# Bartering of Brass
## A Compositional Analysis of English Monumental Brasses

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## English Monumental Brasses

*"A good many of our bodies shall no doubt*
*Find native graves; upon the which, I trust,*
*Shall witness live in brass of this day's work."*
*Henry V, Act IV, Scene 3*

Monumental brasses are a common sight throughout British churches, becoming ubiquitous from 1300 to 1650 [1]. These common sepulchral brass plates, while European in origin, are overwhelmingly English in spread, 7,687 known English examples as opposed to 55 Welsh, 5 Scottish, 5 Irish and 154 continental examples. Such a set provides an extensive collection to study the medieval copper industry in Britain.

Figure: Monumental plate of Sir John Langston d.1506 © The Trustees of the British Museum

### *William Lack's Brasses*

William Lack, during an extensive career refurbishing monumental brasses, collected over 2250 samples from across Britain. He generously donated this collection to the Research Laboratory for Archaeology and the History of Art, University of Oxford. For this pilot study, 232 of these samples were analysed by X-Ray Fluorescence Spectroscopy (XRF).

## Method and Analysis

The samples posed some initial problems as they were either fine powder or turnings, meaning that XRF would be challenging. However, this technique was chosen as both common in ancient metallurgy study and also allowing a high volume of samples to be analysed quickly.
Samples were mounted in drilled out resin blocks, before being ground and polished to expose the metal. While the totals achieved from such a method were still low, mounting the brasses in this fashion meant they remain available for further analysis by more accurate techniques, notably Scanning Electron Microscopy (SEM) and Microprobe (EMPA).

Figure: Five brass samples, mounted in *Streuers Caldo-Fix2 Resin*

## Result and Discussions

Many of the results are consistent with previous knowledge and assumptions about the medieval 'latten' industry. Particularly, the expected increased of zinc (Zn), from $<$20 wt% in the fourteenth century, to 12-23% in the fifteenth century, 11-28% the first half of sixteenth century, then jumping to 27-33% after 1550 [2].

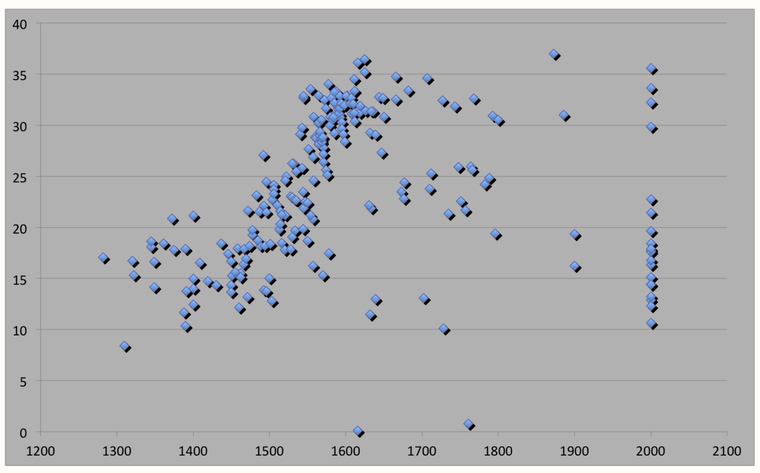


Figure: Weight percentage of zinc in monumental brasses across time, with palimpsest material at 2000.

What is interesting about this decrease is that it is also mirrored by a decrease in lead, and thinning brass plates. This is likely related to fact that while lead was used to 'water down' latten, making production cheaper, the extra zinc would force the alloy into an unworkable $\beta$ brass. The cost of purer brass was countered by thinning the plate.

### *Purity of Copper*

The increasing purity of copper is a feature of monumental brasses, as refining process improve. However, when copper is compared to workshop styles, it is clear there are some significant differences.

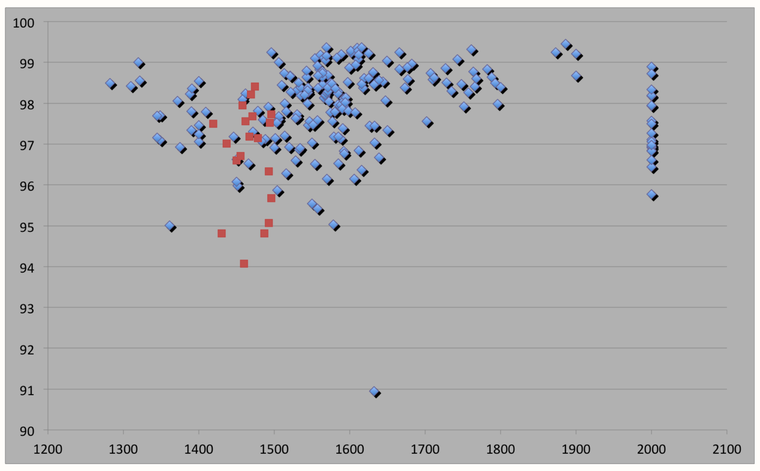


Figure: Weight percentage of copper in monumental brasses across time, with palimpsest material at 2000 and London D in red.

While most workshops seem to have consistent purity of copper, grouping closely, London D style shows notable variation. London D also shows some of the largest variation with regards to other traces.
This raises the point that either London D is being produced by multiple workshops, or the workshop is not using a consistent, single source of copper. Whether or not this is due to problems of availability, and where the copper is actually coming from, requires more investigation.

### *Palimpsests and Recycling*

Monumental brasses are often reused, as palimpsests, the original engraving removed or altered. This is usually easily apparent to a trained eye. As well as this, the ratio between tin and zinc is forms a statistically significant decrease over time, as tin falls and zinc rises. However, the palimpsest material clearly stands out, with a ratio more consistent with earlier metal. As the date given is that recorded on the final monument, this makes perfect sense, the metal being earlier in production than the palimpsests.

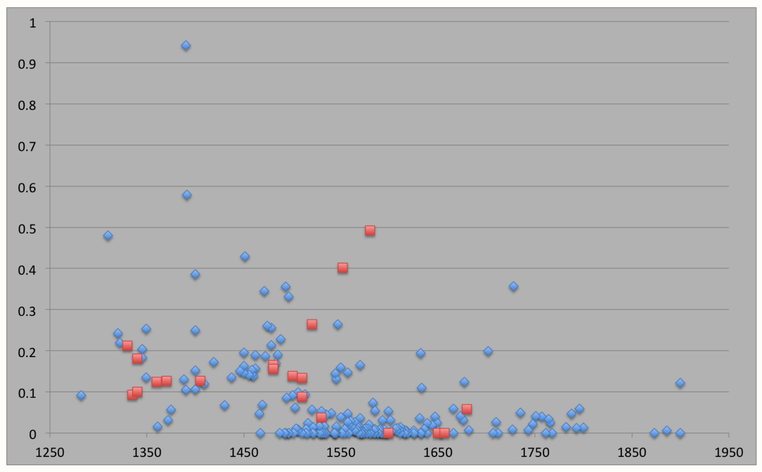


Figure: Ratio of weight percentage of zinc to tin in monumental brasses across time, with palimpsests material in red.

Using such an approach, it can also be seen that there are other brasses which are notably different from the trend. During many points, copper was scavenged and remelted. As it was appropriate to re-engrave plates, one cannot imagine producing them from remelted material would cause ideological issues. With more detailed analysis it is hoped that some elements related to recycling could be assessed.

## Summary and Conclusions

While this is only a preliminary study, it has shown that there is potential for William Lack's substantial collection to answer some pivotal questions on the nature of metal flow in medieval Europe.
The increase in zinc and the decrease in other impurities is likely technological, however the lack of association of some particular workshops to particular compositions, implies a complex system of metal movement across England. The next step in such research is to compare these results to other European copper alloys.

### *Special Thanks:*

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### *References*

[1] S. Badham, H.M. Stuchfield. 2009. *Monumental Brasses*, Shire.
[2] H.K, Cameron. 1974. *Technical Aspects of Medieval Monumental Brasses*, Royal Archaeological Institute.