

# THE DENARIUS IN THE FIRST CENTURY

K. BUTCHER & M. PONTING

This paper presents some of the results of an on-going series of inter-disciplinary projects looking at the composition and technology of Roman Imperial silver coinage. The analyses have been conducted in the School of Archaeology, Classics and Egyptology of the University of Liverpool and have been funded by the Leverhulme Trust and the Arts and Humanities Research Council (UK). We should mention that this project also deals with provincial silver, and with the denarius coinage down to the civil war of AD 193, but an overview of all that material would be difficult in the space allotted here. What follows is a general narrative, by reign, followed by some brief concluding thoughts.

The analysis was by a combination of techniques; inductively-coupled plasma atomic emission spectrometry (ICP-AES) and atomic absorption spectrometry (AAS) for the compositional analysis, multi-collector plasma induced mass spectrometry (MC-PIMS) for the lead isotopes and a combination of scanning electron and optical microscopy for the structural investigations. Samples for compositional analysis were removed from the 'heart-metal' of each coin by drilling; this method minimises the danger of including the artificially silver enriched metal from the surface layers of the coins (for a detailed discussion of the analytical methods used in this project see, (Butcher / Ponting 2005, Gitler / Ponting 2003, Butcher / Ponting 1995, Ponting 2009).

To date we have not analysed the very complex denarius coinage of Augustus in any detail, apart from his later issues, which were produced at Lyon (Fig. 1). This coinage was essentially pure silver bullion, with no adulterating metal deliberately added. So while it was not pure elemental silver as we would understand it (and which the technology of the Romans would not have been able to produce), it was 100% pure in Roman terms – that is, it was the elemental silver plus impurities such as lead (commonly used in the refining process), gold and bismuth. This high level of purity required a very careful and probably labour-intensive secondary refining process to produce the quantities of silver bullion that the mint required.

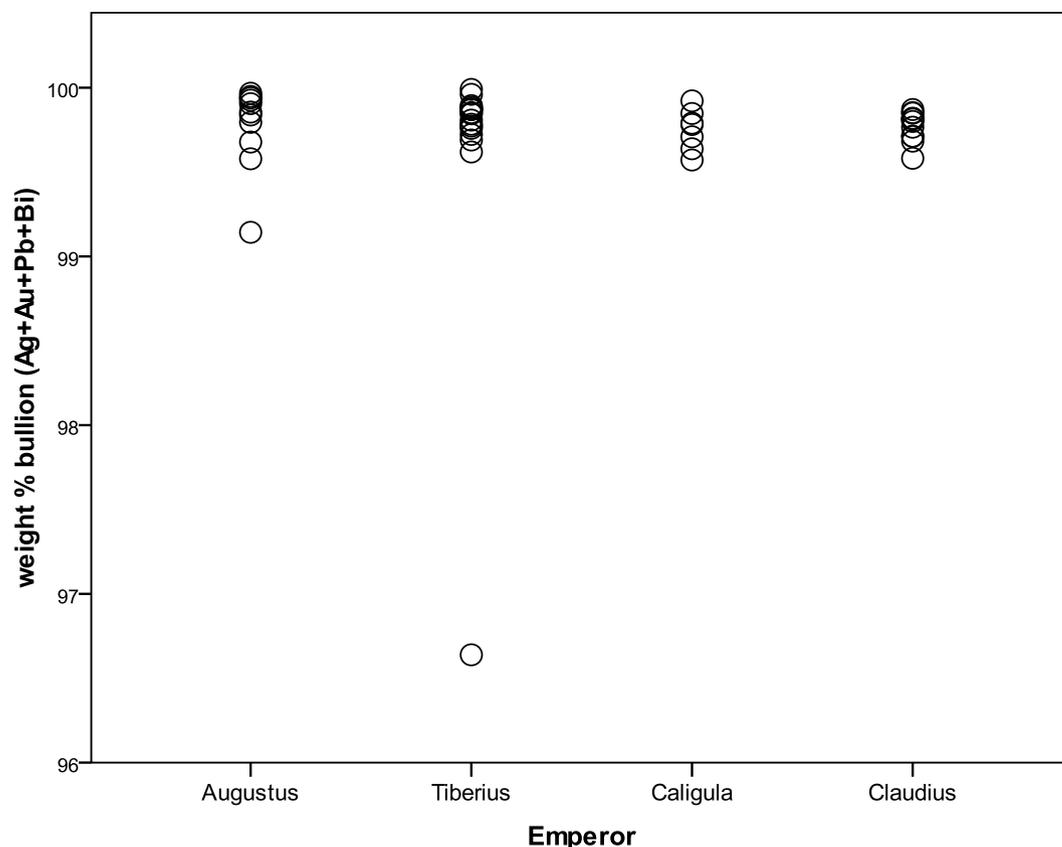


Fig. 1. Fineness of individual denarii from Lyon, by reign.

The seated Pax denarii of Tiberius, also produced at Lyon, continued at the same fineness (Fig. 1). There is nothing in their metallurgical makeup to suggest more than one mint at work, although one specimen from a British hoard has a lead isotope signature that suggests that the silver probably came from a far eastern source, perhaps India. In general, however, the lead in Roman silver coins is more likely to have been added in refining the silver for re-cycling and therefore its isotopic signature more usually provides evidence for the origin of this lead rather than indicating the provenance of the silver itself. Nevertheless, such information can be useful in understanding metal procurement regions and mint attributions, as will be seen below. The denarii of Caligula and Claudius were also made of pure silver bullion (Fig. 1).

Trace element analysis shows a gradual shift in the sources utilised for denarii issued between the reigns of Augustus and Nero, but there is no sudden change that would indicate a change of mint (Fig. 2). Traditionally the reign of Caligula is seen as the point when the mint for denarii switched from Lyon to Rome. The few denarii of Caligula that we have been permitted to sample suggests no dramatic shift such as might have been occasioned by a change of mint, and the trace elements in Caligula's coins form a compositional continuum from Tiberius to Claudius. However, an alternative point in the reign of Nero has been gaining favour as the one in which the main denarius mint shifted to Rome. As will be seen, our results support a change under Nero, but the story is not as simple as one might have hoped.

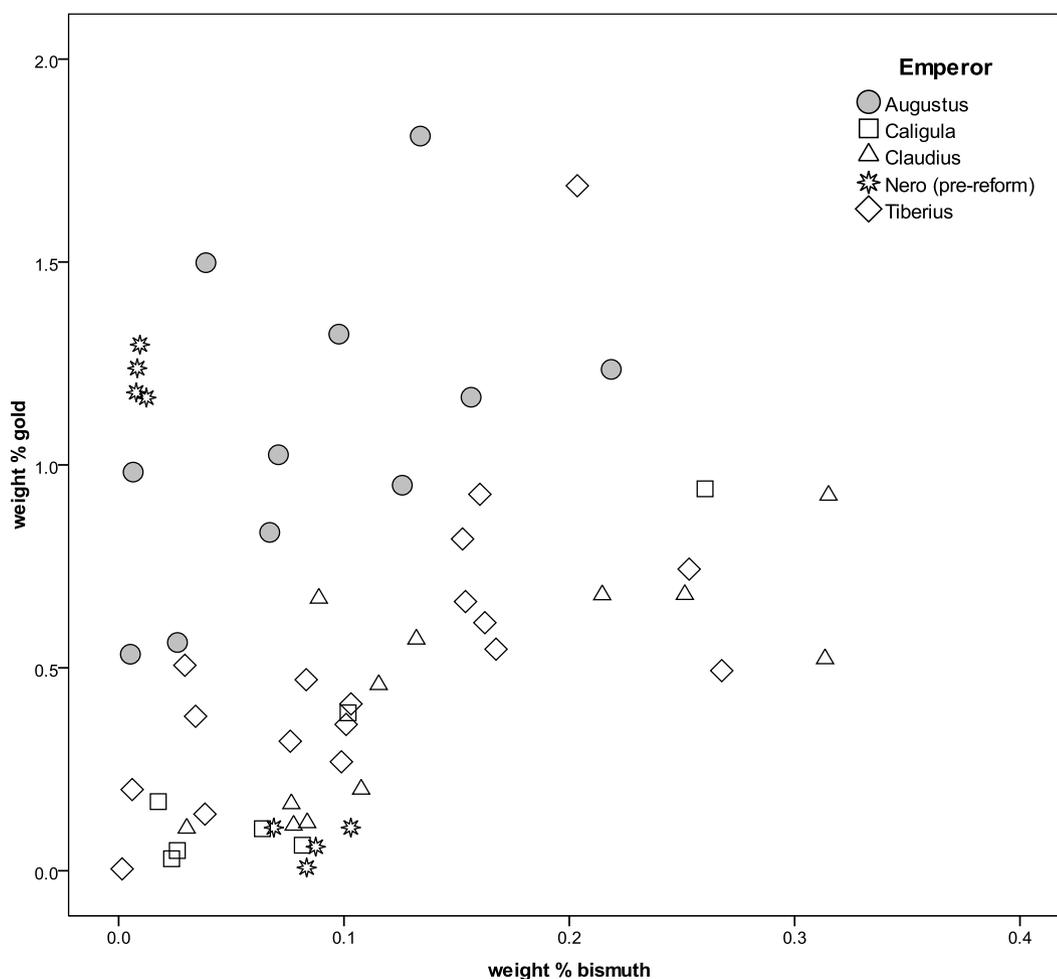


Fig. 2. Gold/bismuth plot of Julio-Claudian silver excluding Nero's post-reform coinage.

The standard history of Nero's denarius reform is as follows: in the early years of his reign, the weight and fineness of the denomination were reduced slightly. Then, in AD 64, there was a significant reduction in weight and a reduction of fineness, down to about 93%, a figure that was defined in David Walker's *Metrology of the Roman Silver Coinage* (Walker 1976). (This was the figure for elemental silver rather than silver bullion.) This Neronian reform of AD 64 marks a significant point in the history of the denarius. It is a watershed in later hoarding patterns (denarii issued before the reform have disappeared by the second century), suggesting that earlier coins were deliberately removed from circulation in the later first or early second century AD (Duncan-Jones 1994, pp. 194-97).

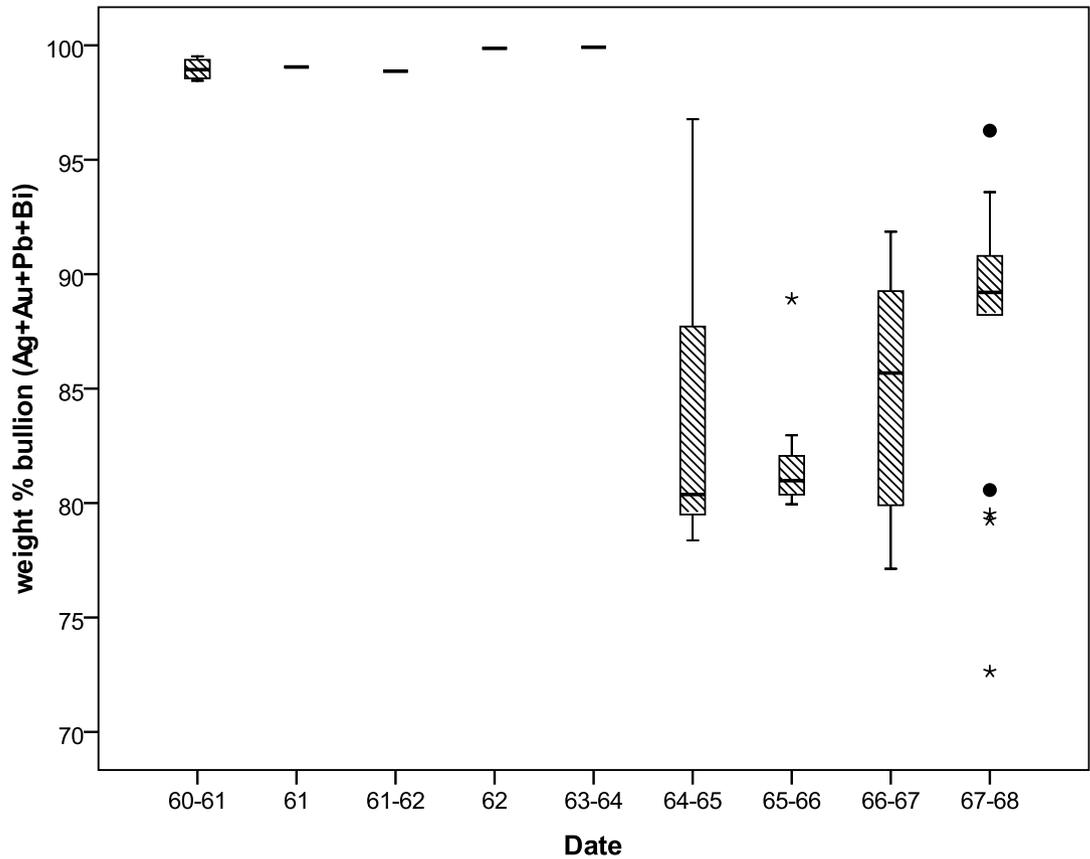


Fig. 3. Fineness plots for Nero's denarii, pre- and post-64, by date.

The true picture of the Neronian reform seems to be rather more complex (Fig. 3). We have identified at least four stages in the history of the Neronian denarius, with two of those stages occurring before AD 64 (Butcher / Ponting 2005). His first issues with the civic wreath on the reverse were issued in small quantities, with the last one, issued during the seventh renewal of Nero's tribunician power, being the most common. Specimens of this last issue were analysed, and showed a slight debasement compared to the denarii of Lyon issued by previous emperors. This proto-debasement consisted of the addition of around 1.5% of copper to the alloy, and they were also lighter in weight. Their trace element profile fits best with the later issues of the mint of Rome (Fig. 4). One would assume, therefore, that these were made at Rome and that these civic wreath issues mark the transfer of the mint for silver and gold from Lyon to Rome.

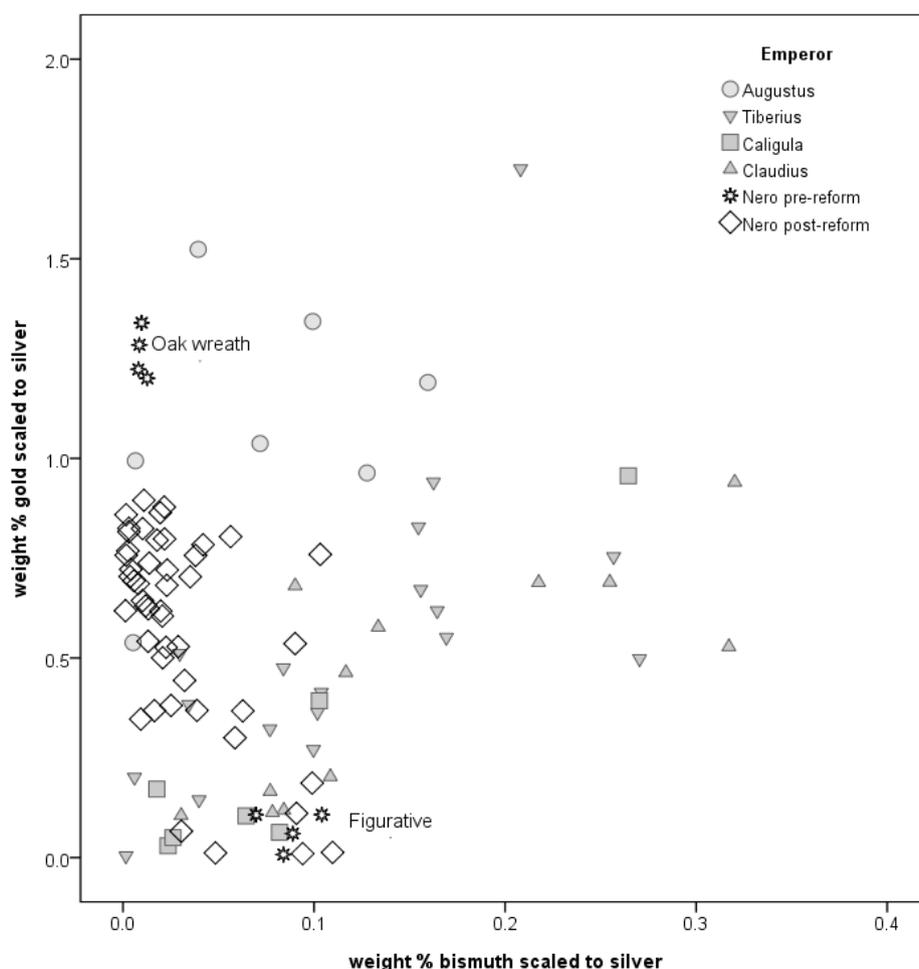


Fig. 4. Pre-reform denarii of Nero compared with the denarii of Lugdunum and Nero's post-reform denarii (minted at Rome). The oak-wreath type (circled at top) are low in bismuth and high in gold, which resembles the post-reform denarii of Nero. The figurative types (circled at bottom) fit closely with the later Lugdunum denarii of Caligula and Claudius.

However, the subsequent issues with either Ceres, Roma or Virtus on the reverse are made of pure silver bullion and their trace element profiles match the earlier fine silver coins of Lyon (Figs. 3, 4). They are also carefully refined, like the coins of Lyon. The fact that there is no change of style at this point would imply that the civic wreath and figurative coins were probably produced at the same location, but the trace element data suggest that the metal came from different sources. It looks as if the mint shifted to Rome, and then reverted to Lyon. The only alternative suggestion we can present at the moment is that the mint shifted to Rome, and then either metal from Lyon, or flans made at Lyon, were shipped to Rome.

Then came the debasement of AD 64. It was much sharper than previously suspected, lowering the fineness to about 80% (Fig. 3).<sup>1</sup> However, at the end of his reign a final, substantial issue

<sup>1</sup> Note however that the single specimen analysed of Nero's very first issue of post-reform denarii (MacDowall 1979, pp. 33-34, issue 1a) has a very high silver content of about 97%.

of denarii (MacDowall 1979, p. 34, issue 3b) was struck at a higher fineness of about 90%. This may indicate that the public did not like the 80% denarii, or that the debasement was viewed by the government as a temporary one, with the fineness to be restored when possible.

This is a trend that repeats from time to time throughout the period under study. Indeed, what happened next during the civil wars of AD 68-69 certainly goes some way towards supporting the hypothesis of temporary debasement. Galba, Otho and Vitellius all issued denarii in huge quantities. Aside from using the mint of Rome, Galba and Vitellius also struck denarii at unidentified mints in the western provinces, and several western mints produced anonymous denarii, some of which can be associated with the activities of Galba and Vitellius, and others not. Galba's denarii issued at Rome are on the revised Neronian standard of 90%. However, his denarii issued at western mints, most of the anonymous civil war issues, and the western denarii of Vitellius, seem to have been produced at a higher fineness, and were often pure silver (Figs. 5, 7). Evidently these western mints were not required to adhere to the fineness standards of Rome, and operated at superior standards. That said, a significant number of plated forgeries and heavily debased coins that had not been suspected by the curators of the holding institutions were also encountered during sampling these issues. The plated coins suggest 'unofficial' mints or forgers at work, and the heavily debased coins may also hail from the same sources.

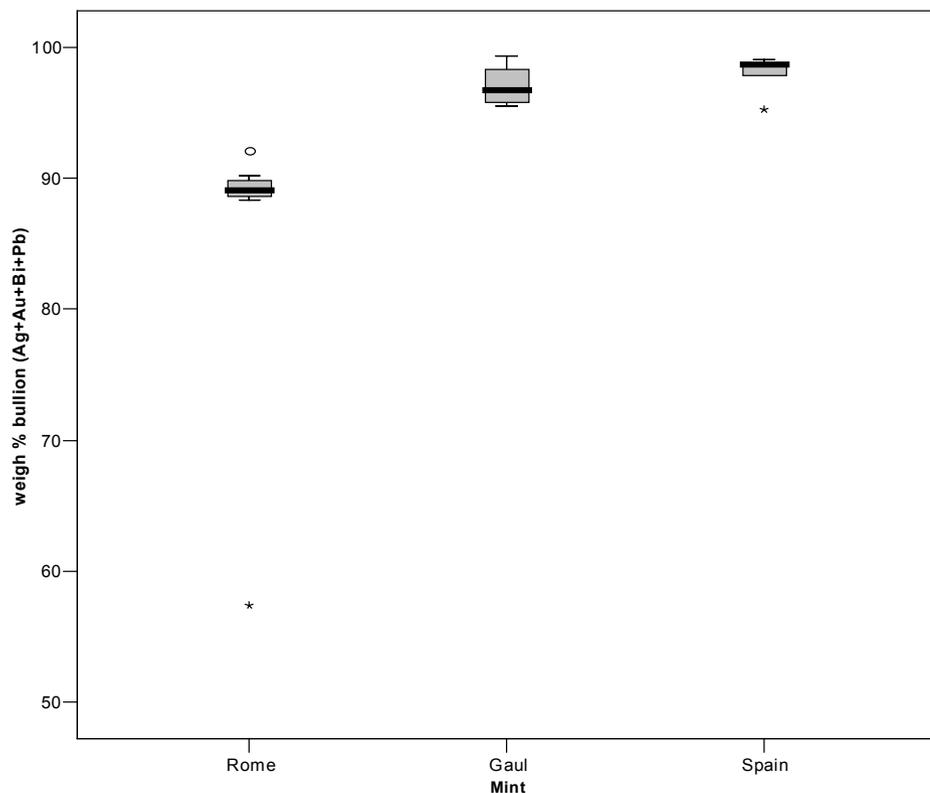


Fig. 5. Finenesses of Galba's denarii, according to traditional mint attributions. Note that Rome is baser than Gaul or Spain.

Otho produced denarii only at the mint of Rome (Fig. 6). After producing most of his denarius

coinage on the 90% standard, Otho lowered the fineness back to almost 80% for his last issue (Butcher / Ponting / Muona 2009). The denarius of Rome continued on this 80% standard under Vitellius and through the reign of Vespasian. Once again, this alters our perception of the times, as Vespasian is usually credited with the debasement of the denarius at the beginning of his reign in order to help cover the costs of the civil war and the excesses of Vitellius. Instead, it now appears that Vespasian did nothing significant to the fineness of the denarius at Rome. Whatever the cost of the civil war, it did not force him to debase the silver. Otho had already done that. At Rome Vespasian continued the standard that had been introduced by Nero in AD 64 (Fig. 8).

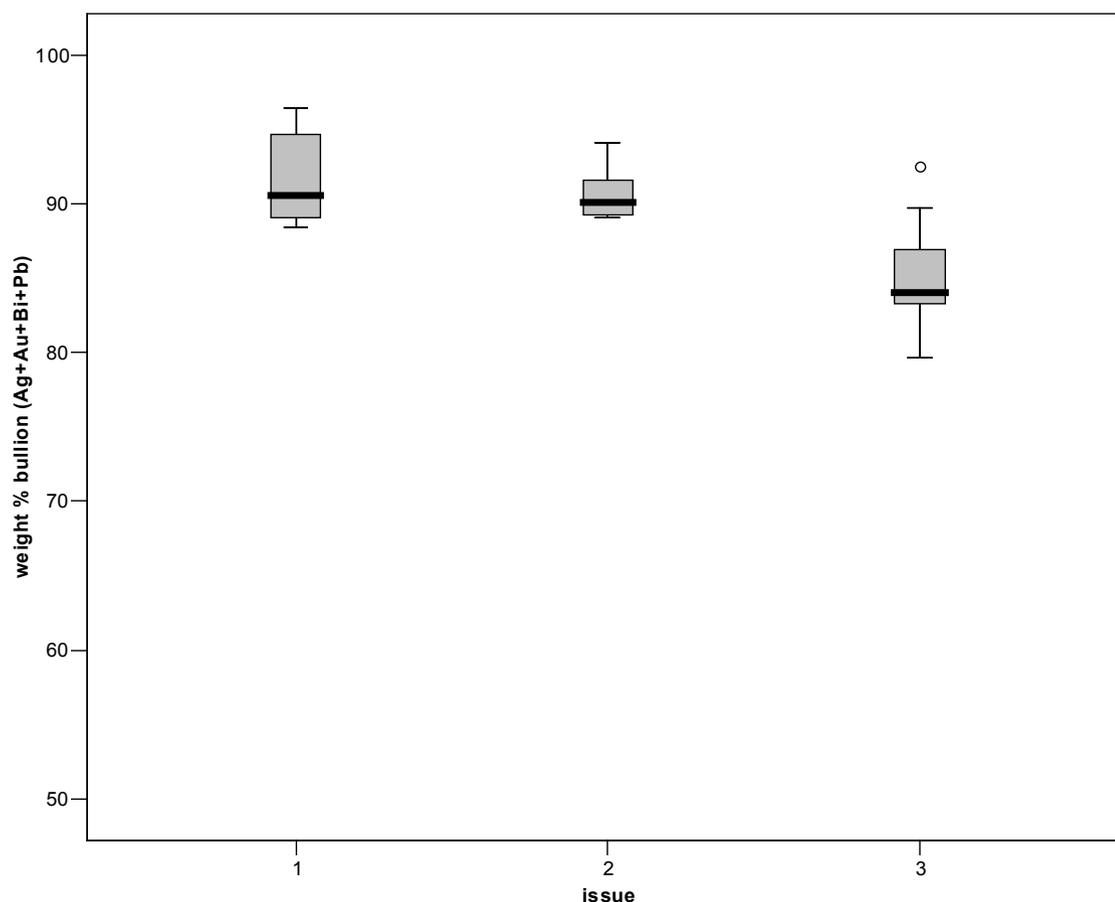


Fig. 6. Finenesses of Otho's denarii at Rome. The third and final issue (with the PONT MAX reverses) shows a significant debasement.

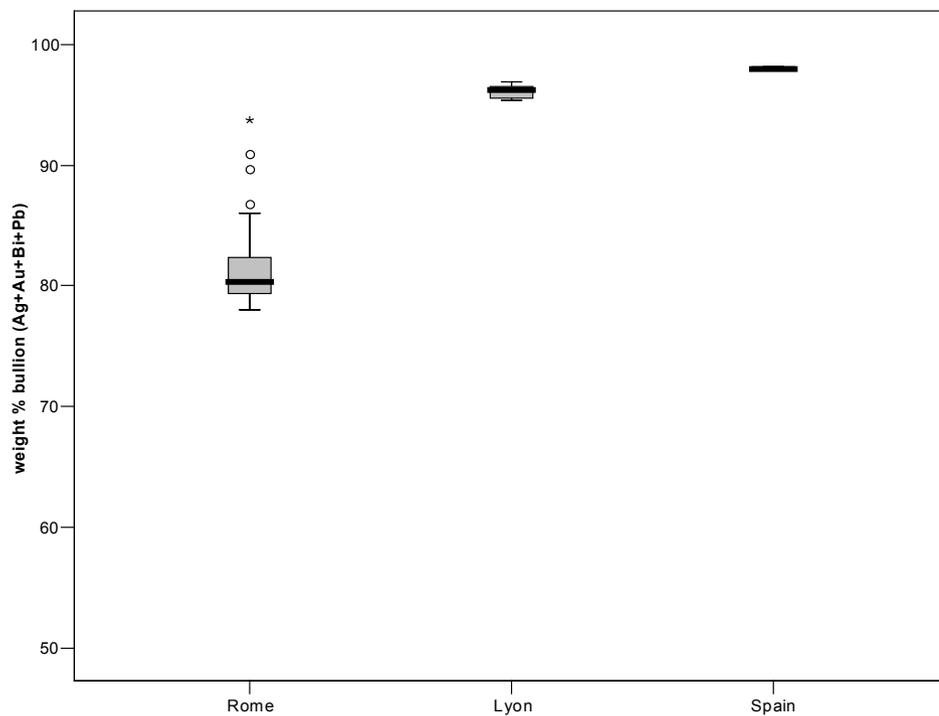


Fig. 7. Finenesses of Vitellius's denarii, according to traditional mint attributions. Note that Rome is baser than Lyon or Spain.

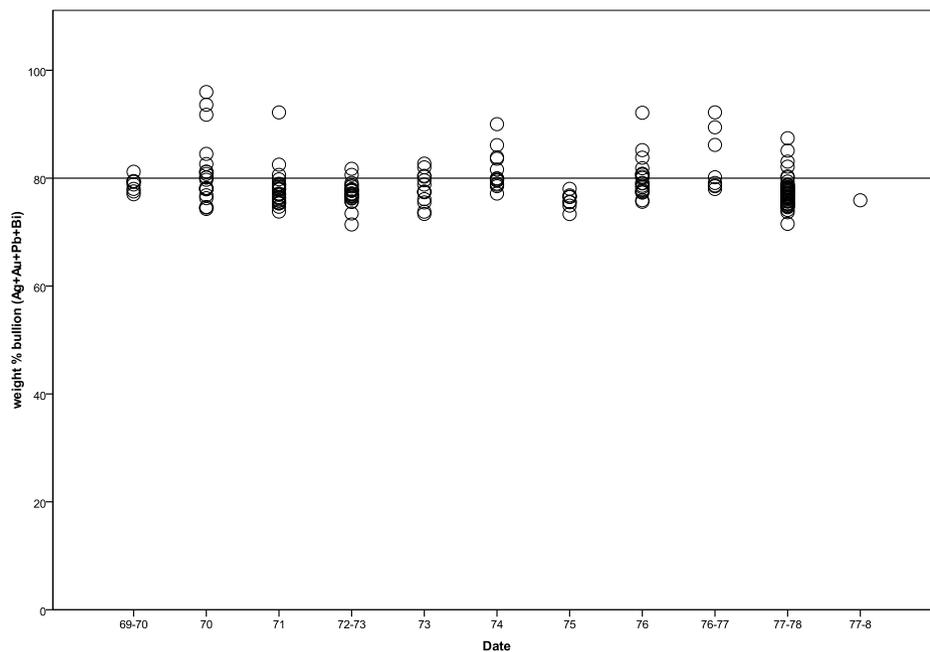


Fig. 8. Finenesses of Vespasian's denarii minted at Rome, year by year.

Once again, mints outside Rome tell another story (Fig. 9). Vespasian's western denarii were struck at a higher fineness, between about 92% and 96%. The same seems to be the case for his denarii of Syria. The denarii attributed to the so-called 'Illyricum' mint are also nearly fine silver. The denarii produced in Asia, however, are quite different. Those of the so-called 'O' mint (probably Ephesus) are about 80% fine, in line with the Rome denarii. But the earlier denarii with the  $\Phi$  symbol or EPHE monogram, attributed to Ephesus, are of very variable fineness, some as low as 45%, whilst others are on a par with the Rome denarii. Currently, on the basis of the analysis of seven coins, there seems to be no relationship between types and fineness at all. It would appear, from the rather limited sample, that there was no control over the fineness of these coins.

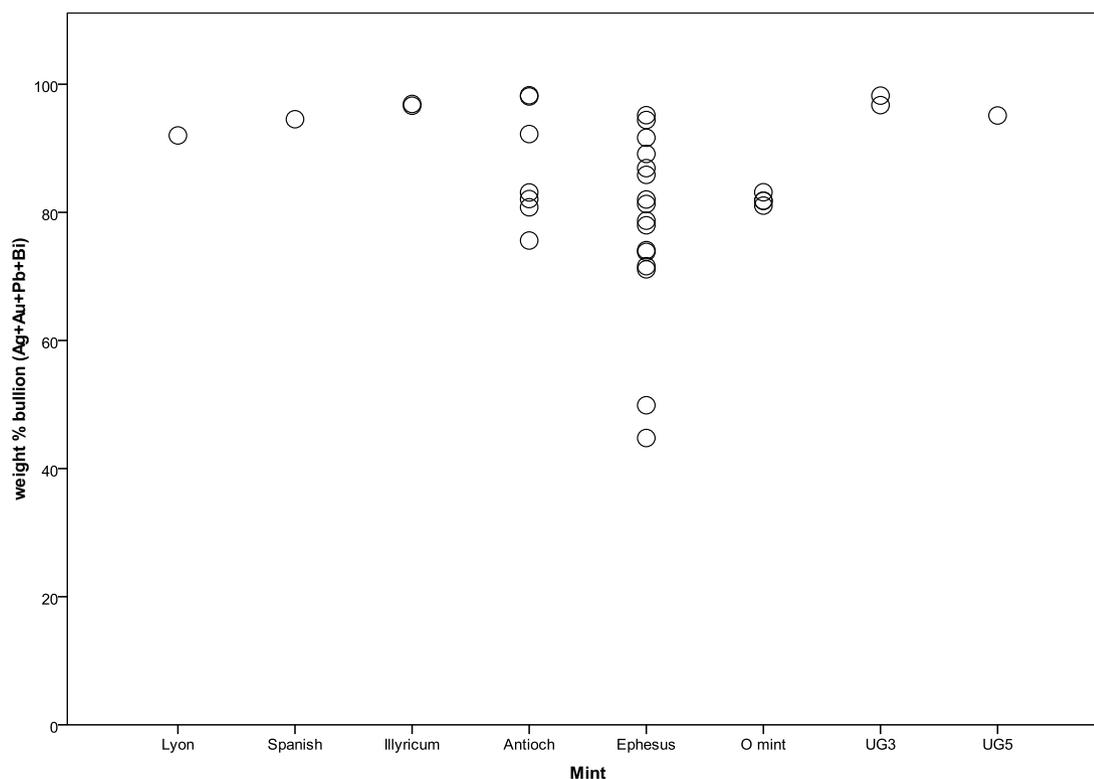


Fig. 9. Finenesses of non-Rome denarii of Vespasian. UG3 = Uncertain Group 3 (RIC II 1348-1364); UG5 = Uncertain Group 5 (RIC II 1380-1389)

The trace elements show that the bullion sources for Rome were generally quite distinct and different from those utilised by the western mints, containing higher levels of gold and lower levels of bismuth. There is less of a distinction between the coins ascribed stylistically to Spain and those ascribed to Gallic mints, although lead isotope analysis suggests that Spanish mints issued coins made of Spanish silver, whilst Gallic mints issued coins made of both Spanish and Gallic silver. It is likely that a re-assessment of current mint attributions will be needed.

The next important stage in the development of the denarius is the reform of Domitian at Rome. This reform was identified by David Walker in his analyses (Walker 1976), and our results

confirm his outline. The Rome denarii of Titus continue on a broadly 80% standard, and so do those of Domitian's first year, until AD 82 (Fig. 10). Then the fineness rises to that of pure silver bullion once again. However, what is curious about these very fine coins is that at least one of the flans appears to have been cut from silver sheets or silver plate. The microstructure of those we have sectioned is quite different from those of earlier (and later) denarii, showing heavily worked micro structures instead of the as-cast dendritic structures usually encountered. They were also produced in fairly small quantities. Perhaps the seizure of some stock of silver objects allowed Domitian to restore the denarius to the desired purity, albeit temporarily.

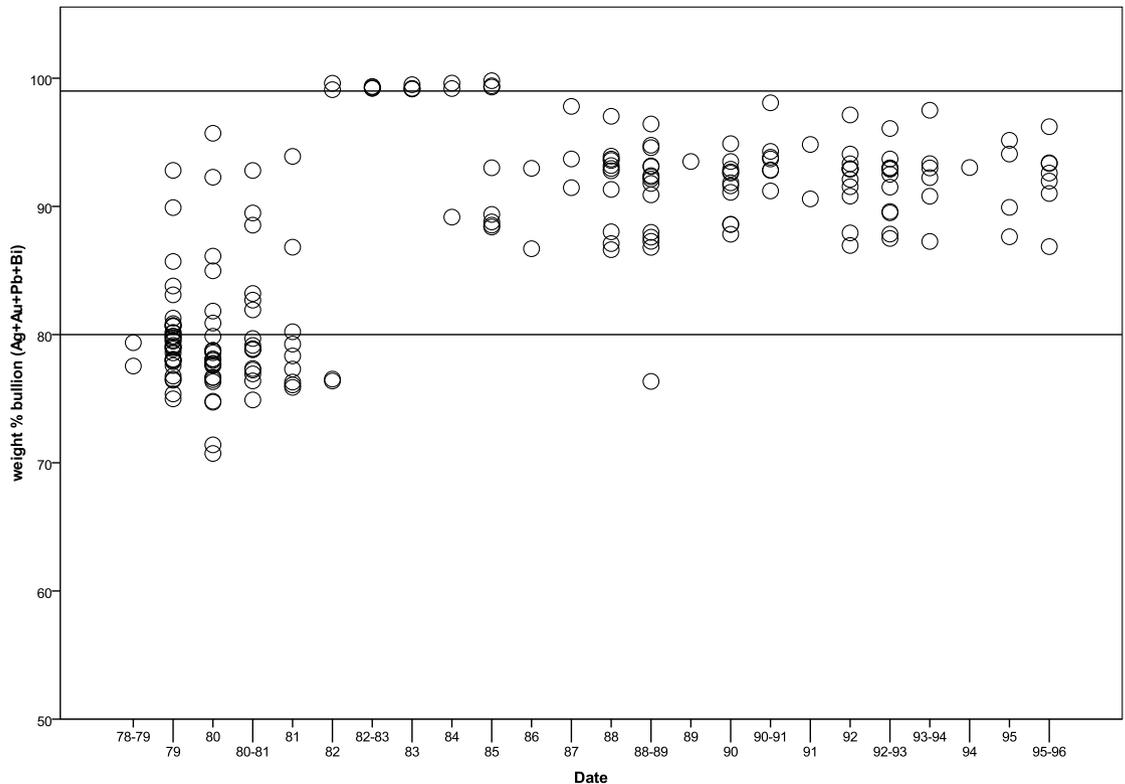


Fig. 10. Finenesses of Domitian's denarii, by year.

During the period AD 85 - 86 the fineness was lowered to about 90%, the standard set by Nero at the end of his reign. Domitian's later denarii are all struck on this standard. His successor Nerva also struck denarii at about 90% fine. Trajan issued denarii on the same standard for the first two years of his reign, but in AD 100 lowered the content back to 80% once again. As Bernhard Woytek and his colleagues have recently demonstrated (Woytek / Uhlir *et al.* 2007), Trajan's denarius reform should be dated to this year, AD 100 and not, as traditionally assumed, in 107.

With this, we reach the end of the century and of this survey. What can we learn from these facts? The first and most striking feature is the marked fluctuation of the silver content between the reigns of Nero and Trajan. While ultimately the trend is downwards, there were significant reversals – even by Nero, the traditional villain in the story of the imperial denarius. We would

propose that these reversals reflect a particular mentality on the part of those issuing coins. Instead of the traditional view of emperors trying to get away with the minimum fineness acceptable (with, perhaps, the exception of Domitian), these new data suggest that the emperors were anxious to restore the fineness of the coinage as much as possible whenever they could. A high silver content was desirable. The activities of peripheral mints suggest that when a very high fineness could be achieved, then coins were produced at that very high fineness, regardless of the standard employed at Rome. This might not make much economic sense, but it might make sense if rulers were concerned about the nobility of their coinage. What this would imply is that, in monetary terms, a kind of metallist mentality prevailed amongst the Roman emperors – they were concerned to have a high-quality silver coinage where possible, even if a full-bodied silver coinage was not always achievable. On the other hand, the varying fineness of the Ephesus denarii of Vespasian indicate that sometimes that quality might be disregarded. But these Ephesian coins had no successors, and it was to be many decades before denarii were again produced at mints other than Rome.

These adjustments, lowering or raising the silver content, might also suggest a more complex story than mere incremental debasement over time. Nero's debasement is traditionally seen as a symptom of that emperor's extravagance – he ran out of money, so he debased the denarius for profit. Vespasian, too, was thought to have debased the denarius to cover the costs of the disastrous year of the four emperors. In the traditional narrative, only Domitian stood out as reversing the trend, and this was explained as exceptional, the consequence of his moralising character. But now we can see that Nero himself, and, if one takes into account the western denarii, Galba, Vitellius and Vespasian were also capable of reversing the debasements. What these differences might hint at is a difference in the cost of production and of raw materials in different places and over time. In this narrative, the aim was to keep the denarius as pure as possible, but not to the point where production costs exceeded face value. The relationship between gold and silver also has to be borne in mind in this respect. Seen this way, debasement was not so much a tool for profit in a world where the state could manipulate the currency at will; it was one of the hazards and consequences of a predominantly metallist approach to coinage.

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