Roman contexts (periods IV and V). The remainder were either unstratified or from later contexts. The analyses were carried out non-destructively by X-ray fluorescence (XRF). In most of the analyses copper, zinc, tin and lead were detected, but in greatly varying amounts. The figures obtained were compared with those from samples of known composition and the analyses divided into six groups: 1) copper with little or no additions, 2) brass (copper + zinc), 3) bronze (copper + tin), 4) leaded bronze (copper + tin + lead), 5) gunmetal (copper + zinc + tin) and 6) leaded gunmetal (copper + zinc + tin + lead). The alloys classed as 'leaded' probably contain more than a few per cent of lead but few of them are heavily leaded. There are no hard and fast divisions between the different alloys, eg a bronze will be reclassified as a gunmetal when the zinc content rises above an arbitrary limit. XRF looks at the surfaces of objects and the analyses therefore refer to the surface layers, which are corroded and hence not of their original composition, though allowances have been made for this in interpreting the results. These sort of qualitative analyses cannot hope to exactly describe the alloys being used but the general indications they give are of use in discussing the choice of metals.

The individual alloy indentifications are given in table 1, below and the results summarised in table 2.

Table 2: Alloy used by period

Period	Unalloyed copper	Brass	Bronze	Leaded bronze	Gunmetal	Leaded gunmetal
IV. 2				2	1	
IV. 3		1	4	4		2
V. 1		2	5	7	1	2
V. 2	2	1	5	3		2
VI		2	2	6		3
VII		1				
Unstratified			5	2		1
Total (Roman contexts)	2	4	14	16	2	6
Total	2	7	21	24	2	10

There is no significant variation in the proportions of objects of different allo at different times. The commonest alloy is leaded bronze, followed by bronze, leade gunmetal and brass. Leaded alloys are most suitable for castings which are not go to be worked much and will not be subjected to undue stresses where the lead might cause premature failure. This seems to be the sort of object chosen, while sheet metal is usually bronze without lead. In this last point the results are completely different from those obtained for a group of objects from Sheepen, Colchester where most of the wrought metalwork was brass (AML Report nos 3286 and 3425). The Sheepen finds however all dated pre 60 AD while n of those from Heybridge were earlier than the late 1st century and most were late 2nd century or later. First century brooches such as 1-piece Colchester or Hod Hill brooches are often made of brass but this alloy is not much used for later brooch types (Bayley and Butcher 1980).

In conclusion it can be said that most of the alloys were suited to the types of objects made from them (where this could be determined). The lack of brass may b due to chronological variations in fashion or the availability of raw material.

Alloy identifications

Phase	No	malloyed copper	brass	bronze	leaded bronze	gunmetal	leaded gunmetal
V.1	395				X		
VI	396			X			
V.1	397		X				
V.2 on	398			X			
VI	400						X
VI	401				X		
–	402			X			
VII	403		X				
V.1	404				X		
V.1	405			X			
IV.3	406				X		
VI	407						X
V.1	408				X		
IV.3	409			X			
V.2 on	410				X		
IV.2	411					X	
VI	412				X		
V.2	413			X			
End IV.3	415			X			
V.2 on	416		X				
–	418				X		
–	419						?
V.2	2/3				X		
End IV.3	2/6				X		
V.2	2/10			?			
IV.2	2/12			?			
V.1	2/18					X	
V.1	2/21				X		
VI	2/24				X		
IV.3	2/25		X				
V.1	2/27				X		
VI	2/28						X
V.1	2/29						X
V.1	2/30				X		
V.1	2/31			?			
V.1	2/32			?			

Phase	No	malloyed copper	brass	bronze	leaded bronze	gunmetal	leaded gunmetal
IV.2	2/33				X		
–	2/34			X			
V.2 on	2/35				X		
VI	2/36				X		
IV.3	2/37				X		
V.2	2/40	?Cu					
VI	2/41			?			
V.1	2/42				X		
VI	2/43		?				
V.1	2/44			X			
V.1	2/45						X
VI	2/46		X				
V.2	2/47						X
IV.3	2/48						X
V.2 on	2/49			X			
IV.3	2/50			?			
VI	2/51				X		
V.1	2/52				X		
V.2 on	2/53	?Cu					
–	2/54			?			
–	2/55			X			
IV.3	2/56				X		
IV.3	2/57			?			
–	2/58				X		
–	2/59				X		
V.1	2/60		X				
IV.2	2/61				X		
VI	2/62				X		
V.2	2/63						X
End IV.3	2/64						X

Note to table 1: A question mark indicates uncertainty in the assignment of an object to an alloy group.