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# Copper alloy objects from seven sites within mid Saxon London (Lundenwic)

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**Summary**

Sixty-eight mid Saxon copper alloy, silver and gold objects along with some iron slag were analysed qualitatively by EDXRF. The majority of the copper alloy objects were small items such as pins. The results allowed the identification of broad trends in copper alloy use and the comparison of this data with that from other mid Saxon sites around the east and south of England.

**Keywords**
Copper alloy,
Silver,
Gold,
Metal working Fe,
Metal working non-Fe,
Technology,
Early medieval

## Archaeological background

Sixty-eight mid Saxon objects from the Museum of London were sent for analysis. They came from seven different sites within Lundenwic, three sites in particular (BRU92, BOB91 and SGA89) produced most of the material. All sites are divided into the following periods:

Period 1 - natural
Period 2 - mid 5th to mid 7th century (pre-Lundenwic, including cemetery)
Period 3 - mid 7th to mid 8th century (Chaff-tempered ware)
Period 4 - mid 8th to mid 9th century (Ipswich ware)
Period 5 - late 8th to mid 9th century (Shelly wares, and Tating ware and red painted wares from early 9th century)
Period 6 - mid 7th to mid 9th century (indet. Middle Saxon)
Period 7 - mid 9th to early 17th century (dark earth*)*

Bruce House (BRU92) is on the south-west side of Kemble Street. The Saxon material sent for analysis is from periods 3 – 7. Periods 3 and 4 were mainly represented by cut features, with slight evidence for roads or hollow ways in period 3. There were two intrusive medieval pottery sherds. The majority of the material from 67-68 Long Acre (BOB91) is from period 3. This includes two graves, structural remains and evidence of iron working. Two pieces of iron slag from this site are included in the material for analysis (see visual assessment). Period 4 was characterised by industrial dumps and possibly some domestic remains. Period 5 consisted of scattered refuse pits. Activity at 2-26 Shorts Gardens (SGA89) was mainly concentrated around period 5. This consisted of a number of hearths and destruction phases.

## Historical Background

At the end of the fourth century Roman London was abandoned. Mid Saxon London existed as a settlement along the Strand from the seventh century onward, surviving early Viking attacks. There is no evidence for its continued existence after the Viking raid in 871. By 889 the settlement had been relocated within the walls of the former Roman city (Vince 1990).

## Objective

To gather basic information about the composition of the different copper alloys being used in Lundenwic and a comparison of this data with other contemporary sites. There are few analyses of mid Saxon copper alloys, making this a useful data set.

## Visual Assessment

The majority of the items are copper alloy pins, the preservation state of which varies widely. Due to the method of analysis to be used (see below) this will have some effect on the reliability of the results. There were also a few silver objects and one gold bead. Two pieces of slag (presumably iron working) are included with the

assemblage, one non-diagnostic, the other run or tap slag. Tap and run slag have distinct shapes resembling a flow of lava and are a product of smelting (Bayley et al 2001), however such a small amount on its own is not indicative of smelting on site.

Because of the size of this assemblage spatial and temporal comparisons between the seven different sites was not possible.

## Analytical method

The samples were analysed using energy dispersive X-ray fluorescence (EDXRF), providing a non-destructive qualitative method of identifying the alloys represented. Prior to analysis the objects were not cleaned. As in Dungworth (2000) and Dennis (1999) the classification of the EDXRF samples was reliant on a simple visual assessment of the relative heights of the characteristic peaks. The peak heights are proportional to the abundance of the elements present in the sample, however they are also dependent on a number of variables (such as absorption of secondary X-rays, the shape of the object and the effects of burial conditions [Bayley 1992: 817-819]). Although this method of analysis is limited, it does allow the identification of broad trends in alloy composition. The larger the set from which the data is extracted the more reliable the data becomes. The alloy names in this report are based upon those used in Bayley (1991:13 – 17).

## Discussion

(See appendix 1)

Bronze (copper and tin) was the most common copper alloy across all periods. Gunmetals (copper, zinc and tin) and brasses (copper and zinc) were well represented in periods 3 and 5. Most of the objects contained significant amounts of lead. The addition of lead lowers the melting point of copper alloys and increases the fluidity (Dungworth 2001) making them easier and more economical to work with when casting. Lead also affects the malleability when the alloy solidified, consequently leaded copper alloys are less suited to drawing and hammering. A small number of copper items were present.

*Table 1: Distribution of alloys by period*

| **Alloy** | **Period** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Unknown** | **3** | **4** | **5** | **6** | **7** | **Total** |
| **Bronze** | 4 | 10 | 6 | 10 | 1 | 3 | 34 |
| **Brass** | 2 | | 1 | 7 | | 2 | 12 |
| **Copper** | | 3 | 2 | | | 1 | 6 |
| **Gunmetal** | 2 | 1 | | 6 | | 1 | 10 |
| **Gold** | | | | | 1 | | 1 |
| **Silver** | 1 | 1 | | 1 | | | 3 |
| **Iron** | | 2 | | | | | 2 |
| **Total** | 9 | 17 | 9 | 24 | 2 | 7 | 68 |

EDXRF confirmed that two of the items were silver but showed that the third thought to be silver is actually a leaded brass (SGA89, accession number 237). There was also

one small piece of silver spillage (BRU92, accession number 277). The gold bead (DRY90, accession number 163), was gold alloyed with silver and copper. The slag was confirmed as iron-rich.

Figure 1 shows a comparison of the Lundenwic copper alloy material with three other mid Saxon sites, the Royal Opera House (also Lundenwic [Dennis 1999]) Brandon, Suffolk (Blades 1992) and the analysis of pins from Southampton, Hampshire (Wilthew 1984). The data from all four sites is broadly comparable, showing bronze to be the most common copper alloy. Leaded and unleaded alloys have been combined in figures 1 and 2.

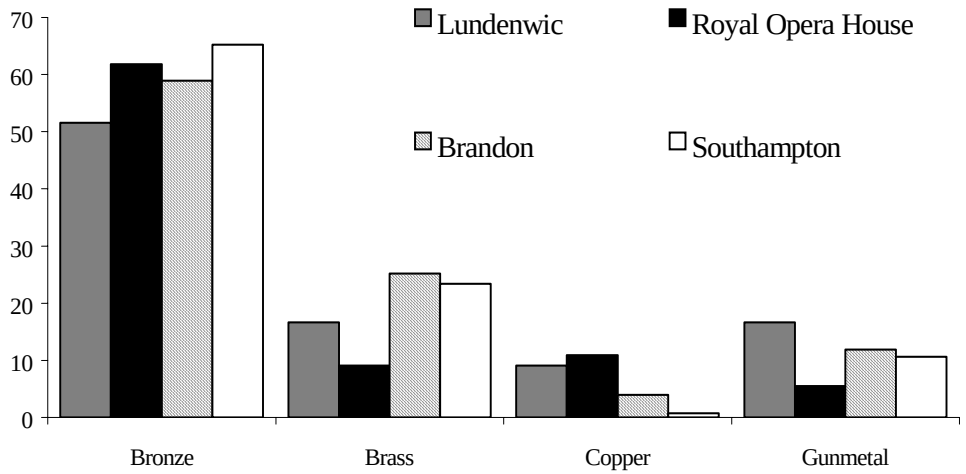


*Figure 1 – Middle Saxon copper alloys (%)*

Figure 2 combines a range of quantitative and qualitative data from a variety of sources and covers a period spanning the 1st to the 17th century AD. When combined with the data from figure 1 we can see a trend in the increasing use of bronze from approximately the 3rd century AD which reaches its peak in the late Saxon era, before declining as brass becomes the dominant copper alloy. The mid Saxon Lundenwic data fits well with this pattern of use.

The finds from BOB91 contained no brasses; this is not simply spatial variation but temporal. The majority of BOB91 artefacts are period 3 (mid 7th to mid 8th century) at the beginning of the middle Saxon period (or at the end of the 'migration period'). BOB91 data compares better with the early Saxon period in figure 2.

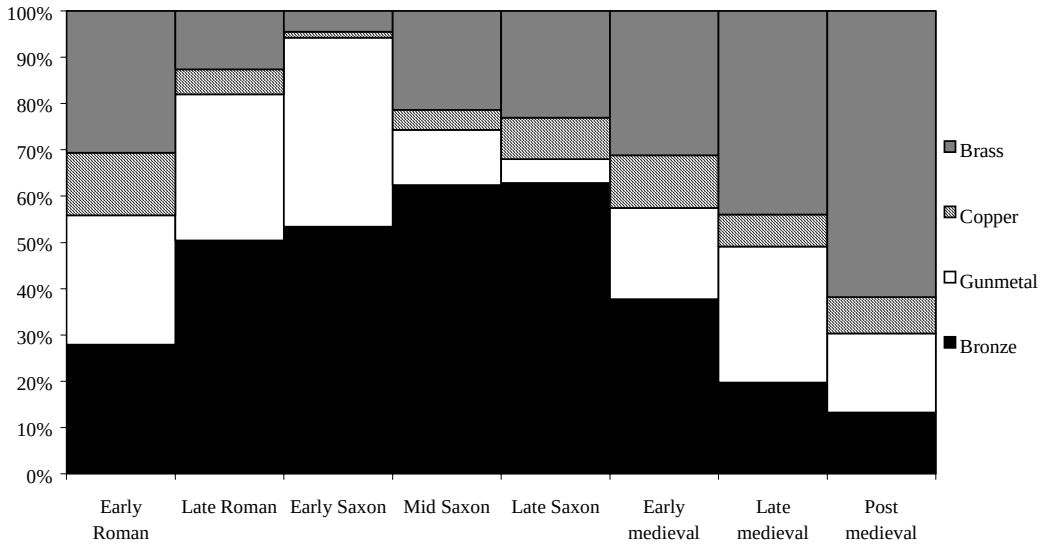


*Figure 2 – Copper alloy usage through time. Roman data was taken from Dungworth (1995), early Saxon, late Saxon and medieval data is from Blades (1992), post medieval data is from Dungworth (2002). Mid Saxon data is combined from figure 1.*

## Conclusion

The majority of the objects analysed from the seven Lundenwic sites were bronze, as is to be expected of copper alloys from the mid Saxon period. A small number of gunmetals, brasses and plain copper artefacts were also present. The Lundenwic artefacts analysed here show a similar range of compositions as those from other mid Saxon sites in London and around the east and south of England.

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## Appendix 1

xxx - element strongly present
xx - element present
x - element detectable
tr - element detectable in trace amounts

| Site | Accession | Context | Period | MoL object | Cu | Sn | Zn | Pb | Ag | Au | Fe | Alloy description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BOB91 | 22 | 547 | 3 | MOUN | xxx | xx | | xx | | | | leaded bronze |
| BOB91 | 42 | 401 | 3 | PIN | xxx | xx | | xx | | | | leaded bronze |
| BOB91 | 48 | 516 | 3 | MOUN | xxx | | | | | | | copper |
| BOB91 | 50 | 530 | 3 | PIN | xxx | xx | | xx | | | | leaded bronze |
| BOB91 | 51 | 498 | 3 | MOUN | xxx | xx | xx | xx | | | | leaded gunmetal |
| BOB91 | 53 | 423 | 3 | SLAG | | | | | | | xxx | iron slag |
| BOB91 | 59 | 468 | 3 | PIN | xxx | xx | | xx | | | | leaded bronze |
| BOB91 | 93 | 332 | 3 | UNK | xxx | | | | | | | copper |
| BOB91 | 98 | 409 | 3 | UNK | xxx | x | | x | | | | bronze |
| BOB91 | 122 | 422 | 3 | UNK | | | | | | | xxx | iron slag |
| BOB91 | 17 | 179 | 4 | PURS | xxx | xx | | x | | | | bronze |
| BOB91 | 38 | 378 | 4 | MOUN | xxx | | | | | | | copper |
| BOB91 | 44 | 421 | 4 | PATC | xxx | | x | | | | | copper |
| BOB91 | 85 | 421 | 4 | UNK | xxx | x | | | | | | bronze |
| BOB91 | 36 | 326 | 5 | UNK | xxx | x | xx | xx | | | | leaded gunmetal |
| BOB91 | 63 | 602 | 5 | PIN | xxx | xx | | xx | | | | leaded bronze |
| BRU92 | 94 | 268 | 0 | PIN | xxx | xx | | xxx | | | | leaded bronze |
| BRU92 | 101 | 368 | 0 | STPE | xxx | xx | | x | | | | bronze |
| BRU92 | 109 | 487 | 0 | PIN | xxx | | xx | x | | | | leaded brass |
| BRU92 | 273 | 782 | 0 | UNK | xxx | x | | tr | | | | bronze |
| BRU92 | 3 | 102 | 3 | UNK | xxx | xx | | x | | | | bronze |
| BRU92 | 268 | 735 | 3 | UNK | xxx | xx | | x | | | | bronze |
| BRU92 | 269 | 736 | 3 | UNK | xxx | x | | x | | | | leaded bronze |
| BRU92 | 277 | 684 | 3 | SLAG | xx | tr | | | xxx | | | silver |
| BRU92 | 108 | 475 | 4 | PIN | xxx | xx | | xx | | | | leaded bronze |
| BRU92 | 270 | 766 | 4 | UNK | xxx | xx | | | | | | bronze |
| BRU92 | 271 | 773 | 4 | PIN | xxx | x | | tr | | | | bronze |
| BRU92 | 272 | 774 | 4 | NAIL | xxx | xx | | x | | | | bronze |
| BRU92 | 275 | 727 | 4 | PIN | xxx | | xx | xx | | | | leaded brass |
| BRU92 | 374 | 702 | 5 | WAST | xxx | | x | tr | | | | brass |
| BRU92 | 266 | 672 | 6 | UNK | xxx | x | | tr | | | | bronze |
| BRU92 | 118 | 604 | 7 | UNK | xxx | x | x | x | | | | leaded gunmetal |
| BRU92 | 119 | 604 | 7 | PIN | xxx | x | | xx | | | | leaded bronze |
| BRU92 | 262 | 457 | 7 | MOUN | xxx | | x | | | | | brass |
| BRU92 | 264 | 604 | 7 | UNK | xxx | | | | | | | copper |
| BRU92 | 265 | 627 | 7 | WAST | xxx | x | | x | | | | bronze |
| BRU92 | 361 | 655 | 7 | SLAG | xxx | xx | | xx | | | | leaded bronze |
| DRY90 | 59 | 162 | 0 | PIN | xxx | xxx | | xxx | | | | leaded bronze |
| DRY90 | 88 | 204 | 0 | PIN | xxx | x | xx | x | | | | leaded gunmetal |
| DRY90 | 3 | 7 | 3 | BROO | xxx | xxx | | xxx | | | | leaded bronze |
| DRY90 | 163 | 118 | 6 | BEAD | xx | | | | xx | xxx | | gold |
| KWH96 | 2 | 111 | | | xxx | xxx | xxx | xxx | | | | leaded gunmetal |
| MAI86 | 56 | 231 | | BROO | xxx | | xx | xx | | | | leaded brass |
| SGA89 | 6 | 51 | 5 | PIN | xxx | xx | | xx | | | | leaded bronze |

| Site | Accession | Context | Period | Object | Cu | Sn | Zn | Pb | Ag | Au | Fe | Alloy description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SGA89 | 21 | 238 | 5 | PIN | xxx | xx | | xx | | | | leaded bronze |
| SGA89 | 23 | 240 | 5 | PIN | xxx | xx | | xx | | | | leaded bronze |
| SGA89 | 37 | 376 | 5 | PIN | xxx | xx | x | xx | | | | leaded bronze |
| SGA89 | 53 | 473 | 5 | PIN | xxx | | xx | xx | | | | leaded brass |
| SGA89 | 56 | 312 | 5 | MOUN | xxx | xx | xx | xx | | | | leaded gunmetal |
| SGA89 | 63 | 501 | 5 | PIN | xxx | xx | | xx | | | | leaded bronze |
| SGA89 | 98 | 629 | 5 | PIN | xxx | xx | | xx | | | | leaded bronze |
| SGA89 | 123 | 722 | 5 | PIN | xxx | x | x | xx | | | | leaded gunmetal |
| SGA89 | 140 | 81 | 5 | UNK | xxx | xx | | xx | | | | leaded bronze |
| SGA89 | 183 | 850 | 5 | PIN | xxx | xx | | xx | | | | leaded bronze |
| SGA89 | 237 | 470 | 5 | PIN | xxx | | xx | xx | | | | leaded brass |
| SGA89 | 242 | 1089 | 5 | PIN | xxx | | xx | x | | | | brass |
| SGA89 | 244 | 1089 | 5 | PIN | xxx | tr | xx | tr | | | | brass |
| SGA89 | 248 | 1603 | 5 | PIN | xxx | x | xxx | x | | | | brass |
| SGA89 | 284 | 1143 | 5 | PIN | xxx | xx | x | xx | | | | leaded gunmetal |
| SGA89 | 303 | 1089 | 5 | PIN | xxx | xx | xx | x | | | | gunmetal |
| SGA89 | 320 | 385 | 5 | MOUN | x | | | | xxx | | | silver |
| SGA89 | 71 | 527 | 7 | PIN | xxx | xx | xx | xx | | | | leaded gunmetal |
| SOT89 | 114 | 184 | 3 | UNK | xxx | | | tr | tr | | | copper |
| SOT89 | 115 | 184 | 3 | PIN | xxx | x | | xx | | | | leaded bronze |
| SOT89 | 38 | 25 | 5 | PIN | xxx | tr | xx | xx | | | | leaded brass |
| SOT89 | 83 | 30 | 5 | PIN | xxx | xx | | xx | | | | leaded bronze |
| SOT89 | 85 | 30 | 5 | PIN | xxx | xx | xx | xx | | | | leaded gunmetal |
| SOT89 | 86 | 30 | | PIN | xxx | | xx | xx | xxx | | | silver |