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REVUE NUMISMATIQUE

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Bernhard E. WOYTEK*, Maryse BLET-LEMARQUAND**

The C. L. CAESARES denarii *RIC* I^2 Augustus 208

A pseudo-Augustan unsigned restoration issue. Corpus, die study, metallurgical analyses[1]

Summary - This article is a thorough study of a scarce sub-type of the C. L. CAESARES denarii, *RIC* (2nd edition) Augustus 208, currently known from 26 specimens. These coins bear the well-known Augustan types and legends, but metallurgical analyses as well as observations on typological details make it clear that we are in fact dealing with an unsigned restoration issue, for which an attribution to the reign of Hadrian is proposed.

Keywords - Augustus, *RIC* 208, C. L. CAESARES, restoration, Hadrian, metallurgical analysis.

Résumé - Cet article livre une étude complète d'un rare sous-type de deniers C. L. CAESARES, l'émission *RIC* (2e édition) Auguste 208, dont 26 exemplaires sont actuellement connus. Ces monnaies portent les types et les légendes augustéens bien connus mais des analyses métallurgiques ainsi que certains détails typologiques révèlent qu'il s'agit en fait d'une émission de restauration non signée que nous proposons d'attribuer au règne d'Hadrien.

Mots clés - Auguste, *RIC* 208, C. L. CAESARES, restauration, Hadrien, analyse métallurgique.

1. Introduction

Since the mid-1990s, C. L. CAESARES denarii of the sub-type *RIC* I^2 Augustus 208 have been turning up time and again on the international coin market. In the revised edition of the first volume of *RIC* C. H. V. Sutherland had listed this sub-type as being "common", but this indication is highly misleading: in fact, these denarii were of the utmost rarity until about 20 years ago. Apart from *BMC* Augustus 536 – the coin referred to in the revised *RIC* volume – just a handful of specimens were known at the time of publication of Sutherland's

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1. Bernhard Woytek became interested in this group of coins about ten years ago, in the course of his work on the imperial coinage of Trajan, and started to collect material for this study back then. An invitation to the University of Orléans as "Professeur étranger invité" in spring 2015 provided the welcome opportunity to finally return to this project, in collaboration with Maryse Blet-Lemarquand, who performed metallurgical analyses

book in 1984.[2] In Thomas Fischer's critical study of the C. L. CAESARES issues, based on a systematic examination of the different varieties of this coinage, the piece in the British Museum was even treated as unique, and Fischer implausibly suspected it to be a "Fehlprägung, Imitation oder Fälschung", just because he did not know of any parallels.[3] Due to its infrequence, this sub-type is missing in most of the public coin collections visited or contacted by the lead author of this publication. Thus, the emergence of a significant quantity of these coins in recent times – 26 specimens are currently known to us –, which was accompanied by various speculations over their chronology and attribution in the catalogues of the trade, made it necessary to take a closer look at the issue and to investigate the metallurgical composition of its alloy. Since additional coins of this sub-type, whether currently hiding in collections or lurking in the ground, will doubtless come to light in the future, the present study is preliminary in character (as most numismatic publications). Still, we hope to be able to provide a solid basis and sound framework for future research on this extraordinary coinage.

on several coins of the group at the IRAMAT – Centre Ernest-Babelon. Among the many debts Bernhard Woytek incurred in the course of researching this article, the greatest single one by far is to Arnaud Suspène (Orléans): not only for arranging for his invitation to France and for making his research stay in Orléans most pleasurable, but also for tracking down one specimen of the group studied here in the collection of the Musée de l'Hôtel Sandelin of Saint-Omer, temporarily on loan at the Bibliothèque nationale de France (BnF, Paris). Apart from Frédérique Duyrat, the current director of the Département des Monnaies, médailles et antiques, as well as the responsible keeper Julien Olivier – who kindly made the St. Omer specimen available for analysis at the Centre Ernest-Babelon –, we are greatly indebted to the past director of the Département des Monnaies, médailles et antiques of the BnF, Michel Amandry, for his longstanding backing of this research project. Special thanks are due to Matthew Ponting (Liverpool), who generously shared comparative metallurgical data regarding the silver coinage of the Roman principate with us, which were generated in his long-term research project on this topic, led jointly with Kevin Butcher (Warwick), who we would also like to thank. Furthermore, we are most grateful to private collectors who wish to remain anonymous for their crucial support, and also to the following curators who generously gave access to coins in their collections or kindly provided images and information: Richard Abdy (London, British Museum), Dominique Hollard (Paris, BnF), Jérôme Mairat (Oxford, Ashmolean Museum), Roberta Parise (Padova, Museo Bottacin), Andrzej Romanowski and Janina Wiercińska (Warsaw, National Museum), Klaus Vondrovec (Vienna, Kunsthistorisches Museum) as well as Uta Wallenstein (Gotha, Stiftung Friedenstein). Also, we are indebted to Duncan Hook (London) for undertaking metallurgical analyses on the specimen of *RIC* Augustus 208 in the Department of Coins and Medals of the British Museum. Finally, thanks for discussing different aspects of the project with us over the years, as well as for providing help in various ways are due to Dorian Bocciarelli (Orléans), Jérémie Chameroy (Mainz), Curtis Clay (Chicago), Ben Lee Damsky (Decatur, AL), Jacopo Marcer (Lentiai), Charles Parisot-Sillon (Orléans), Markus Peter (Bâle), Gabrielle Thiboutot (Stanford), David L. Vagi, Patrick Villemur (Paris) and Alan Walker (Zurich).

2. Of the specimens listed in the catalogue below, theoretically only three or four more pieces would have been available for study to Sutherland. According to SUTHERLAND 1984, p. xxii, a type known from up to 5 specimens should have been "R4" in his scale of rarity.
3. FISCHER 1981, p. 31, n. 2 and p. 39.

2. The C.L. CAESARES coins and their varieties

The aurei and denarii of the C.L. CAESARES type[4] are the iconic coins of the Augustan period *par excellence* (plate 6, A-J). These pieces combine the laureate obverse portrait of Augustus, styled *Divi f(ilius)* and *pater patriae* in the legend, with full-length depictions of his grandsons – and, since 17 BC, adopted sons – Gaius and Lucius on the reverse. The two *Caesares* wear the *toga* and sport the round shields and spears they were awarded in their capacity of *principes iuventutis*, mentioned in the reverse inscription, by the equestrian order. These shields and spears seem to have been the key symbols of the two *Caesares*: after their death, Augustus set them up as dedications in the *Curia Iulia*.[5] In the reverse legend of the coins, Gaius and Lucius are also styled *consules designati*. A *simpulum* and a *lituus*, invariably pictured between the two young men in the upper central reverse field, symbolise their priesthoods: the pontificate of Gaius, the elder brother, and the augurate of Lucius. As already pointed out by Joseph Eckhel in a lengthy passage in volume 6 of the *Doctrina numorum veterum*,[6] these coins specifically lend themselves to a comparison with several passages in textual sources of the Augustan period: in particular, they constitute a pretty close numismatic equivalent of chapter 14 of the *Res gestae Divi Augusti*.[7] Also, they provide one of the most compelling visual syntheses of Augustus' dynastic programme. Hence, the issue figures prominently in most modern standard accounts of the history and culture of the Augustan period.[8] It has been suggested that the reverse image of these coins goes back to a group of statues,[9] but this is far from certain; we shall return to this point below.

The titulatures in the obverse and reverse legends of these coins are correct exclusively for the years 2 and 1 BC: Augustus was awarded the title "Father of the Fatherland", which was of a tremendous ideological importance to the

4. Main group: *RIC* I² Augustus nos. 206-207, 209-210.
5. Cass. Dio 55.12.1 (αἱ πέλται τά τε δόρατα, ἃ παρὰ τῶν ἱππέων [...] εἰλήφεσαν, ἐς τὸ βουλευτήριον ἀνετέθη).
6. Eckhel 1796, p. 171-173; cp. p. 171: "Egregii sunt hi numi ad illustrandam utriusque Caesaris historiam, dignique, qui per singulas partes adcuratius explicentur."
7. *Filios meos, quos iuvenes mihi eripuit fortuna, Gaium et Lucium Caesares honoris mei caussa senatus populusque Romanus annum quintum et decimum agentis consules designavit, ut eum magistratum inirent post quinquennium. Et ex eo die, quo deducti sunt in forum, ut interessent consiliis publicis decrevit senatus. Equites autem Romani universi principem iuventutis utrumque eorum parmis et hastis argenteis donatum appellaverunt* (14.1f.; cp. Scheid 2007, p. 12; see also the commentary by Cooley 2009, p. 162-167). It is worth noting that the title "princeps iuventutis" seems to have been created specifically for Gaius and Lucius: Kienast 1999, p. 131.
8. Kienast 1999, p. 131; Bleicken 1999, p. 637f.; Zanker 1987, p. 220f.
9. Hill 1989, p. 75: "The well-known type from Lyons, representing Gaius and Lucius with two shields and two spears between them, may well have been copied from their statues in the Basilica Julia, if such existed".

princeps,[10] only on 5 February 2 BC,[11] and in AD 1 Gaius already held office as *consul* – he was no longer *designatus* during this year.[12] The years 2-1 BC should therefore without any doubt *a priori* be taken as the period of production at least of the main group of the C.L. CAESARES coins, as advocated by (*inter alios*) Max von Bahrfeldt, Andrew Burnett and, somewhat tentatively, by Reinhard Wolters.[13] However, this fairly narrow dating is by no means universally accepted, especially in view of the enormous size of the issue. The C.L. CAESARES coins are the most common precious metal coins of Augustus by far, which consequently provoked 'barbarian' imitations – especially in Eastern Europe? – on a large scale;[14] also, the borrowing of their reverse type on antoniniani of Valerianus I., struck in Antioch in Syria in AD 257, demonstrates that these coins were known well into the third century.[15] The issue is, in fact, so huge that it has even been suspected that Augustus attempted, through its production, nothing short of "une [...] refondation de la monnaie romaine", and that only the premature deaths of his adopted sons prevented him from putting the concept into practice.[16] While this seems like overstating the case, the sheer quantity of aurei and denarii of the main group prompted many researchers to propose that the production of these coins may have continued beyond the period 2-1 BC: at a time, when the reverse legend was no longer current. Various end dates were envisaged: among others the death of Gaius Caesar in AD 4,[17] the assumption of the *imperium proconsulare aequum*

10. It is fittingly mentioned in the penultimate sentence of the *Res gestae* (chapter 35.1): *Tertium decimum consulatum cum gerebam, senatus et equester ordo populusque Romanus universus appellavit me patrem patriae idque in vestibulo aedium mearum inscribendum et in curia Iulia et in foro Aug. sub quadrigis quae mihi ex s.c. positae sunt censuit.* Cp. Scheid 2007, p. 24f. and Cooley 2009, p. 273-275.
11. Kienast 1999, p. 132f.
12. Kienast 1996, p. 74.
13. Bahrfeldt 1923, p. 167 ("Also muß die Münze zwischen dem 5. Febr. 752 / 2 v. Chr. und dem 1. Januar 754 / 1 n. Chr. geprägt sein [...], sehr wahrscheinlich aber noch im Laufe des Jahres 752 / 2 v. Chr., als ganz besondere Ehrung für die beiden jungen Prinzen"); Burnett 1978, p. 176 ("the C. L. Caesares issue [...] which, incidentally, I would restrict to 2-1 BC. on grounds of titulature"); Wolters 2002, p. 298 and 311.
14. As already remarked by Eckhel 1796, p. 173. For examples of such imitations, see Bahrfeldt 1932, p. 125f.; Fischer 1990a, p. 17; Giard 2001, nos. 1670-1677.
15. See Göbl 2000, no. 1598: struck in the year of the joint consulate of Valerianus (cos IIII) and Gallienus (cos III).
16. Suspène 2009, p. 163. He suggests that the type was deliberately chosen with reference to the classic Republican denarii with the Dioscuri on horseback in mind, a coin type that had almost completely vanished from circulation by the Augustan period: Suspène 2009, p. 162; see ibid. n. 62 for exhaustive bibliographical references to the ideological assimilation of Gaius and Lucius to Castor and Pollux. On this topic, see also Mellado Rivera 2003.
17. Cesano 1934, p. 120; Sutherland 1984, p. 28: "*c.* 2 BC to AD 4 or beyond", recently followed, amongst others, by Butcher, Ponting 2014, p. 180, and Suspène 2014, p. 41: "une frappe sur plusieurs années, pas forcément régulière, entre 2 av. J.-C. et 4 apr. J.-C., complétée de frappes sporadiques après cette date." See also Mlasowsky 1990, p. 263.

by Tiberius in AD 13,[18] the death of Augustus in AD 14,[19] the reigns of Tiberius (14-37; tentatively),[20] or even of Caligula (37-41).[21] However, there is no hard and fast numismatic evidence underpinning these proposals: the one piece of evidence quoted for any of them is a hybrid denarius combining a reverse of the C.L. CAESARES type with an obverse of Tiberius, mentioned by Michael Grant as being in his collection, but apparently never published by him.[22] However, this line of argument is highly problematic. In recent years, three hybrid pieces of this kind have turned up in the trade. One of them is plated,[23] another one is of very light weight and is struck badly off-centre on both obverse and reverse:[24] these coins are doubtless irregular and do not have any bearing on the date of the official C.L. CAESARES coins. A third denarius hybrid[25] is of about the right weight and stylistically marginally more convincing than the other two, although the reverse does seem to show some anomalies, so that it is by no means certain that this coin is an official product, either.[26] The latter specimen is, in fact, somewhat similar to a fourth hybrid denarius of this kind which recently turned up in the South-Warwickshire hoard, closing under Nero. This coin is of good weight, but its fabric seems somewhat peculiar; it was understandably classified as a "barbarous / irregular issue" by the hoard's editor.[27] We may therefore conclude that the proposals of a production of the C.L. CAESARES coins beyond 1 BC mainly rest on the observation of a considerable variety of styles they exhibit – hence, on the rather subjective criterion of 'probability'.

Just as the date of issue of the main group of these coins, their place of production has caused a lot of controversy over the years, too. Despite Thomas Fischer's passionate arguments in favour of a production at the mint of Rome,[28] it may currently be regarded as widely accepted that the main group of the C.L. CAESARES coins was struck at Lugdunum.[29] However, the survival

18. Giard 1983, p. 43 and 102: "2 avant J.-C. - 12 après J.-C.". Cp. Kienast 1996, p. 77; Ferrary 2012, p. 559f.
19. Grant 1954, p. 77.
20. Grant 1969, p. 467 ("the famous 'CL CAESARES' issues, which may well have continued after the princeps' death"; then Grant specifies that he believes production may at least have lasted until Tiberius, see n. 22 below).
21. Fischer 1990b, p. 352.
22. Grant 1969, p. 467 ("a hybrid has this reverse with an obverse of Tiberius"), with n. 10 referring to his personal collection. See Wolters 2002, p. 299, n. 10.
23. H. D. Rauch, Numismata Auction 2011, 15 April 2011, no. 230 (3.07g).
24. Gorny & Mosch Giessener Münzhandlung 186, 8 March 2010, no. 1877 (2.64g).
25. NAC 42, 20 Nov. 2007 (Feirstein part III), no. 299 (3.45g).
26. It is not clear if the piece sold through NAC is identical with the piece which was part of Michael Grant's collection.
27. Ireland 2013, p. 30, no. 955 (3.91g; 12h).
28. Fischer 1981, p. 33-35; Fischer 1990a, p. 16.
29. For a current synthesis, see Suspène 2014, p. 35-36.

of several ancient obverse and reverse dies with the types of this series somewhat complicates matters. A pair of bronze dies (which are set into iron shafts) from a private collection, examined at the Prähistorische Staatssammlung in Munich in 2000 by Bernward Ziegaus, does not cause too much of a problem: these dies of an unknown provenance, but reportedly from "Eastern Europe", are obviously forgers' tools; *inter alia* the fact that the design is extremely off-centre on the reverse die clearly marks out the latter as a "transfer die", which was not produced by an engraver, but by means of a coin through hubbing, in a forgers' workshop.[30]

The case of two pairs of dies discovered near Calahorra in Spain is completely different. The two obverse and two reverse dies, unearthed at the beginning of the 20th century and presently kept in the Instituto Valencia de Don Juan, Madrid, are made of bronze and have the typical conical shape seemingly characteristic of official Julio-Claudian coin dies. These four dies,[31] which are somewhat similar to an obverse die for the same coin type in the Paris collection,[32] were taken as evidence for the production of part of the C.L. CAESARES issue in Spain by Max von Bahrfeldt: he remarked that the coins of this type were particularly common in Spanish hoards as well as in museum collections and therefore proposed Tarragona as one of the potential mints of the series.[33] Some Spanish researchers are inclined to follow Bahrfeldt in this attribution up to the present day.[34] His general concept was that this common coinage should have been produced "wie in Rom und in anderen Teilen des Reiches, so auch auf einer spanischen Münzstätte".[35] Bahrfeldt's idea was in principle embraced and further developed by Jean-Baptiste Giard, albeit under somewhat different auspices: since the attribution of the core of the issue to Lugdunum could hardly be doubted by Giard's time, he transformed Bahrfeldt's model of several independent minting places for these coins in the empire into the concept of "Lyon et ateliers auxiliaires".[36]

However, this somewhat arbitrary concept of "auxiliary mints", regarded with suspicion by some for quite a long time,[37] has recently come under attack from different angles – and justly so. First, the notion of smaller external workshops supporting a central mint has been recognised as rather improbable for the Roman period in general. Sylviane Estiot and Isabelle Aymar have

30. On these dies see Wamser 2000, p. 350f.; Paunov 2014, p. 30f., no. 5.
31. Giard 2001, p. 18, nos. 4-7 and pl. A, nos. 4-7; Malkmus 2007, p. 126-128, dies nos. V-15 to V-18.
32. Giard 2001, p. 18, no. 3 and pl. A, nos. 3a-c; Malkmus 2007, p. 125, die no. V-14. Provenance: cabinet of Sainte-Geneviève (as per Babelon 1901, col. 909).
33. Bahrfeldt 1932, p. 125; 1933/1934, p. 754.
34. See García-Bellido 2004, p. 104-106.
35. Bahrfeldt 1933/1934, p. 754.
36. Giard 2001, p. 52; see also Giard 1983, p. 31. On this theory, see most recently the remarks by Martin 2015, p. 279-283.
37. See Burnett 1978, p. 176: "The extra mints should not, I think, be accepted".

fittingly used a comparison with the third century to point out that large Roman mints were capable of producing huge quantities of money in relatively short periods by multiplying the number of workshops within a single mint, when faced with the necessity to coin large amounts of metal.[38] More importantly, recent metallurgical analyses have shown that both the Augustan gold coinage attributed to the mint of Lugdunum[39] and the bulk of the C.L. CAESARES coins of Augustus[40] is homogeneous, regarding the characteristics of their respective alloys: there are no significant compositional differences which would warrant the conjecture of several mints producing the same coin type in parallel.

To sum up, it seems not unreasonable to assume that the main group of the C.L. CAESARES issue was minted in Lugdunum in 2 and 1 BC. This large group was struck in gold and silver: it comprises a spectacular four-aureus-piece ("*quaternio*")[41] the authenticity of which should not be doubted,[42] aurei[43] as well as denarii.[44] The varieties among these coins – conveniently visualised in diagrams by various scholars[45] – are in principle determined by the relative positions of Gaius and Lucius on the reverses: on the major part of both aurei and denarii, the *simpulum* is depicted on the left and the *lituus* on the right, meaning that Gaius (who was a *pontifex*, whose symbol was the *simpulum*) is standing to the viewer's left, and his younger brother, who was an *augur*, to the viewer's right.[46] On about a fifth of the denarius output (and an even smaller percentage of the aurei currently known), the two brothers have changed places, and Lucius with his *lituus* stands on the left.[47] On all of these coins of the main group the *simpulum* and *lituus* are turned inwards: the bowl of the *simpulum* and the crook of the staff face the centre of the coin.

38. Estiot, Aymard 2001 / 2002, p. 92f.
39. See Suspène et alii 2011; Blet-Lemarquand et alii 2015.
40. Butcher, Ponting 2014, p. 175 and 181.
41. *RIC* I² Augustus 205 (now in the Museo Archeologico di Este): see Bahrfeldt 1932, p. 120f.; Cesano 1934, p. 104-113; Gorini 1968, p. 49-54.
42. *Pace* Sutherland 1984, p. 28: "cannot be said to be secure". For the authenticity of the piece, see, e.g., Gorini 1968, p. 49-51.
43. *RIC* I² Augustus 206 and 209.
44. *RIC* I² Augustus 207 and 210.
45. Cp. Fischer 1990a, p. 20; Wolters 2002, p. 323.
46. This is also the case on a cornelian bearing the same image in the Florence collection, discussed by Vollenweider 1964, p. 79 (with additional explanatory letters: C beneath the *simpulum* and L beneath the *lituus*), as well as on the four-aureus-piece in Este (*RIC* I² Augustus 205). Fischer 1990a, p. 16 states correctly that this seems to have been the "Archetyp" of the image. Interestingly, Gaius is depicted taller than his younger brother on this *quaternio*, whereas usually no difference in height between the two is in evidence on the aurei and denarii.
47. As per Wolters 2002, p. 323. These two varieties have been known and commented upon since the 17th century: see Pedrusi 1694, p. 38.

On practically all the extant specimens of the two described varieties, the seniority (and, consequently, superior position) of Gaius – whether he is standing on the right or on the left – is expressed by a significant detail: his shield is depicted in the foreground and therefore partly conceals the *parma* of Lucius.[48] This typological flexibility regarding the depiction of the shields does not seem to speak in favour of the hypothesis that the coins reproduce a group of statues, by the way[49] – but the problem as such ultimately is as irresolvable as it is unimportant.

In a short and elegant note David MacDonald drew attention to the fact that a careful observation of protocol, as it is found on the main group of these coins, is not in evidence on the numerically most important sub-type of the C. L. CAESARES group, namely the "X"-group.[50] This group consists exclusively of denarii (plate 6, K-L). They reproduce the designs and legends of the main group faithfully, but add the letter (or numeral) X beneath the priestly implements, in the centre of the reverse. On nearly all of these coins, the round shield held by the figure on the right is pictured in the foreground, but the position of the *simpulum* (the attribute of Gaius) is not consequently attuned to the position of the shields: on many of these denarii, the *lituus* is depicted above the shield in the foreground instead of the *simpulum*.[51] MacDonald concluded that this difference had a chronological implication: "When the coins without the X were issued, the superior dignity of Gaius was pertinent and important; when those bearing the X were struck, the position of Gaius was no longer a living issue."[52] Consequently, he dated the pieces bearing the X to the period after Gaius Caesar's death, "between A.D. 4 and about A.D. 13",[53] and explained the X as "a control mark to distinguish the later strikings".[54]

MacDonald's interpretation inexplicably met with criticism from scholars who flatly denied that the described incongruities could have a chronological significance – without providing a more plausible explanation of the phenomenon.[55] Their critique may safely be disregarded. Building on MacDonald's observation, Reinhard Wolters recently provided a compelling interpretation

48. One exception is the aureus offered in the sales Dupriez 110 bis, 4 November 1912, no. 1694 = Dupriez 112 bis, 7 April 1913, no. 737 (*lituus* on the right; shield on the right in the foreground).
49. We are grateful to Arnaud Suspène for sharing his thoughts on this problem with us.
50. *RIC* I^2 Augustus 211-212.
51. In the sample analysed by Wolters 2002, p. 323, the *simpulum* was depicted on the right, above the shield in the foreground, in fifteen cases, the *lituus* in nine cases. On the coins of the "X"-group, the priestly symbols are invariably turned inwards, just as in the main group.
52. MacDonald 1978 / 1979, p. 28.
53. MacDonald 1978 / 1979, p. 28.
54. MacDonald 1978 / 1979, p. 29.
55. Giard 1983, p. 43f.; Estiot, Aymar 2001 / 2002, p. 92.

of the numeral "X". He connected it with the *lex Valeria Cornelia* of AD 5, through which a body of 10 *centuriae* of senators and knights was created: their task was to destine suitable candidates for the election to the consulate and the praetorship. Five of these *centuriae* were named after Gaius, and five after Lucius.[56] Despite a recent call for caution,[57] this persuasive explanation most probably is the correct one, in our opinion.

It is, thus, very likely that the denarii marked with an X are a commemorative issue manufactured after the death of both Gaius and Lucius. Wolters believes them to have been struck in one go, in AD 5, when the *lex Valeria Cornelia* was passed.[58] Of course it was particularly appropriate to commemorate the creation of *centuriae* responsible for destining candidates for the consulship on a coin-type which depicted the Caesares as CO(n)S(ules) DESIG(nati). Where were these coins minted? Wolters observed some differences in the circulation behaviour between the denarii of the "main" and the "X"-groups[59] and suggested that the latter were either minted in Lugdunum and immediately transported to the empire's capital *en bloc*, or that they were perhaps struck at the mint of Rome.[60]

On the basis of a very small sample – just twenty coins in total, published by Giard[61] –, Wolters noted that C. L. CAESARES denarii with an X on the reverse were somewhat lighter than silver coins of the main group: he calculated mean weights of 3.68g for the "X"-group, and 3.82g for the main group.[62] A substantial metrological difference between these two groups can indeed be corroborated by further calculations: 38 well-preserved specimens of the "X"-group from trade average even less than what Wolters had obtained for this sub-type, namely just 3.62g.[63] On the other hand, twelve excellently preserved coins of the main group in the Nant (Aveyron) hoard, which closes

56. Wolters 2002, p. 305f. For this *lex*, which *de facto* seems to have moved the elections of consuls and praetors from the *comitia* to the newly constituted body of ten *centuriae*, since these probably gave mandatory recommendations for the vote, see Kienast 1999, p. 163. The measure, of course, increased Augustus' influence on the voting process, for the new body was relatively small and easy to control: its members were drawn from the *decuriae iudicum*, whose members were in part appointed by the *princeps* himself.
57. Suspène 2014, p. 39: "C'est là une intuition brillante, qui a le mérite de résoudre une des plus irritantes énigmes de la numismatique augustéenne, mais qui reste fragile."
58. Wolters 2002, p. 311, where he calls "eine Prägung noch über viele Jahre nach der *lex Valeria Cornelia*" "wenig wahrscheinlich. Sie [sc. the group] dürfte, auch angesichts des Umfangs, in einem Zug ausgeprägt worden sein."
59. Wolters 2002, p. 318-320. The denarii with "X" are normally not encountered in Spain: García-Bellido 2004, p. 105.
60. Wolters 2002, p. 320f.
61. Giard 1983, p. 103f.
62. Wolters 2002, p. 302 (12 denarii of the main group, 8 with "X").
63. Sources: "Numismatische Zentralkartei (NZK)", Institute for Numismatics and Monetary History, University of Vienna and <http://pro.coinarchives.com> [accessed on 29 June, 2015].

under Augustus,[64] average 3.84g, and thirty well-preserved denarii of the main group in the deposit of La Villeneuve-au-Châtelot (Aube), believed by its editors to close between AD 7 and 10,[65] average 3.81g.[66] This is pretty close to Wolters' result, and also not far from the mean weight of 3.79g recently calculated for 40 C.L. CAESARES denarii from museum collections and coin trade in general.[67]

Hence, the difference in average weight between these two groups is considerable: about 0.2g. Furthermore, metallurgical analyses by proton activation, conducted by Jean-Noël Barrandon (IRAMAT Orléans) on five denarii of the main group and two pieces of the "X"-group from the Meussia hoard, the results of which were published at about the same time as Wolters' article, seem to reveal a difference in the silver content of the alloys of these two groups: while the coins of the main group were found to be very pure (between 99.77 and 98.17% silver), the two denarii of the "X"-group just contain 96.88 and 96.54% silver respectively.[68] Additional metallurgical analyses of the latter group are currently being conducted,[69] but for the moment it may be stated that the hypothesis of a chronological (and perhaps also geographical?) distance in the production of the two groups seems to be supported by metrological and metallurgical data.[70] When the coins of the "X"-group were struck exactly is hard to tell: of course the interpretation given by Wolters seems to favour a date near AD 5, when the law was passed, but theoretically we cannot exclude that they were minted a little later. In this context, it should be remembered

64. Bost, Schaad 2001 / 2002, p. 67, nos. 28-39.
65. Zehnacker et alii 1984, p. 91.
66. Zehnacker et alii 1984, p. 38, nos. 227-245 and 248-258. We have excluded from this calculation one coin of the main group in this hoard, no. 259, because it is visibly worn (weight: 3.28g). Nearly all the coins in this hoard were demonetised with two deep cross-shaped chisel-cuts across the portrait, but this will not have affected their weight.
67. Butcher, Ponting 2014, p. 169, table 8.4. This figure, however, is probably affected by the inclusion of some pieces of the "X"-group in the sample. Maybe this is the right place to point out that the weights given in the publication of the large Cerro Casal hoard of Augustan denarii, containing 266 pieces of the main group of the C.L. CAESARES issue (Villaronga 1989), are suspect: for 252 pieces of the main group, which all seem to be "very fine" (to judge from the illustrations), Villaronga obtains a mean weight of just 3.63g (Villaronga 1989, p. 73). This ties in with an observation by Michel Amandry (pers. comm., November 2016), according to which the weights given by Villaronga in several of his publications for Roman provincial coins from museum collections that Amandry visited are systematically too low – between c. 0.1 and 0.3g so: evidently there was a problem with the balance Villaronga used. Hence, a metrological study of the C.L. CAESARES denarii must not be based on the weights published for the coins in the Cerro Casal hoard.
68. Estiot, Aymar 2001 / 2002, p. 160. These data seem to cast doubt on the reliability of the value of 100% silver obtained for a denarius of the "X"-group from the Needham, Norfolk hoard: Butcher, Ponting 2014, p. 181.
69. Blet-Lemarquand et alii (in preparation).
70. However, the "X"-group was apparently struck with an irregular die-axis, just as the main group: see Giard 2001, p. 227.

that the "X"-group is missing without exception in all the Roman settlements situated on the right bank of the Rhine (abandoned in AD 9, after the Battle of the Teutoburg Forest).[71] It may also be noted that according to the metrological data recently published by Butcher and Ponting, a mean weight of just 3.62g is rather unusual for a Julio-Claudian denarius issue.[72]

A few years ago, a coin cataloguer proposed to identify a new sub-group among the C.L. CAESARES denarii, in addition to the group with the "X" described above: he suggested that it was possible to detect an "AVG" monogram 'pin' on two obverse dies of the main series, hidden at the tie of the laurel wreath of Augustus.[73] Another cataloguer later describing the same coin (plate 6, G) was more cautious, but concurred that the object was "a discrete descriptive or control element added in the same manner as engravers' signatures on Greek coinage".[74] In the meantime, five more specimens of this 'variety', all from different obverse dies, have come to our attention: apart from three denarii (plate 6, H-J) also two aurei (plate 6, E-F).[75] Close inspection of the images available reveals, however, that the feature observed by the cataloguers is a mere stylistic variety, and that these coins must not count as a sub-type of the C.L. CAESARES issue: far from being a monogram, what is to be seen at the back of Augustus' head on these dies are the two stems of the laurel-branches forming the emperor's wreath which are going through the loop of the wreath ties. The stems and the loop form what is vaguely reminiscent of an A rotated 90 degrees to the right. All the dies with this special feature are, in general, characterised by a very fine style of engraving: on all of them the laurel wreath presents a lot of detail, with laurel berries in evidence. All these dies seem to have been cut by the same engraver.

This means that, apart from the denarii featuring the "X", there is only one clearly defined sub-group of this coinage, as far as we can see: the enigmatic denarii *RIC* Augustus 208, which we shall now turn to. They are differentiated typologically from all the C.L. CAESARES coins discussed up to now in one detail: the *simpulum* and *lituus* on the reverse are not turned inwards, but outwards.

71. See Wolters 2002, p. 319 for detailed references. For some remarks on the behaviour of C.L. CAESARES denarii in circulation in general, see Berger 1996, p. 31.
72. See table 8.4 in Butcher, Ponting 2014, p. 169, where only the late Claudian denarii have a comparably low mean weight. However, the complex of La Villeneuve-au-Châtelot (Zehnacker et alii 1984), closing with C.L. CAESARES denarii, among which there are two coins of the "X"-group (nos. 246f.), seems to demonstrate that this issue is Augustan.
73. CNG 75, 23 May 2007, no. 971 (3.68g; 12h). The reference coin for this peculiarity, cited in the write-up to the piece in the catalogue, is a denarius in the Paris collection: Giard 2001, no. 1651 (3.74g; 5h).
74. Coin Galleries, 18 August 2009, no. 4263 (= CNG 75, no. 971).
75. Denarii: (a) Lanz 147, 2 Nov. 2009, no. 240 (3.73g; 7h), (b) Klassische Münzen Dr. Michael Brandt (Tübingen), stock no. 150108 (3.72g, 20mm); ex Kricheldorf, June 1956, (c) Roma Numismatics Ltd. E-Sale 21, 31 Oct. 2015, no. 683 (3.82g, 18mm, 6h). Aurei: (a) Helios 3, 29 April 2009, no. 81 (7.90g), (b) Giessener Münzhandlung 191, 11 Oct. 2010, no. 2022 (7.77g).

3. Catalogue of the denarii *RIC* I² Augustus 208: the dies and their combinations

Description

Obv. CAESAR AVGVSTVS – DIVI F PATER PATRIAE
(legend starts at 5h and is to be read inwards)

Laureate head of Augustus r.; a wrinkle at the neck, the rendition of the neck muscle and the truncation indicate that the head is turned r. and the lower part of the neck is seen from behind.

The wreath ties are depicted in three varieties:
1) both ties fluttering: die I
2) the left tie falling down the neck, the other one on the shoulder: dies II, III, V, VIII, IX, X
3) both ties on the shoulder: dies IV, VI, VII

Rev. C L CAESARES (in the exergue) AVGVSTI F COS DESIG PRINC IVVENT
(legend starts at 4h and is to be read inwards)

Gaius Caesar (on the left) and Lucius Caesar (on the right), both bareheaded and facing, standing front on exergual line, wearing the *toga*. Between them, two profiled round shields (*parmae*) on the ground, overlapping, the left one (with a round shield boss) in the foreground. The degree of overlap of the two shields varies on the various dies. Behind the shields, the upper parts of two spears (*hastae argenteae*) appear, spearheads up? (see die no. 8), forming a V-shape: the spears are crossed behind the shields. Gaius lowers his right arm in front of his body and rests his left hand on the shield in the foreground next to him; Lucius rests his right hand on the shield in the background and bends his left arm, holding a *rotulus* in his left hand.

Between the spears, in the upper centre of the field, a *simpulum* with a curved handle (on the left, next to Gaius) and a *lituus* (on the right, next to Lucius). The implements are depicted upright, and both the bowl of the *simpulum* and the crook of the staff are turned outwards. Both objects are often small and rather sketchily engraved; the *lituus* always has a bifurcate base.

Each coin listed in the catalogue is illustrated on plates 1-2.

No.	Die-combinations, specimens	Weight	Axis	Commentary	References
	Obv. I (ties 1) Rev. 1				
1	a.	3.73g	12h*		NAC 45, 2 April 2008 (Feirstein coll., part IV), no. 71. Ex H.J. Berk stock.
2	b.	3.55g	1h		Antiqua, Inc. (S.L. Rubinger: Woodland Hills, CA), Catalog II: Ancient Art & Numismatics (no date), no. 25 (3.54g) = NAC 8, 3 April 1995, no. 754 (3.54g) = Leu Numismatik AG 71, 24 Oct. 1997, no. 293 (3.55g).
3	c.	3.49g	12h		Ben Lee Damsky coll. Privately purchased from Mike Vosper on 9 November 2011. Ex Tom Cederlind Catalogue 130, 30 March 2004, no. 210 (3.49g) = New York Sale 17, 9 Jan. 2008, no. 191 (3.50g) = Lanz 150, 13 Dec. 2010, no. 215 (3.49g).
	Obv. II (ties 2) Rev. 1				
4	a.	3.68g	12h		Sisyphus coll., ex Peus 386, 26 April 2006, no. 672 (3.68g) = Gorny & Mosch Giessener Münzhandlung 159, 8 Oct. 2007, no. 364 (3.69g).
5	b.	3.59g	12h		Saint-Omer, Musée de l'Hôtel Sandelin, collection numismatique (on temporary loan at the Dépt. des Monnaies, médailles et antiques, BnF, Paris). No. 87 in the manuscript catalogue of the museum (compiled with reference to the first edition of Cohen).
	Obv. II (ties 2) Rev. 2				
6	a.	3.82g	12h		Künker 83, 17 June 2003, no. 697 (3.81g) = Gorny & Mosch Giessener Münzhandlung 125, 13 Oct. 2003, no. 382 (3.82g).
7	b.	3.72g	12h		NAC – Spink Taisei, 16 Nov. 1994 (Steinberg coll.), no. 181 = UBS AG 53, 29 Jan. 2002, no. 119.
8	c.	3.71g	12h		Paris, Bibliothèque nationale de France, Dépt. des Monnaies, médailles et antiques acq. 2009/13, ex Gemini 5, 6 Jan. 2009, no. 791, ex Glenn W. Woods stock (listed on Vcoins in February 2008).
	Obv. III (ties 2) Rev. 3				
9	a.	3.73g	10h	Die flaw to the right of the *simpulum*'s handle.	CNG 63, 21 May 2003, no. 1213 (3.22g) = NAC 64, 17 May 2012, no. 1077 (3.73g).

* Calculation by courtesy of Jérôme Mairat.

No.	Die-combinations, specimens	Weight	Axis	Commentary	References
10	b.	3.67g	10h	Die flaw to the right of the *simpulum*'s handle.	Vienna, Kunsthistorisches Museum, Coin Cabinet, inv. RÖ 95.088, ex CNG Electronic Auction 170, 8 Aug. 2007, no. 199.
	Obv. III (ties 2) Rev. 4				
11	a.	3.32g	9h*		Măgura hoard: Mihăilescu-Bîrliba, Mitrea 1977, p. 35, no. 1.
12	b.	3.19g	9/10h*	Die flaw on rev., to the left of Gaius' right foot.	Triton 1, 2 Dec. 1997, no. 1283.
	Obv. IV (ties 3) Rev. 5				
13	a.	3.67g	12h		CNG 103, 14 Sep. 2016, no. 806
14	b.	3.53g	1h		London, British Museum, *BMC* Augustus 536 (bought in 1920 from Platt): Mattingly 1923, pl. 13, no. 18. Grant 1954, pl. VI, no. 4.
	Obv. V (ties 2) Rev. 5				
15	a.	3.63g	6h		Roma Numismatics E-Sale 17, 25 April 2015, no. 611. Ex Mark Gibbons coll.; privately purchased from Mike Vosper.
	Obv. V (ties 2) Rev. 6				
16	a.	–	1h		Münchner Münzhandlung Karl Kreß 143, 27 May 1968, no. 435.
17	b.	83g (mounted)	c. 12h	Several small die flaws on the obv., e.g. next to the tip of the nose, the D of DIVI, the T of PATER, the E of PATRIAE etc.	London, British Museum, Department of Greek and Roman Antiquities, Reg. no. 1872,0604.1060. Marshall 1911, p. 349, no. 2936 (not illustrated). Mounted in a plain gold setting, with suspension loop. Acquired in 1872 (from Giulio Sambon), from the Castellani collection.
	Obv. VI (ties 3) Rev. 7				
18	a.	3.53g	6h		Private coll., ex Lanz 138, 26 Nov. 2007, no. 542 (3.54g).
19	b.	2.97g	6h		CNG Electronic Auction 373, 20 April 2016, no. 343.
	Obv. VI (ties 3) Rev. 8				
20	a.	3.38g	1h*		Elsen 116, 16 March 2013, no. 374.
21	b.	3.31g	1h		Private coll. Privately purchased from Mike Vosper on 10 Oct. 2014.
22	c.	2.86g	1h		CNG Electronic Auction 330, 9 July 2014, no. 312.

* Calculation by courtesy of Jérôme Mairat.

No.	Die-combinations, specimens	Weight	Axis	Commentary	References
	Obv. VII (ties 3) Rev. 9				
23	a.	3.65g	12h		Künker 89, 8 March 2004, no. 2019 (3.64g) = CNG 67, 22 Sept. 2004, no. 1262 (3.65g) = CNG 70, 21 Sept. 2005, no. 853 (3.65g).
	Obv. VIII (ties 2) Rev. 10				
24	a.	3.62g	8h	Die break at the first I of "DIVI".	Private coll., ex CNG 78, 14 May 2008, no. 1705.
	Obv. IX (ties 2) Rev. 11				
25	a.	3.33g	12h		Warsaw, National Museum, Coin Cabinet inv. no. 107113 (acquired after World War II).
	Obv. X (ties 2) Rev. 12				
26	a.	3.74g	6h	Tiny die break between the wreath tie falling down the neck and the T of PATRIAE	CNG 102, 18 May 2016, no. 842.
	Ancient fake				
	Obv. III (ties 2) Rev. 13				
27	a.	2.93g	10h		Private coll., privately purchased from Forum Ancient Coins in November 2014.

4. Commentary on the die study; size of the issue

Performing a die-study of this group proved fairly straightforward, since it is relatively easy to distinguish the dies used: the obverse dies are not only stylistically rather diverse (on which see below), but they are also differentiated typologically by the depiction of the wreath ties in three different varieties, as indicated in the catalogue. As for the reverse dies, the diagnostic criteria for their distinction are mainly the shape and the position of the priestly instruments, the degree of overlap of the two shields, and especially the position of the top ends of the two spears in relation to the reverse legend: by carefully observing to which letters the spears point, it is quite easy to tell the dies apart. Die-breaks rarely occur in this group; a few exceptions have been noted in the catalogue.

The 26 silver denarii assembled for this study were struck from ten obverse dies and 12 reverse dies (plates 3-5). There are four short die-chains (figure 1), two of which connect four and two of which connect three dies each. The dies in one of these die-chains (dies I, II, 1, 2) seem to have been particularly prolific, since no fewer than eight of our 26 specimens were struck from them.

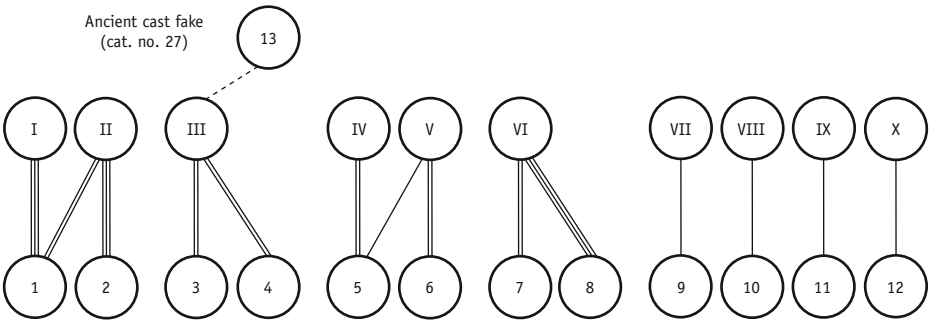

Figure 1 - *RIC* Augustus 208 – the dies and their combinations.
Each line represents one coin.

These eight coins are of a very fine style, and they are carefully struck on broad, well-made flans with a regular die axis of 12 / 1 o'clock, so that it is tempting to place this chain at the start of the production. The other three die-chains have been grouped arbitrarily after the first one. The group also includes four singletons, which have been placed at the end: denarii whose obverse and reverse dies are attested exclusively on single coins. Despite the fact that it is not possible to link all of the dies of the group, there is nothing to suggest that the production of *RIC* Augustus 208 was split into several groups, struck at different periods of time: especially the reverse dies form a tightly knit unit, in a stylistic perspective, on which see below. The ratio n (total of coins attested) / d (number of obverse dies observed) is 2.6 for our sample.[76] Hence, it is unfortunately below the threshold of three, above which "the use of statistics" in the calculation of the original population of obverse dies has rightly been termed "only a minor source of trouble".[77] Still, the ratio is well above two, so that the application of statistical methods for the calculation of the original number of dies of course makes good sense. By applying the formula most recently proposed by Esty,[78] one obtains the point estimate of 16.25 for the original population of obverse dies.[79] The formula by Carter,[80] by way of contrast, yields an estimate of just 13.64. This means that we currently know perhaps about two thirds of the obverse dies originally used to strike the issue.

76. If we take into account just the silver denarii – although theoretically a case could be made for including the ancient fake in the calculation, too, since it represents a genuine coin: see section 9 below. If we included the ancient fake, the ratio would be 2.7.
77. De Callataÿ 1995, p. 295.
78. Esty 2011.
79. Again, this calculation is based just on the 26 silver denarii, and the fake was excluded.
80. Carter 1983, p. 202, formula 2 (to be used in the range n = 2 to 3d).

5. Technical features: weight and die-axis

Of the 26 silver denarii of the group, weight data are available for 24.[81] This is not a large sample, and consequently a metrological analysis can be performed just with reservation: the emergence of new data may well change the picture. In any case, the mean weight of these 24 coins is 3.52g; for the weight distribution, see figure 2. There is a peak in the region between 3.70g and 3.74g, and it seems probable that the target weight of the issue should be sought here (or perhaps even in a marginally higher region). The average weight of the particularly well-made specimens from the large die chain which we placed at the start of the sequence is 3.66g, thus a little higher than the average of the total sample. Four of the coins in our sample, viz. the specimens in Warsaw, in the Măgura hoard and in CNG E-Auctions 330 and 373, show considerable signs of wear and / or corrosion, and two of these contribute to the concentration of weights in the region 3.30-3.34g, in our diagram. Hence, there is no need whatsoever to suppose that the issue was struck on more than one weight standard.[82]

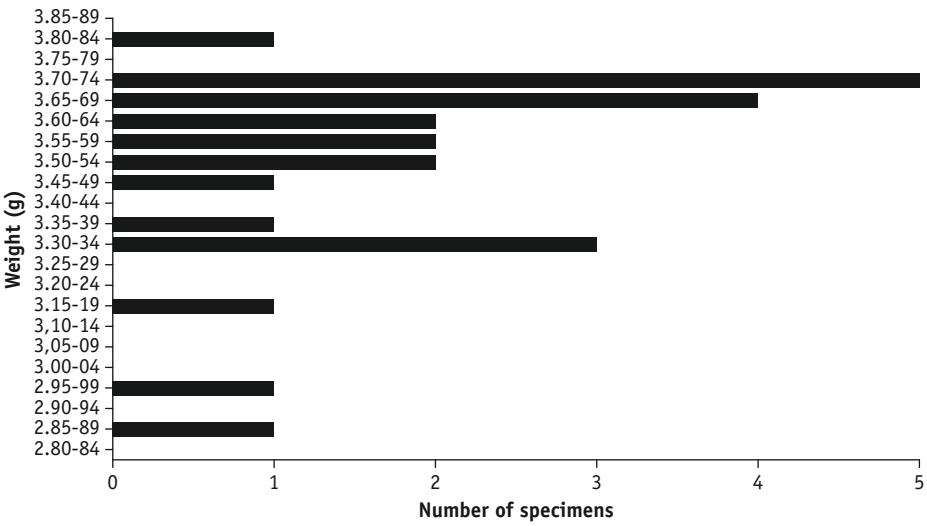

Figure 2 - The weights of 24 denarii of the type *RIC* Augustus 208 (average weight: 3.52g).

81. Unfortunately no weight is reported for specimen no. 16 in the auction catalogue Münchner Münzhandlung Karl Kreß 143 (1968); specimen no. 17 is mounted as jewellery.
82. As proposed by the cataloguer in NAC Auction Sale 45 (The Barry Feirstein Collection of Ancient Coins, Part IV), 2 April 2008, in the write-up to no. 71, who suggested "two major phases of striking – the first [...] has coins weighing c. 3.20 grams, and the second [...] has denarii with weights ranging from 3.50 to 3.81 grams."

The mean weight of our group is considerably lower than the mean weight of the main group of C. L. CAESARES denarii issued under Augustus, which seems to be around 3.80g, as detailed above. It is also somewhat below the mean weight of the sub-type with the X, calculated as 3.62g. In the frequency table, our coins peak in a lower region than the Augustan C. L. CAESARES denarii charted by Butcher and Ponting, for which the greatest concentration of weights is to be observed between 3.75 and 3.84g.[83]

What was the weight standard of our coins? It is clear from the literary sources that Roman mints traditionally expressed the theoretical weight standards of their coins as "so and so many specimens per pound". Unfortunately, it has so far proved impossible to work out what the precise weight of the Roman pound in the early principate was, as a most judicious discussion of the problem recently published by Butcher and Ponting eloquently shows.[84] Still, their analysis at least seems to bear out that especially for the silver coinage Böckh's classic estimate of 327.45g matches the numismatic evidence best, which is why we adopt it here for practical reasons. On the basis of Böckh's *libra*, the theoretical weight of a denarius struck at a standard of 87 to the pound would be 3.76g; at 88 to the pound, its weight would be 3.72g. It is in this region that the weight standard of our group should probably be sought, on the evidence currently available.

Hence, our group was issued on a lighter weight standard than the coins of Augustus, but clearly on a heavier weight standard than the reformed denarii of Nero, for which a standard of 96 to the pound (theoretically 3.41g target weight) is indirectly attested in late antique literary sources;[85] in a frequency table, these reformed Neronian coins peak in the region 3.40-3.49g, as we would expect them to.[86] The average weight of the denarii of our enigmatic group of 3.52g may be compared to the mean weights of 45 denarii of the emperor Claudius (AD 51-52) of 3.59g and of 24 denarii of Nero (pre-reform) of 3.57g, recently calculated by Butcher and Ponting.[87] Still, the divergence of 0.2g in the mean weights of the main group and the "X"-group of Augustan C. L. CAESARES denarii observed above provides a salutary warning how diverse weight standards under the rule of a single emperor could be, and how little we know about the topic as such so far.

Another important technical feature is die-axis. We are able to provide die-axis data for all the denarii of the group listed above (figure 3): for the specimens that are known to us from an image only, and for which no data was

83. Butcher, Ponting 2014, p. 170, fig. 8.6.
84. Butcher, Ponting 2014, p. 90-96.
85. See Butcher, Ponting 2014, p. 668f.
86. Butcher, Ponting 2014, p. 204.
87. Butcher, Ponting 2014, p. 169 and 203.

provided by the auction houses, the die axis was kindly calculated on the basis of the digital photos by Jérôme Mairat, as indicated in the catalogue above.

Axis (h)	1	2	3	4	5	6	7	8	9	10	11	12
Specimens	6	-	-	-	-	4	-	1	1	3	-	11

Figure 3 - The die axes of 26 specimens of *RIC* Augustus 208.
NB: Pieces at 9/10h have been listed as 10h in this table.

As may be seen from the table, the issue is not completely regular, but there is a strong tendency towards 12 o'clock and 1 o'clock: for 17 of the 26 coins one of these values was obtained. The axis of 6 o'clock, in evidence four times, is closely connected to the axis around 12 o'clock: three of these four pieces were struck from obv. dies V and VI, from which also pieces with an axis of 1 o'clock were produced. The presence of five pieces with axes between 8 and 10 o'clock is remarkable; the four specimens with an axis between 9 and 10 o'clock were all struck from the same obverse die, viz. die III. As already mentioned above, the specimens from the longest die chain (presumably to be placed at the beginning of the sequence) were all struck at 12/1 o'clock. This clear tendency towards regularity sets the denarii of the sub-group *RIC* 208 apart from the C.L. CAESARES denarii of the main group, whose die-axis is irregular.

The maximum diameter of the denarii *RIC* 208 is between 19 and 21mm; the field of the dies (the zone within the beading) is about 19mm wide. Especially the coins of the first die-chain tend to be well-struck on rather broad planchets. On the whole, the form of the flans of the entire group *RIC* 208 is fairly regular. Quite a few pieces (e.g. coins nos. 3, 4, 6, 7, 8, 9, 16, 19, 23 and 25) have just one irregularity or 'nick' in the edge – clearly remains of the casting sprue. An exception with regard to the shape of the flan is specimen no. 5, which shows numerous cracks around the edge, but also two zones at opposite ends of the flan, where casting sprues seem to have been cut off. Specimen no. 26 is also struck on a somewhat unshapely flan. In general, the coins of the group are well-centred; just in a few cases, off-centre strikes occur, see coins no. 10 (obv. and rev.), 11 (obv.), 17 (rev.), 20 (obv.) and 23 (rev.).

6. Typological and stylistic commentary

When coins of this group began to turn up more often in the trade in the mid-1990s, it was above all their style that caught the attention of cataloguers. It led them to question whether this rare variety, known before that time almost exclusively through the specimen in the British Museum (*BMC* Augustus 536), was really produced under Augustus, as the types and legends *a priori* suggest. Already at the appearance of such a coin at auction in autumn 1994 (no. 7 in our catalogue above), the cataloguer – while sticking to the Augustan dating

given in 1923 by Harold Mattingly in the *BMC* – paradoxically praised the "magnificent detailed proto-Trajanic style" of the denarius.[88] About half a year later, the mould was broken. When coin no. 2, at its first appearance in the trade simply described as being from "meticulously engraved dies with a strong attractive style",[89] was offered again at an NAC auction sale in 1995,[90] it was explicitly dated to the Trajanic period in the catalogue: "Rome about 107"; "this exceptional denarius seems by fabric, style, and epigraphy to belong to an anonymous restitution preceding Trajan's signed series of restored denarii". The most detailed considerations on the series up to now were put forward by Alan Walker, who catalogued coin no. 2 when it was auctioned again in 1997.[91] In describing this coin he compared it with *BMC* Augustus 536 and noted the "exceptionally fine portraits, carefully delineated reverse figures (the robes are shown with great precision), and small and neat legends. These traits set them apart from all the usual coins of this issue, and make it clear they were not struck at Lugdunum." Furthermore, Walker was the first to draw attention to an important typological detail: "the ties of Augustus's laurel wreath are shown fluttering in a way which seems to be unparalleled by any other wreath on an Augustan portrait coin. Such ties are, however, commonly found on some issues of Trajan and Hadrian!" "While more research is called for, there seems to be a good possibility that [sc. the coins of this group] are all post-Augustan, and were struck either under Trajan (as part of the restored series of 107?), or, perhaps more likely, as an unsigned restoration issue under Hadrian." Hence, Alan Walker was not convinced that the Trajanic date, proposed for the issue by the NAC cataloguer, was correct, and preferred to leave the question open; a similar, more prudent approach was chosen by the cataloguer responsible for a description of coin no. 12, which also turned up in 1997, in the first Triton sale:[92] "struck circa 2nd century AD."

However, the fine style of the specimen of our group in the British Museum had attracted attention already long before more specimens appeared in the trade. When Michael Grant needed to select one C. L. CAESARES denarius for illustration in his book *Roman Imperial Money* in 1954, he picked precisely *BMC* 536, although he was free to choose among all the Augustus coins in the BM and in other British collections.[93] The reason for his choice seems obvious: this coin is of better style and simply more 'beautiful' than coins of the main group.

88. *Roman Coins. The Gilbert Steinberg Collection.* Auction Sale in Zurich, NAC – Spink Taisei Numismatics, 16 November 1994, p. 23, no. 181 (dating: "about AD 7").
89. Antiqua, Inc. (Steve L. Rubinger: Woodland Hills, CA), Catalog II: Ancient Art & Numismatics (no date), p. 16, no. 25.
90. NAC 8, 3 April 1995, p. 80, no. 754.
91. Leu Numismatik AG 71, 24 October 1997, p. 80, no. 293. Alan Walker confirmed his authorship of the catalogue entry to us (pers. comm.).
92. Triton 1, 2-3 December, 1997, p. 232, no. 1283.
93. Grant 1954, pl. VI, no. 4.

Of course it is only now, on the basis of our die-study, that a comprehensive analysis of the typology and style of the group – which is also conspicuous for the small and neat lettering of its legends – can be attempted. First, the obverses. When looking at the ten dies hitherto attested, it is immediately obvious that the portrait of Augustus, well engraved technically on all of them, is extremely varied in appearance. While on some dies, e. g. dies II, III and X, it looks pretty "Augustan", in some other cases it does not resemble the portraits of the emperor known from the coins of the Augustan period at all: this is true especially for die I. The differences between the facial features on some of the portraits are, in fact, so marked that one would hardly recognise that it is the same emperor, were it not for the context and legend: cp. the dies II, I and V. Also, considerable differences in the emperor's coiffure may be observed on the various dies: one of them stands out for the short parallel, pretty regular locks at the forehead (die VII), while other dies present a more natural hairstyle of a better (die II) or more modest execution (die VI). On die no. I the imperial coiffure is characterised by waves at the forehead. All this diversity on various levels does seem to speak in favour of a production in post-Augustan times. However, it doubtless would be methodologically unsound to try and use potential resemblances in the facial features or coiffures of "Augustus" on single dies of the group to the numismatic portraits of later emperors in order to date these coins.

Apart from the facial features and the hairstyle of the portraits, variability is also in evidence regarding the truncation of the bust. In general, on these coins the imperial image often is not cut off near the head, as it is normally the case on the main group of Augustan C.L. CAESARES denarii, but a little deeper, and especially two dies (VIII, IX) stand out in having an elegantly curved truncation. It is true that this is a feature usually not found on Augustan issues, especially not on C.L. CAESARES coins. However, forerunners of this manner of designing the truncation may be identified already in the Lugdunese IMP XII coinage of Augustus.[94] Consequently, utmost caution of interpretation is required, and this truncation cannot be considered to constitute a reliable chronological criterion – although it rather points to the post-Augustan period, of course. The same may be said of the truncation of the bust on die no. X, which stands apart from the other obverses of the group in that the truncation line is not too curvy, but very steep: it does not run more or less horizontally, as the truncations of the other portraits of the group and especially of the Augustan prototypes, but at an angle of about 45 degrees, in relation to an imaginary horizontal line (or to the imaginary vertical axis of the portrait). We shall return to this feature below.

94. Cp. Giard 2001, pl. LVIII, nos. 1422ff.; Mattingly 1923, pl. 11, nos. 16ff. and pl. 12, no. 1.

As seen correctly by Walker, the evidence provided by the ties of the laurel wreath of Augustus on our denarii is chronologically significant. On ordinary Augustan C.L. CAESARES coins, three varieties may be observed regarding the wreath ties. On the vast majority of these pieces, one of the two ties is depicted as falling down the neck vertically, while the other one is on the shoulder (see, e.g., plate 6, A-B). In some cases both ties are on the shoulder (plate 6, C), and on extremely few coins both wreath ties are falling down the neck, parallel to each other (plate 6, D). As for the enigmatic denarii of our group, nine of the ten obverse dies copy the two more common Augustan varieties: on six obverse dies just one of the ties is on the shoulder, and on three dies both ties are depicted on the shoulder. Die no. I, however, depicts the two wreath ties fluttering: there is no Augustan parallel for this.

As Walker noted, fluttering wreath ties occur regularly on coins of Trajan and Hadrian. However, he was mistaken in assuming that this detail automatically points to their reigns. Fluttering ties are occasionally attested already on much earlier Roman imperial coins: under Nero and the Flavians[95] (see, e.g., plate 6, M). Unless one wants to postulate that this detail was invented on die no. I of our group, it seems to be a reasonable assumption that the fluttering wreath ties are a typological indicator useful for establishing the chronology of this series of C.L. CAESARES denarii. Consequently, the reign of Nero might be regarded as a *terminus post quem* for these coins, on typological grounds.

Unfortunately, the reverses of our group do not provide us with a similar chronological clue, but it is instructive to compare them with the reverses of the main group: remarkable differences emerge. First and foremost, it needs to be stressed that – unlike in the "X"-group described above – there is no typological confusion here regarding the attribution of the priestly implements and the seniority of Gaius Caesar: the shield next to the person standing on the left is always in the foreground, and the *simpulum* is attributed to him.

Already Walker emphasized that the *togae* of Gaius and Lucius are shown with much greater precision on the coins of our group than on specimens of the Augustan main group.[96] But there is a more fundamental difference. While the two brothers are normally depicted in an almost fully frontal view on the

95. Cp. MATTINGLY 1923, pl. 41, nos. 1-2; see also e.g. GIARD 1998, Titus (for Domitian Caesar) nos. 239f., 258, 260; Domitian nos. 89 and 208. CARRADICE, BUTTREY 2007, pl. 141, no. 282 (Domitian).

96. Walker also observed that "a togate figure of Hadrian" on a sestertius of AD 136, pictured by KENT, HIRMER 1978, no. 290, is "almost identical to the figure standing on the right on the reverse of the coin". The *togatus* on the coin and the figure of Lucius are indeed quite similar, but the utmost caution is required in comparisons of this kind, since the similarity may be generic. See, however, also section 10, part C of this article on the dating of the coins.

coins of the main group,[97] much like 'mummies', staring directly at the viewer (if their faces are visible at all, which often is not the case on the Augustan coins), the impression the reverse image of our coins conveys is a completely different one: here, the group does not seem static, but rather dynamic. The bodies of the Caesars are slightly twisted towards each other (and at the same time towards the centre of the reverse image), and the brothers do not look at the viewer, but their regards are directed towards the centre, too. The die-cutters engraved the reverses so delicately that this detail can be seen on several dies. Also, they somewhat modified the positions of the right arm of Gaius (on the left) and the left arm of Lucius (on the right), in accordance with the more dynamic posture they gave the two figures. The right arm of Gaius, hanging straight down on the side of the body on the Augustan pieces (if the arm is visible at all), now is shown in front of the body. The left arm of Lucius, of which just the hand holding the scroll normally can be made out on Augustan pieces, in the form of a knob, is better visible in our group: it is bent, with folds of the toga falling over it, and on some dies the *rotulus* can be seen in front of the body. Also, their feet are depicted in a much more naturalistic way.[98] All these details contribute to creating a three-dimensional impression of the reverse image on the coins of the enigmatic sub-group.

As already stated above, the most obvious typological difference between the main group of C.L. CAESARES denarii and our coins is the orientation of the *simpulum* and *lituus* in the centre of the reverse. The fact that the implements are constantly turned outwards in the small group – and not inwards, as in the main group – might *prima facie* be thought to imply a conscious decision on the part of the issuing authority to mark out these coins as a special group: if the die-cutters were able to copy all the details of their models, even considerably enhancing the beauty of the scene in the process, they doubtless should have been able to copy the sacerdotal implements true to the originals, too, had they so desired.

However, there is a general problem with these sacerdotal emblems. While the reverses as such are, on the whole, very well engraved, the *simpulum* and *lituus* normally are not. Three points require comment. Firstly, the shape of the objects. The *simpulum* is strangely mis-shaped on nearly all of the dies, and the *lituus* looks more like a hook than a *lituus*, since its "scroll" is not adequately developed; what is more, it always has a most curious bifurcate base. It is true that this is merely an exaggeration of a form of the *lituus* with

97. The one body part for which this is not the case is the foot near the shield of both figures, which is normally shown from the side, while the outer one is shown from the front, which creates a somewhat strange impression. For the iconographic details of these coins the Este *quaternio* may be consulted, since it probably preserves the most authoritative version of the reverse composition: see, e. g., Fischer 1990a, p. 16.

98. See n. 97 above on that point.

a shallowly split base which, in principle, can be observed not only on some of the Augustan C.L. CAESARES coins, but also on late Republican issues (plates 6-7, A, N); also, there are quite good parallels to this *lituus* shape on the "X"-group (plate 6, L). This feature probably is to be explained as a somewhat clumsy rendering of a view from below of the hollow base of the *lituus*. Still, the particular shape of the object on our coins is slightly unsettling. Secondly, the objects are positioned awkwardly on some of the dies. On reverse die no. 1, the two objects are not depicted at the same level, and on reverse die no. 2, the *lituus* is tilted to the right and practically touches the spear of Lucius. On this die it also is extremely small, which brings us to the third point: the dimensions of the implements, which are not standardised. While they are normally about as large as the heads of the Caesars, they are considerably larger on one die (no. 7).

Hence, one should perhaps envisage the hypothesis that the *simpulum* and *lituus* were not engraved by the same artists who cut the reverse design as such, but that they were added by different *scalptores*: this might explain the difference in quality. If the hypothesis is correct, the engravers of Gaius and Lucius had originally planned to leave out the implements completely; we shall see below that this assumption is not inherently implausible. For some reason, it may have been decided by the minting authority that the prototype should be copied as closely as possible, and so the instruments were added to the entire set of dies for the issue, which had probably been prepared before striking began, only as a last-minute extra. Of course we are in the realm of speculation here. However, if the above scenario corresponds to reality, it may be that the outward orientation of the sacerdotal emblems does not convey a conscious decision by the authority to mark out the denarii as special: perhaps it betrays just the apprentice engravers' incompetence to correctly copy their models.

7. The silver content of the alloy

Six C.L. CAESARES denarii of our sub-group (cat. nos. 4, 5, 8, 18, 21 and 24) were analysed using LA-ICP-MS[99] in order to determine their composition regarding a large number of elements (figure 4). Furthermore, a bulk analysis

99. LA-ICP-MS (or Laser Ablation Inductively Coupled Plasma Mass Spectrometry) enables the determination of the elemental contents of silver coins with low detection limits (parts per million, ppm). A micro-sampling is carried out using a laser from the surface of one side of the coin toward its interior, leaving a damage invisible to the naked eye. The removed substance is then ionised and finally analysed by mass spectrometry. The time resolved analysis mode makes it possible to overcome the problem of depth heterogeneities of the elemental composition in most cases. See Sarah et alii 2007 and Sarah, Gratuze 2016 for further information about LA-ICP-MS applied to silver and silver-copper alloy coins.

was carried out with FNAA[100] on one of these coins, in order to validate the concentrations in major elements obtained via LA-ICP-MS. Finally, we had the opportunity to have the specimen in the coin department of the British Museum (cat. no. 14) analysed using XRF.

LA-ICP-MS analysis allows to reconstruct concentration-depth profiles from the surface of the coin to its inner part and, as expected, our denarii appear to be highly enriched in silver on their surface (figure 5).[101] The composition of the alloy beyond the silver-enriched layer corresponds to the one of the metal used to produce the coins. Coin no. 5 was also subjected to FNAA (figure 4); that the results of both types of analyses are in good agreement underlines the reliability of LA-ICP-MS for analysing this type of coins.[102]

The silver concentrations we encountered are ranging from 80.3% to 82.5% for five of the denarii, while the sixth coin, no. 21, has a markedly higher silver content of around 87%. Also, significant variations in the composition of the different micro-samplings of this coin may be noticed (see the standard deviations reported in figure 4). We suspect that the LA-ICP-MS analysis of denarius no. 21 may have led to overestimating its silver content to the detriment of the copper concentration, unless this coin was really manufactured from an alloy with a higher silver concentration. However, we have not considered its composition in our calculation of the average silver contents of the group. On the basis of the results of the other five measurements, we conclude that the C. L. CAESARES denarii *RIC* Augustus 208 contain on an average 81.2% silver and 18.1% copper. It should be noticed that two coins from the same pair of dies were analysed (nos. 4 and 5), and their compositions are consistent.

The XRF analysis reported in figure 4 was performed by Duncan Hook at the research laboratory of the British Museum in 2016. This analysis on a specimen of the British Museum collection was done on the edge of the coin; a few measurements were made, after re-abrading each time (in order to remove

100. Fast Neutron Activation Analysis; for details about this non-destructive method see for instance Guerra, Barrandon 1998. We are grateful to the CEMHTI laboratory (CNRS, Orléans) for making the irradiation facilities available to us.

101. The question of "surface enrichment" of ancient silver coins in general – which is actually the result of a copper depletion – has been much commented on (Hall 1961; Condamin, Picon 1972; Beck et alii 2004). For Roman silver coins in particular see now: Ponting 2012; Butcher, Ponting 2014, p. 77f.

102. FNAA measures the average metallurgical composition of the entire coin; the silver-enriched surface layer also contributes to the results. Hence, FNAA measurements are believed to tendentially overestimate the silver content, as compared to results obtained through methods analysing exclusively the heart-metal of silver-copper alloy coins. This is why M. Ponting rejected the pertinence of FNAA (Ponting 2012, p. 21). However, the consistency in the results obtained by us for the same coin through both FNAA and LA-ICP-MS leads to think that at least in the measurement of denarius no. 5 the silver-enriched layer did not significantly influence the overall results.

the silver-rich layer), until a constant result was found. The value obtained for this denarius via XRF closely matches the silver values obtained for the other coins with different methods.

LA-ICP-MS analyses

No.	Die-combination (obv.–rev.)	Method	Ag	Cu	Au	Bi	Pb	As	Ni	Sb	Sn	Zn	Silver bullion content
			(%)					(ppm)					
21	VI–8	LA-ICP-MS	86.6 ± 1.7	12.3 ± 1.6	0.15	0.08	0.89	21	15	158	25	3	87.7
18	VI–7		82.5 ± 0.1	16.7 ± 0.2	0.04	0.14	0.59	21	10	166	75	14	83.3
8	II–2		81.3 ± 0.4	17.8 ± 0.4	0.10	0.04	0.71	38	20	184	32	11	82.1
24	VIII–10		81.1 ± 0.2	18.2 ± 0.1	0.07	0.06	0.57	23	27	111	18	20	81.8
4	II–1		80.8 ± 0.3	18.5 ± 0.3	0.04	0.19	0.52	25	12	142	33	6	81.5
5	II–1		80.3 ± 0.4	18.8 ± 0.4	0.12	0.10	0.65	44	23	176	68	8	81.1
Mean ± 1 SD for the 6 LA-ICP-MS results			82.1 ± 2.3	17.0 ± 2.5	0.09	0.10	0.66	29	18	156	42	10	82.9 ± 2.5
Mean ± 1 SD for 5 LA-ICP-MS results			81.2 ± 0.8	18.1 ± 0.8	0.07	0.11	0.61	30	18	156	45	12	82.0 ± 0.8
Further analyses													
14	IV–5	XRF	82.7	16.3	0.16	0.06	0.68				<4,000	<2,000	83.6
5	II–1	FNAA	80.3	18.8	0.15	/	0.71	75		198	<50	<4,000	81.2

Figure 4 - Results obtained for the C. L. CAESARES denarii *RIC* 208 (contents in weight percent or ppm). SD: standard deviation. The coins are arranged by the method used and by decreasing silver bullion content. The silver bullion content is the sum of the concentrations of silver, gold, bismuth and lead.[103] Three to five micro-samplings were carried out for each coin with LA-ICP-MS, and standard deviations were calculated for all the elements.

103. The silver bullion content, a figure used by Butcher and Ponting, is calculated as the sum of the contents of silver and of the elements assumed to be present in the alloy as silver metal impurities (gold, lead and bismuth if applicable): see Butcher, Ponting 2014, p. 102.

The fineness of our denarii is well below that of the Augustan silver coinage, which was essentially struck in pure silver.[104] This offers conclusive proof that our series does not date back to the principate of Augustus, but must have been produced later. In fact, it is now well established that the denarii minted up to Nero's reform in c. AD 64 are made of virtually pure silver bullion; the debasement that occurred in that year lowered the fineness of the denarius alloy to about the level of 80%.[105] This standard, dubbed "First Neronian Standard" by Butcher and Ponting,[106] was used on and off for the production of Roman denarii (alternatively with a 90% silver standard) from AD 64 to AD 156 / 157, when Antoninus Pius lowered the alloy to 70%. With a few almost negligible exceptions, the Roman standard silver coin did not return to a better alloy after Pius.[107] Since the group of denarii we are focusing on is very close to the "First Neronian Standard" of 80%, it should have been minted after Nero's reform, and before the debasement of Antoninus Pius.

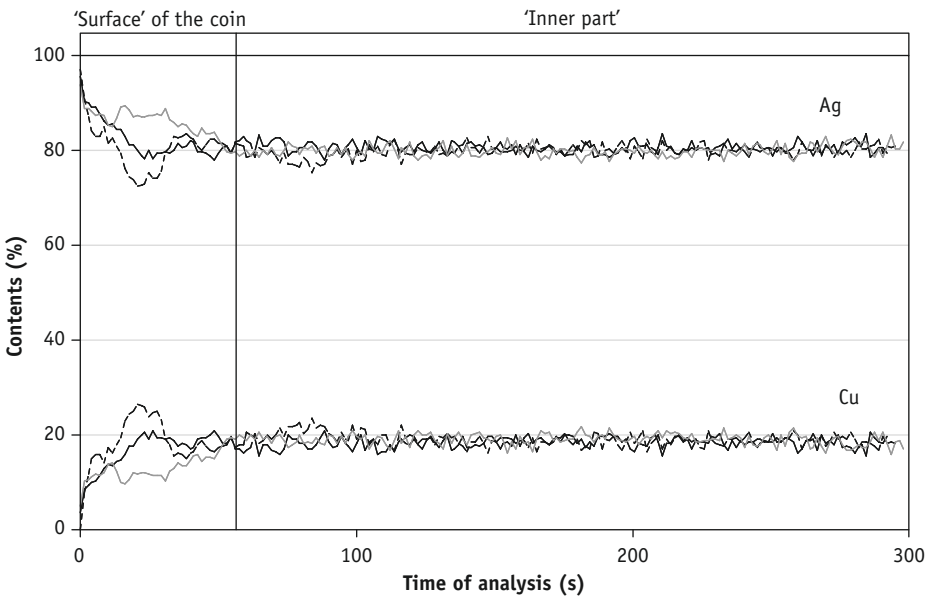

Figure 5 - Depth contents profile for silver and copper obtained with LA-ICP-MS on coin no. 5. Three micro-samplings were carried out.

104. Butcher, Ponting 2011, p. 557.
105. Butcher, Ponting 2011, p. 561.
106. Butcher, Ponting 2014, p. 217-219.
107. Butcher, Ponting 2012, p. 74.

8. Hoard evidence

It is a commonplace that the vast majority of Roman imperial silver coins are found in hoards, and newly found hoards have, as a matter of course, always been an important source for the international coin market. Alas, the hoard context of the material in the trade normally cannot be reconstructed. In the case of our group, this is particularly unfortunate, because the contexts in which these rare C.L. CAESARES denarii were found might tell us a lot about their attribution. It is interesting to analyse the chronology of the appearance of specimens of *RIC* Augustus 208 in trade; three waves may be discerned: three pieces were sold in 1994, 1995 and 1997 (nos. 2, 7 and 12); after a pause of five years, another ten specimens – many of which shared the same dies – appeared between 2003 and 2008 (nos. 1, 3, 4, 6, 8, 9, 10, 18, 23, 24), and after a pause of four years seven more coins were offered for sale in 2013-2016: nos. 13, 15, 19, 20, 21, 22 and 26. That three of the latter coins, put up for auction in 2013 and 2014, are struck from the same pair of dies, is quite telling.

Just one of the coins in our catalogue (no. 11) is recorded in the context it was found in, and it provides us with incontrovertible evidence that *RIC* Augustus 208 is an ancient coin type (and not a modern invention): it is coin no. 1 in the publication of the Măgura hoard,[108] an important pot hoard of 2,828 denarii and 2 drachmas, discovered on 28 April 1976 in the homonymous village situated near Brașov in south-eastern Transylvania. The hoard, which was published already in the year following its discovery, closes with seven denarii issued at the beginning of the reign of Septimius Severus.[109] Apart from the C.L. CAESARES denarius of our group, which the editors naturally took to be an Augustan coin, the hoard starts with 19 post-reform denarii of Nero.[110] If the coins of our group are of a post-Neronian date, as the typological and metallurgical evidence laid out above indicates, the strange chronological gap between Augustus and Nero at the beginning of the Măgura hoard disappears: the hoard contents may then be recognised to form a compact sequence from Nero to Septimius Severus.

In general, the modest quality of the image of the C.L. CAESARES denarius *RIC* 208 and the incomplete photographic record of the Măgura hoard in the publication make it difficult to compare the degree of wear of the denarius with the wear of the coins of other emperors in the hoard: for example, no Neronian denarii are pictured in the book at all, and just a tiny selection of 24 of the nearly 500 Flavian pieces. The C.L. CAESARES denarius, as pictured in the publication, does show some signs of wear, but it is by no means completely worn off. In fact, while the portrait on the obverse is somewhat worn, the

108. Mihăilescu-Bîrliba, Mitrea 1977.
109. Mihăilescu-Bîrliba, Mitrea 1977, p. 73, nos. 2823-2829.
110. Mihăilescu-Bîrliba, Mitrea 1977, p. 35, nos. 2-20.

reverse is still quite nice. For what can be seen on the plates of the Măgura hoard publication, the wear of denarii of one and the same emperor tends to be quite uneven in this assemblage. Still, it would seem that the wear of the C.L. CAESARES denarius *RIC* 208 broadly corresponds to the degree of wear of the pieces from Domitianus (as Augustus) to Antoninus Pius, but obviously this argument cannot be pressed too much. The editors calculated average weights of the denarii in the hoard per emperor and obtained the highest average weights for Marcus Aurelius (3.31g) and Antoninus Pius (3.25g).[111] For what it is worth, at 3.32g the C.L. CAESARES denarius is heavier than that – but again, this does not help a lot, since the weight standard of these coins seems to be somewhat eccentric anyway, as noted above.

9. An ancient counterfeit

In 2014, an ancient forgery – or 'imitation' – of *RIC* Augustus 208 appeared in the coin market (no. 27 of our catalogue). It is dark in tone and has a rather uneven surface. When it was subjected to several types of metallurgical analyses, it became clear that it belongs to a well-known class of ancient denarius counterfeits cast from a bronze alloy containing a significant proportion of tin. First, an LA-ICP-MS analysis was carried out that indicated that this coin is made of a lead-bronze alloy containing about 12% tin, with lead ranging between 12% and 16%.[112] Subsequently, a cross-section of the coin was prepared that confirmed that it was cast, not struck.[113] This cross-section also gave us the opportunity to take a closer look at the elemental composition of the coin, performing SEM-EDX: the alloy is made of about 77% copper, 13% tin and 10% lead (for the precise figures, see the appendix). We compared these values with a selection of analytical results obtained for 128 copper alloy coins imitating denarii and antoniniani almost exclusively of the second and third centuries AD, most of which were published by Christoph Raub and Ulrich Zwicker[114] (see figure 6). Apart from a small group of coins showing very high copper concentrations of c. 95% and more, these pieces normally contain between c. 70% and 85% copper. Tin is the main alloying metal, with concentrations that

111. Mihăilescu-Bîrliba, Mitrea 1977, p. 79.
112. LA-ICP-MS is usually not suitable for analysing lead-bronze alloys: the tiny micro-samplings carried out by the laser may not reveal the average composition of this type of alloy because the lead globules are not always uniformly distributed within these coins, and because the dimensions of some of them are of the same order of magnitude as the volume of the micro-samples taken.
113. The etched cross-section shows a typical as-cast structure and no distortion near the surface (which would indicate production by striking).
114. See Raub, Zwicker 2012, who published results obtained by SEM-EDX on a polished area on the edge of 122 counterfeits coming from Carnuntum (Austria) or bought in the market: Raub, Zwicker 2012, p. 222-224. For our other comparanda, see the appendix.

are mostly between 15% and 25%, only in a few cases below 10%; lead occurs in various percentages up to about 15%; zinc remains most of the time at the trace element level, but can in exceptional cases be found in concentrations up to c. 10%. The composition measured for the C.L. CAESARES counterfeit appears to be consistent with these trends, although its tin content is not on the high side.

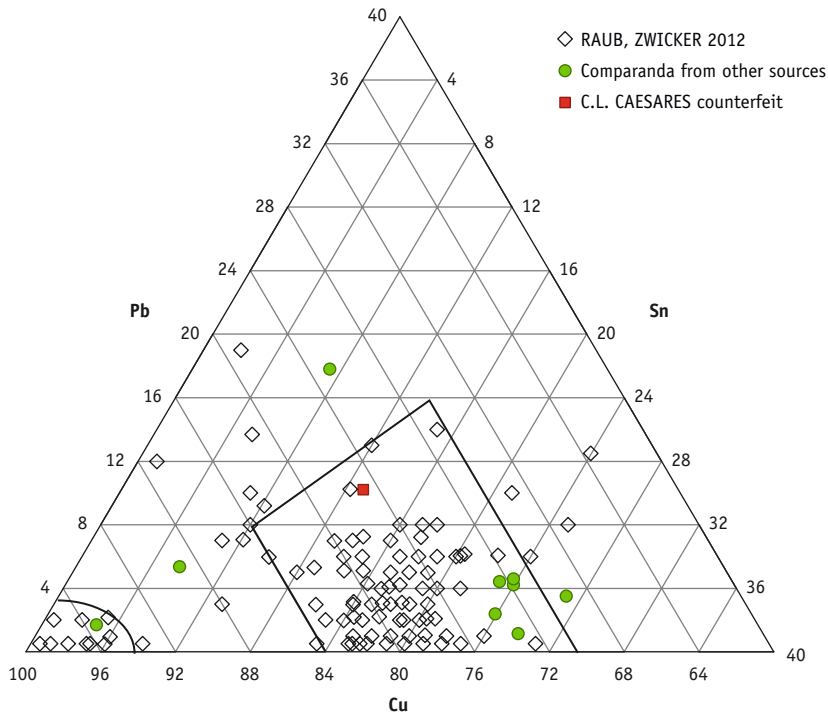

Figure 6 - Ternary diagram showing the copper, tin and lead concentrations in the C.L. CAESARES counterfeit and in other copper alloy coins imitating denarii and antoniniani. For the comparanda from other sources, see the appendix.

The physical properties of tin bronzes change with their tin content.[115] The colour becomes particularly silvery when the amount of tin is well over 20%, in a fully homogenised alloy;[116] also, coins from such an alloy have a high

115. See Picon et alii 1966.

116. Meeks 1993, p. 263. See also Picon et alii 1966, p. 191: "Notons enfin que la couleur jaune-brun de l'alliage s'éclaircit nettement au-delà de 15% d'étain pour devenir presque blanche aux taux supérieurs à 25%".

ringing sound when they are tapped or dropped, very much like silver: for precisely these reasons such imitations were well-suited to deceive ancient coin-users.[117] But also coins from a low-tin bronze (up to about 14% tin) could be deceptive, since this type of alloy is prone to "tin-sweat" (or inverse segregation) during casting.[118] This phenomenon appears as a silver-grey surface coating that is enriched in tin, as compared to the core of the cast bronze. "Lead sweat" may occur simultaneously, when leaded bronze alloys are cast. This is probably why skilled counterfeiters could use bronze alloys with a wide range of tin and lead contents to cast coins effectively imitating silver denarii.

The production process of pieces of this type, which was studied thoroughly by experts of ancient counterfeit coins, has repeatedly been described and illustrated in the recent past, so that there is no need to go into too much detail here.[119] Typically, the counterfeits seem to have been cast from moulds which were mass-produced by pressing genuine denarii into small discs of moist clay, of a diameter of about 2.5 to 3cm. These moulds, which survive in Western Europe in huge numbers, were manufactured by piling up, in a tube, alternately such discs of clay and official denarii. These piles were then removed from the tube, and sprues were cut into the clay. Thereupon the valuable silver coins could be removed, and then the re-assembled piles were fired; finally, counterfeit coins were cast from these moulds. When, after setting, the freshly cast coins – of course still attached to the casting tree – were removed, the moulds were partly destroyed: these were single-use moulds.

The cast C.L. CAESARES coin published here is of considerable interest for our study, for two reasons. firstly, it is fascinating to see that the obverse of this counterfeit is known from four regular silver denarii of our group (die no. III); the reverse die is not attested among the silver coins so far. This means that the fake was cast from a mould produced from a denarius featuring a die combination not attested in our sample; the fake is our only source so far for the reverse die its model was struck from. The die-axis of the fake is 10 o'clock. This ties in very well with the fact that all four silver denarii struck from obv. die no. III have the somewhat eccentric die-axes of 9 or 10 o'clock (see above). As fittingly underlined already by Matthias Pfisterer, the production technique of the moulds, through which both obverse and reverse of an authentic coin were reproduced in the course of a single operation, resulted in the die-axis of the cast copies normally being identical to the axis of the model coins.[120]

117. See Pfisterer 2005, p. 148f., Chameroy 2007, p. 540f. and especially Peter 2011, p. 113-115 (with Abb. 5), who also discusses the problem of identification of the producers of this type of fakes: were they private forgers – or are we faced with "einer organisierten Maßnahme größeren Stils", as Peter 2011 proposes (p. 113)?
118. On this aspect, see Meeks 1993, p. 262.
119. See Pfisterer 2005, p. 146-148; Chameroy 2007, p. 533-536; Schiavone 2012, p. 377-381 (with references to the previous literature).
120. Pfisterer 2005, p. 146.

This means that the original denarii of the die-combination III–13 (so far unattested in our sample) had about the same die-axis as the combinations III–3 and III–4, known from two specimens each.

Secondly, the mere existence of a cast copper-tin-counterfeit of a denarius of our enigmatic group of C. L. CAESARES coins is methodologically not without interest. While producing plated gold and silver coins (with silver, copper or bronze cores) was a very traditional technique, used already by forgers in the Greek world from the Archaic period onwards and attested in the Roman empire from Republican times down to Late Antiquity, the phenomenon of cast coins of this type seems to have been more circumscribed chronologically, by and large. Most of the coins of this type known today are Severan denarii, and it is a well-known fact that most of the clay moulds that have come down to us show impressions of Severan denarius types. Jérémie Chameroy recently provided a useful overview table of the published assemblages of such moulds and added, for each group, the date of the most recent coin impression as well as the overall chronological distribution.[121] Among 128 different assemblages listed by him, only two contain moulds bearing impressions of denarii of the first century AD: of the moulds from Augusta Raurica (Augst, Switzerland) known to Chameroy, two were produced from first century coins,[122] and the ten clay moulds found in Rottenburg (Germany) bear impressions of denarii of Domitian, Trajan and Hadrian.[123] Chameroy concluded that after an early phase of production of cast fakes in the second century AD, attested by just very few assemblages of moulds like the Rottenburg group, the main production phase of cast denarii set in only after the end of the regular denarius production in c. AD 240. In his opinion, which seems well-founded and is shared by other scholars, cast denarii of a copper-tin alloy were produced mainly in AD 240-270.[124] The vast majority of clay moulds typologically reflects the denarius coinage in circulation at that time – and the bulk of the denarii then circulating were Severan, with a few Antonine coins still surviving.

121. Chameroy 2007, p. 542-543 (Tabelle 1).
122. Chameroy 2007, p. 543, no. 47. He refers to moulds of Otho and Titus (for Domitian Caesar), as per Markus Peter (pers. comm.), who also kindly informs me that in the meantime another Flavian mould has been discovered in Augst: Titus for Iulia Titi (inv. 2014.008. G04389.4). Furthermore, a cast Cu / Sn-denarius of Vitellius has been found there (inv. 1986.6400).
123. Chameroy 2007, p. 541 and p. 543, no. 50 bis. The cast denarii with the earliest prototypes in the group analysed by Raub and Zwicker are nos. Z4112 (Domitian) and Z4213 (Trajan); see Raub, Zwicker 2012, p. 222.
124. Chameroy 2007, p. 545. See also Aubin 2003, p. 146 ("force est de reconnaître qu'il n'y a actuellement, et à ma connaissance, pas de preuve incontestable d'utilisation de moules dans la première moitié du IIIe siècle, peut-être même pas avant 260" – with the exception of a few forerunners, we have to add), Peter 2011, p. 115 ("wohl erst um die Mitte des 3. Jahrhunderts n. Chr. zu datieren") and Schiavone 2012, p. 385.

Hence, in this perspective the very existence of a cast fake of a denarius of the enigmatic C.L. CAESARES group in a copper-tin alloy could create the presumption that the model – and consequently the entire group – cannot be Augustan, since Augustan denarii do not seem to be attested among the thousands of impressions on Roman clay moulds used to cast such coins. However, things are not that simple: while no clay moulds with impressions of Republican, Augustan or other Julio-Claudian denarii currently seem to be attested, there are counterfeits of Republican silver coins in a copper-tin alloy. Curiously enough, none of the cited contributions on counterfeiting in the High Principate took into account recent analytical research work on the Lucoli hoard of Republican denarii,[125] which closes with denarii of 124 BC, as per Crawford. Guido Devoto and Patrizia Serafin Petrillo analysed 32 coins and coin fragments of this group with SEM-EDS and found out that they were not made of silver. Devoto and Serafin Petrillo obtained constant values of c. 65-68% copper and between 29 and 32% tin, as well as 1.5-1.7% lead.[126] This composition of the alloy corresponds closely to the alloy used to produce Roman bronze mirrors,[127] and is also not too dissimilar from the metallurgical data variously obtained for cast imperial denarii of the third century AD, as discussed above.[128] Thus, despite Crawford's original interpretation,[129] the Lucoli hoard consists exclusively in counterfeit Republican coins, most of which were cast from a copper-tin alloy. Since the hypothesis of the production of such a group of cast denarii exclusively after Republican models in a much later period – e.g. in the third century AD – would seem extremely far-fetched,[130] the Lucoli hoard should most probably be taken as evidence that the technique of producing cast counterfeits from a copper-tin alloy was known in Italy already in Republican times, at the end of the second or the beginning of the first century BC. This seems to be confirmed by a cast quinarius of the Republican moneyer Q. Titius (*RRC* 341/3: 90 BC) discovered at Augusta Raurica.[131] The piece was analysed with XRF and was found to contain mainly copper and tin, in a proportion very similar to the alloy attested in the Lucoli hoard.[132]

125. Crawford 1969, no. 164.
126. Devoto et alii 1993, p. 21.
127. Devoto et alii 1993, p. 21.
128. See also Devoto et alii 1993, p. 43-45; Chameroy 2007, p. 540.
129. Crawford 1974, p. 572 ("the Lucoli hoard, consisting largely of fragments of silver denarii ready to be melted down and of newly manufactured plated denarii").
130. Even if it cannot be excluded completely, at least in theory: see Devoto et alii 1993, p. 50f.
131. Inv. 1958.11865 (Insula 24/4): Peter 1996, p. 156 (thanks to Markus Peter for directing my attention to this piece).
132. This quinarius contained more than 55% Cu, more than 30% Sn, and less than 1% Ag.

For our purpose, this means that the mere existence of the cast counterfeit C. L. CAESARES denarius *RIC* Augustus 208, made from a copper-tin-lead alloy, does not offer conclusive proof that its model must be post-Augustan: already Republican denarii and quinarii were counterfeited using the very same technique and a similar alloy. Still, the scale of the phenomenon was apparently a very different one in the second and especially in the third century AD, when cast denarii of this kind were produced in enormous quantities, whereas the Republican evidence so far available is tenuous, and the Augustan (as well as the Julio-Claudian in general) seems to be non-existent. Thus, one may conclude by cautiously stating that the occurrence of the cast counterfeit of the rare C. L. CAESARES subtype in a copper-tin alloy is not inconsistent with the post-Neronian date of its model, as established by means of other criteria.

10. The problem of attribution

A. An unsigned Trajanic restoration issue?

The evidence discussed so far makes it clear that *RIC* Augustus 208 is, in fact, not a coin type struck under Augustus, but that it must have been produced during a later period: the type of alloy it was made of was introduced only under Nero; fluttering wreath ties, which are attested on one of the obverse dies, are equally unparalleled before Nero's reign, and the single recorded hoard containing a denarius of this type otherwise starts just with Neronian coins. The fine style of these pseudo-Augustan denarii indicates that they doubtless are regular mint products, and not unofficial imitations, so that we must be dealing with an unsigned restoration issue.

The largest group of restored denarii issued in the Roman Empire by far was struck under Trajan: probably in about AD 112 / 113, no fewer than 50 Republican or Augustan coin types were re-issued by this emperor.[133] The two Augustan denarii restored by him are rare types of the *IIIvir monetalis* Cossus Lentulus, struck in Rome in 12 BC, featuring on their reverses an equestrian statue of Agrippa and Agrippa's portrait:[134] the most common denarius type of Augustus by far, the C. L. CAESARES denarii, are lacking. Perhaps also for this reason, soon after the emergence of the first denarii of our group in the market suspicions were voiced that this group might have been issued under Trajan, too – see the pertinent quotations from auction catalogues above. The metallurgical evidence *a priori* does not exclude such a dating: from AD 100

133. On the dating, see Komnick 2001, p. 137f.; Woytek 2010, p. 168f.
134. Woytek 2010, nos. 848f. Trajan also restored a denarius type struck by Octavian as *IIIvir r.p.c.*: Woytek 2010, no. 845 (copying *RRC* 497/2).

onwards, the "First Neronian Standard" of about 80% fineness was used, under Trajan,[135] and his restored coins apparently conformed to this standard,[136] just as our C.L. CAESARES denarii. However, it can easily be demonstrated that a Trajanic date of our group is unlikely in the extreme, for the following reasons:

1) The die axis. As demonstrated above, the restored C.L. CAESARES denarii were not all struck with a regular die axis; however, there is a strong tendency within the group towards 12 / 1 o'clock (17 of 26 specimens). Trajanic imperial coins, by contrast, were nearly always produced with a die axis of (around) 6 o'clock, and Trajan's signed restored aurei and denarii are no exception to this rule: according to the documentation assembled during the preparation of the monograph on Trajan's imperial coinage by the lead author of this article, the restored coins have an axis between 5 and 8 o'clock, without exception.[137]
2) The weight standard. Denarii of Trajan were issued on the reformed Neronian weight standard of 1 / 96 lb (3.41g theoretical target weight) throughout his reign: for example, the denarii struck in AD 98 as well as in AD 116 / 117 peak in the region 3.30-3.39g, in frequency tables.[138] Most of the Trajanic restored denarii available for study in collections or through publications of the trade are much more worn than ordinary denarii of Trajan: since they are highly sought after, curators and collectors do not hesitate to add badly preserved pieces to their holdings, just to be able to document the type. Consequently, the average weight of 157 restored Trajanic specimens in our files – peaking at 3.05-3.09g in a frequency table – is just 3.10g. Still, the weight range up to 3.30-3.34g is well represented, so that there is probably no need to doubt that these pieces adhered to the same weight standard. However, there is no indication whatsoever that Trajanic restorations were issued on a higher weight standard than the reformed Neronian one – but the enigmatic group of C.L. CAESARES denarii definitely was; the average weight of these coins is 3.52g, as demonstrated above.
3) The size of the issue. Trajanic restored denarii are highly coveted by collectors – and understandably so: many of the 50 types were struck from a single pair of dies, according to the documentation presently available. In 2010, more than ten restored denarius types of Trajan were known from a unique specimen, and for just three of the 50 types more than ten specimens were recorded: Woytek 2010, no. 814 (13 specimens), no. 820 (14 specimens), no. 849 (12 specimens). These proportions have not changed dramatically

135. Woytek et alii 2007; Butcher, Ponting 2014, p. 420-428.
136. Besombes 2008, p. 24 (results of FNAA of four restored denarii in the Paris collection, with a silver content between 78.3 and 82.4% in their alloy); see also Butcher, Ponting 2014, p. 426.
137. Cp. Woytek 2010, p. 509-531.
138. Woytek et alii 2007, p. 155, fig. 3, and p. 157, fig. 7.

in recent years.[139] For the entire group of 50 restored denarius types a maximum original total of just 57 obverse dies used has recently been calculated.[140] The enigmatic restored C. L. CAESARES denarii, a single type for which alone currently no fewer than ten obverse dies are attested, were a considerably larger issue than any of the Trajanic restored denarius types.

4) Trajan did not strike a signed restoration of the C. L. CAESARES denarius, it is true, but it seems to have gone unnoticed that a spectacular restored aureus of Augustus, struck under Trajan, preserves a restitution of the obverse of the C. L. CAESARES type. As is well known, the group of restored imperial aurei of Trajan is remarkable for the eclecticism with which the mint masters sometimes combined designs of different prototypes on obverse and reverse, and for the ingenuity with which they invented coin types, thereby creating restorations of imperial aurei which had never existed. The aureus type issued in honour of Augustus (lifetime issue), with a crocodile on the reverse (plate 7, O),[141] is a good example of this procedure: there are rare aurei of Octavian / Augustus with a crocodile, but they bear the reverse legend AEGVPT CAPTA (plate 7, P), while the restored issue features just Trajan's restitution legend. Also, the crocodile's tail is bent upwards on the Trajanic aurei, while it is invariably bent downwards on the prototype aurei (and the denarii accompanying these).[142] On the obverse, the prototypes feature a bareheaded portrait of the emperor with the legend CAESAR DIVI F COS VII: hence, they were produced before Octavian was awarded the name "Augustus" in January 27 BC. The Trajanic pieces, by contrast, show a laureate portrait encircled by the legend CAESAR AVGVSTVS DIVI F PATER PATRIAE: this is the obverse type we know from the main group of the C. L. CAESARES issue of 2-1 BC. Despite the fact that it was also used on scarce gold and silver issues of Lugdunum dating from the end of Augustus' reign,[143] as well as on various denominations of the ROM ET AVG bronzes from the same city,[144] it seems to be a fair assumption that the Trajanic mint masters took it from the C. L. CAESARES coins.

139. Several of the eight Trajanic restored denarii of one particular type (*RIC* Trajan 777 = Woytek 2010, no. 810) that were sold at auction between 2005 and 2014 are doubtless modern forgeries: see Woytek 2016.
140. Beckmann 2015, p. 315, 320.
141. Woytek 2010, no. 854; Komnick 2001, no. 56.0.
142. *RIC* Augustus 544f. The posture of the crocodile on the restored aurei rather seems to have been copied from the reverses of the famous COL NEM bronzes of Nemausus with the portraits of Augustus and Agrippa on the obverse, see *RIC* Augustus 154ff.: I owe this observation to Patrick Villemur.
143. These aurei and denarii of AD 13-14 feature on their reverses the seated "Livia", the triumph of Tiberius and the latter's portrait (*RIC* Augustus 219-226).
144. *RIC* Augustus 231-234.

Thus, we can compare the single obverse die of these Trajanic restored aurei of Augustus[145] with the obverse dies of the enigmatic group of C.L. CAESARES denarii, in order to check if the contention of some modern commentators is correct, according to which these coins breathe a Trajanic spirit. Actually, the differences between the aureus die and the denarius dies are substantial. Apart from the fact that the aureus die features an Augustus portrait of a subtle, classicistic style which nobody could mistake for any other emperor, especially one typological detail strikes the eye: the two ties of the laurel wreath are depicted falling down the neck, parallel to each other. As mentioned above, this is the least common ribbon variety by far on the Augustan main group of C.L. CAESARES denarii; it never occurs on our enigmatic denarii, which, for the most part, imitate the more common varieties of the prototypes. There is just one specific typological feature of the bust on the aureus die that has a parallel among the denarii *RIC* Augustus 208 – but just on one out of the ten denarius dies hitherto attested: it is the slanting truncation, which may be compared to the truncation on die no. X, also for the shape of the truncation line. Apart from this, the aureus die is most unlike the denarius dies, both typologically and stylistically. Hence the contention that our denarii should be associated with the restored coins of Trajan appears gratuitous, on the basis of this comparison, even if one allows for the fact that aureus dies were engraved with a particular care.

5) Finally, one must not forget that all the denarii and aurei restored by Trajan invariably bear the restitution legend IMP CAES TRAIAN AVG GER DAC P P REST. If the enigmatic group of C.L. CAESARES denarii were of Trajanic origin, it would be hard to explain why they lack the legend.[146] By the way, this point was already correctly noted by a cataloguer of the first Triton sale: "The fact that this coin retains its original legend without any mention of the issuer suggests that it is not part of the great restitution series of Trajan."[147]

B. A pre-Trajanic restoration issue?

Coins with restoration legends were issued in the Roman Empire under Titus, Domitian, Nerva and Trajan, as well as under Marcus Aurelius and Lucius Verus, who restored a single denarius type, viz. Mark Antony's denarius for

145. Four specimens of this type are known, all from the same pair of dies.
146. If the prototypes bore a long legend in the round, there were two concentric legends on the restored coins: see Woytek 2010, nos. 831 and 849.
147. Triton 1, 2 Dec. 1997, p. 232, no. 1283.

the sixth legion (*RRC* 544/19).[148] Hence, one might *a priori* be tempted to assign the unlabelled restored issue we are dealing with to the period preceding the signed restorations, and to postulate that it was the first restored coin issue ever to be produced by the Romans. Since the C. L. CAESARES denarii *RIC* 208 must be Neronian or post-Neronian in date, in view of the silver content of their alloy, such an approach would imply an attribution of the group either to the Neronian period, to the issues of the Civil Wars after Nero's death or to Vespasian's reign.

The first options may be disposed of quickly. There is nothing to suggest that the pieces are Neronian in date, neither typologically nor stylistically, and it would also be very difficult to reconcile such an attribution with the degree of wear of the specimen in the Măgura hoard, as discussed above. An attribution to the period of turmoil after the end of the Julio-Claudian dynasty also seems unlikely in the extreme. The major part of the issues of these years are characterised by a somewhat rough style and coarse fabric, thus contrasting strongly with the neatly struck denarii *RIC* Augustus 208. Traditionally, a coin type imitating the C. L. CAESARES denarii of Augustus has been attributed to the Civil Wars,[149] and Peter Hugo Martin included this type in his monograph on the anonymous issues of AD 68 / 69,[150] albeit with considerable misgivings. Just two specimens (in the Oxford [plate 7, Q] and Paris collections respectively) from the same pair of dies are known: the obverse legend of these denarii is CAISAR AVGVSTVS; the reverse legend follows the prototype, but it is garbled. Martin correctly stated: "Ob die unter Nr. A7 aufgeführte Nachahmung des bekannten Denars mit Gaius und Lucius Caesar [...] tatsächlich aus dieser Zeit stammt, ist angesichts der zahlreichen Barbarisierungen gerade dieses Typs nicht zu entscheiden."[151] In fact, there is a strong probability that this is just another imitation of the C. L. CAESARES coin type that cannot be ascribed to any period with certainty, as Christopher Ehrhardt pointed out.[152] Whether it is of "Danubian" origin, as he surmises, should best be left open. There are no die-links between these coins and other denarii attributed to the Civil War period. The obverse die-link between the Paris specimen, illustrated by Mattingly, and a denarius type with IVPPITER CONSERVATOR also pictured

148. *RIC* Marcus Aurelius 443.

149. Mattingly 1923, p. 301, n. † and *RIC* Civil Wars (AD 68-69), p. 210f., no. 87, attributed to Spain and Gaul (?).

150. Martin 1974, p. 83, no. A7.

151. Martin 1974, p. 35.

152. Ehrhardt 2000, p. 518: "several of those [sc. pseudo-Augustan coins attributed to AD 68 / 69] which are or seem to be of solid silver, are not official Roman products. The most obvious is an imitation of Augustus' type with the 'Gaius et Lucius Caesares' reverse: the coin Mattingly ascribed to A.D. 68 is obviously a 'Danubian' imitation, as juxtaposition with undoubted Danubian products shows".

on the same *BMC* plate[153] is a ghost resulting from a blunder by Mattingly[154] – an erroneous coupling of the IVPPITER reverse with another specimen of the cast of the CAISAR AVGVSTVS obverse, when the plate was mounted.[155]

An attribution of our group to the reign of Vespasian looks marginally more plausible at first sight, especially in view of the reverse type, picturing two *Caesares*. A lot of work has been done recently on the iconographic emphasis placed on Titus and Domitian in the coinage of Vespasian, for example by Emmanuelle Rosso[156] and Gunnar Seelentag.[157] The most important pertinent Flavian coin type in our context is the denarius type *RIC* Vespasian 1344, dated to AD 69 / 70 and assigned to an uncertain western mint by Buttrey and Carradice.[158] The obverse of these rare coins shows a laureate head of Vespasian (legend: IMP CAESAR VESPASIANVS AVGVSTVS), the reverse pictures Titus and Domitian, identified as T DOM CAE (thus the inscription in the exergue) VESPASIANI AVGVSTI FILI (to be read inwards). This inscription clearly echoes the C. L. CAESARES / AVGVSTI F COS DESIG PRINC IVVENT of the Gaius and Lucius type of Augustus, and the reverse of the Flavian denarius as a whole is a close copy of the Julio-Claudian prototype: two *togati* standing to the front, with round shields (the one on the right is in the foreground) and spears between them. The main typological difference between this reverse type and the prototype is that the Flavian princes do not sport priestly instruments: the centre of the reverse is left empty. In this context it should be remembered that the *simpulum* and *lituus* have a somewhat awkward shape on the unsigned restored denarii of our group *RIC* Augustus 208, which led us to consider the possibility that they were added to the dies just as a last-minute extra.

The Flavian denarius type first appeared in print in 1752, when the plates of the imperial section of the *Thesaurus Morellianus*, compiled by Andreas Morell (1646-1703), were published in Amsterdam, with commentaries by various scholars (plate 7, R).[159] Currently, the following five specimens of this type are known to us:

1. Yale University Art Gallery, inv. 2004.52.1 (3.01g; 12h; max. diam. 19mm). Purchased from Matt Kreuzer (plate 7, S).

153. Mattingly 1923, pl. 51, nos. 3 and 8.
154. Mattingly 1923, p. 302, n. §.
155. The IVPPITER CONSERVATOR reverse is, in reality, coupled with a female bust on the obverse: Martin 1974, p. 71, no. 16; Giard 1998, pl. 1, no. 13 (the Paris specimen is unique).
156. Rosso 2009, p. 224-230.
157. Seelentag 2009 and 2010 (for the consequent depiction of both brothers together on coin reverses of the early years of Vespasian's rule, despite their considerable difference in age).
158. See the commentary in *RIC* (Carradice, Buttrey 2007), p. 40.
159. [Morell] 1752, vol. 3, "Nummi argentei Imp. Vespasiani Tab. VII", no. 24; with the commentary by Havercamp in vol. 2, p. 287. The specimen pictured by Morell was in the Schwarzburg collection in Arnstadt; a coin of this type is not, however, present today in the Gotha cabinet, as Uta Wallenstein kindly informs us.

2. Padova, Museo Bottacin, inv. 2209 (2.88g; 12h; max. diam. 16mm). Published by Gnecchi 1903, p. 368f., no. 5: "rinvenuto assieme ad altre monete erose romane, nel fare le fondazioni di un nuovo fabbricato ad uso Liceo, nell'orto dell'ex monastero di S. Stefano in Padova" (p. 369). This is the only specimen of the group with a provenance (plate 7, T).
3. Classical Numismatic Group 72, 14 June 2006, no. 1423 (2.73g; 6h) = Künker 124, 16 March 2007, no. 8949 (2.72g) (plate 7, U).
4. W. Kimber coll., ex H. Sneh coll., ex Gemini 4, 8 January 2008, no. 405 (3.23g) (pictured in *RIC*, pl. 73) (plate 7, V).
5. H. J. Berk 138, 1 June 2004, no. 223 (fragmented; 2.88g; 6h) = H. J. Berk 140, 27 Oct. 2004, no. 280 (2.88g).

It is well known that Vespasian's mint authorities relied heavily on Roman Republican and early imperial numismatic prototypes, in the design of a part of this emperor's coin issues.[160] These denarii show that they were of course familiar with the C. L. CAESARES type, and it is not at all surprising that they chose it as a model for a new issue, since the dynastic constellation under Vespasian was indeed pretty similar to the Augustan period. What may seem odd is the fact that the Flavian denarii reproducing the Augustan coin type were struck in such small numbers – but then perhaps the dire fate of Gaius and Lucius prevented the type from becoming too popular under Vespasian.

On the attribution of the anonymously restored denarius type *RIC* Augustus 208 we are studying the existence of this Vespasianic coin type inspired by the C. L. CAESARES issue does not seem to have a direct bearing. Morphologically and stylistically, the anonymous denarii, some of which are struck on broad flans, with their neatly cut legends and small letters, are in general quite unlike the denarii of Vespasian, often struck on short flans, with large and somewhat clumsily engraved letters.

More specifically, two factors seem to militate against an attribution of the denarii *RIC* Augustus 208 to the rule of Vespasian. Firstly, the observation of the degree of wear of the specimen in the Măgura hoard: as discussed above, the denarii of Vespasian illustrated in the publication of this Severan hoard (on plate XIV) definitely look more worn than the restored C. L. CAESARES denarius. Secondly, the analysis of the denominational structure of the restored issues of the Roman Empire, as laid out in figure 7 below, might speak against an attribution of the pseudo-Augustan denarius issue to the Flavian period.

Under Titus and Domitian restored issues were exclusively struck in bronze: sestertii, dupondii and asses. During the brief reign of Nerva, restored bronze issues featuring the DIVVS AVGVSTVS were joined by three restored denarius types in his honour, all of which are of the utmost rarity: these three

160. See the classic treatment by Buttrey 1972.

Issues	Aurei	Denarii	Aes
Titus			X
Domitian			X
Nerva		X	X
Trajan	X	X	
Marcus Aurelius and Lucius Verus		X	

Figure 7 - Signed restoration coinages of the Roman Empire – denominational structure.

types are known from just five specimens, all of which were struck from just one obverse die.[161] Under Trajan, no more restored bronze was struck, but the production of restored denarii was increased significantly, with 50 types known today. Also, the only group of restored aurei of the Roman Empire was minted under Trajan. After a hiatus of about fifty years, a final signed denarius restoration was struck under Marcus Aurelius and Lucius Verus (AD 161-169): this type is incomparably more common than any single of the Trajanic restored denarius types, with no less than 57 hits coming up when a search for the type at <http://pro.coinarchives.com> is performed,[162] and with many small typological varieties in evidence, particularly on the reverse dies.

It is clear from this overview that the reign of Nerva was the 'hinge', the period of transition from restorations in bronze to those in precious metals, and one may also note that the production volume of single signed restored denarius types steadily increased from Nerva to Trajan and Marcus Aurelius. Hence, from a structural point of view the unsigned restored C.L. CAESARES denarii of our group could fittingly be attributed to the period between Nerva and Marcus Aurelius, and the size of the issue might place it between the issues of Trajan and Marcus Aurelius (assuming a linear development of the quantities of production).

C. A Hadrianic restoration issue

If one were to look for a period, between the reigns of Trajan and Marcus Aurelius, in which the production of a pseudo-Augustan, anonymously restored issue could have made sense from a historical point of view, Hadrian's rule (and particularly its latter half) would certainly be the most natural choice. The denarius type *RIC* Augustus 208 might be interpreted as a numismatic counterpart to historic edifices which Hadrian restored or enlarged without

161. See Komnick 2001, p. 100f. and 231 and Helios 4, 14 October 2009, no. 233 (Komnick type 3.0: 3.29g).
162. Accessed on 12 November 2015.

adding his own name to the new building inscription: he was famous for his modesty in this respect, as the author of the Historia Augusta stresses, citing *inter alia* various Augustan monuments in the city of Rome anonymously restored by Hadrian.[163] Of course the best known example of this policy today is the Pantheon, with the monumental inscription M. AGRIPPA L. F. COS TERTIVM FECIT still in place today (*ILS* 129). In this way, the bewildering absence of a restoration legend on what was doubtless a restored denarius issue, produced many decades after the death of Augustus, may be perceived to provide a surprising, yet in our opinion most compelling argument in favour of a Hadrianic date.

Hadrian's deep admiration of the first *princeps* is well known.[164] An impressive numismatic proof of this is the fact that, at some point of his rule, Hadrian decided to break with the tradition of putting long legends on the imperial coinage, with a full version of the emperor's name, as Nerva and Trajan had done, and opted for the monumental HADRIANVS AVGVSTVS instead.[165] The pronounced mention of the name of the principate's founder in this inscription, which is reminiscent of the legend CAESAR AVGVSTVS on many Augustan issues, must be seen in the context of other typological recollections of the Augustan period on imperial coins of Hadrian, detected already by Strack.[166]

At this point, an extraordinary provincial issue struck under Hadrian has to be mentioned, a series of cistophori produced around AD 130 in an unidentified mint in the province of Asia. They feature the bare head of IMP CAESAR AVGVSTVS on the obverse and a togate full-length figure of Hadrian on the reverse, with the unusual inscription HADRIANVS AVG P P REN. There are two varieties of the reverse type: on the (relatively) more common one, Hadrian holds two corn ears in his right hand, while he is depicted sacrificing with a patera over a tripod on the rarer variety, which became known only in the mid-1990s (plate 7, W, X).[167] The reverse legend of these coins – and, indeed, the meaning of the issue as such – has been explained in different ways over the centuries, depending on how the last word of the inscription was expanded. William Metcalf and the authors of the newly published volume III of *RPC* concur in interpreting this word as *ren(ovavit)* and convincingly take the issue

163. HA Hadrian 19.9f.: *Cum opera ubique infinita fecisset, numquam ipse nisi in Traiani patris templo nomen suum scripsit. Romae instauravit Pantheum, saepta, basilicam Neptuni, sacras aedes plurimas, forum Augusti, lavacrum Agrippae, eaque omnia propriis auctorum nominibus consecravit.* See the commentary by Fündling 2006, vol. 2, p. 888-898 on this passage, who provides a nuanced interpretation.
164. See in general Fündling 1996, vol. 1, p. 445-448, and Birley 1997, p. 201; for the fact that Hadrian honoured Augustus also through his building policy, see Birley 1997, p. 111.
165. See Strack 1933, p. 38.
166. See Strack 1933, p. 13, 105f. and 181.
167. Metcalf 1980, p. 86f., no. 92 (Hadrian holding corn ears); *RPC* nos. 1441-1442.

to refer to Hadrian's massive recoinage of late Republican and Augustan cistophori in Asia, through which he "renewed" the silver currency of the region. The obverse portrait and the legend (which is copied from the obverse and reverse of an important group of Augustan cistophori) were probably intended to ensure that the image and name of Augustus, which had disappeared from hundreds of thousands of coins through restriking, remained in circulation at least on some cistophori.[168] Hence, these cistophori may perhaps in some way be regarded as a provincial restoration issue, although they do not directly copy both sides of a given prototype and avoid the element REST in the legend, replacing it by REN.

Coins aside, there are several other testimonies of Hadrian's veneration of Augustus, and of his deliberate imitation of the first *princeps*. For example, in AD 120, the emperor sealed a letter to the *fratres arvales* with a signet bearing the portrait of Augustus.[169] According to Suetonius, Hadrian kept a bronze statuette (or bust) of Augustus, a gift by Suetonius, in the *lararium* of his bedchamber.[170] Hadrian accepted the honorific *pater patriae* relatively late – only in AD 128[171] –, with the precedent of Augustus in mind: *Patris patriae nomen delatum sibi statim et iterum postea distulit, quod hoc nomen Augustus sero meruisset* (HA Hadr. 6.4). Also, a fragment of one of Hadrian's speeches is preserved, in which the emperor asked the Roman senators to set up, next to a statue of Augustus, a silver shield in Hadrian's honour; since he specifically added "as for Augustus", the award requested by Hadrian is to be connected with the *clupeus aureus in curia Iulia positus*, with which the Senate and the Roman people had famously honoured Augustus in view of his *virtus, clementia, iustitia* and *pietas* (RgdA 34.2): *Valdissime divus Hadrianus orationum XII, 'a vobis P. C. peto et inpetratum valdissime cupio ut proxime imaginem Augusti argenteum potius clupeum sicut Augusto ponatis'.*[172]

168. For this interpretation of the coins (and a refutation of previous explanations), see Metcalf 1980, p. 89f., and Amandry, Burnett 2015, p. 176 and 848. Mlasowsky 2011 proposes to expand the last word of the legend as *ren(ovator)* and to interpret the coin type as celebrating Hadrian as the new κτίστης of Ephesus, but fails to adequately explain the most unusual feature of the series – the name and portrait of Augustus on the obverse.
169. Smallwood 1966, p. 24, no. 7, lines 24f. (from the Acta Fratrum Arvalium, 7 February 120: *tabulae apertae signo signatae quod exprimit [ca]put Aug., in quibus scriptum fuit...*).
170. Suet. Aug. 7.1: *nactus puerilem imagunculam eius aeream veterem ferreis et paene iam exolescentibus litteris hoc nomine* (sc. Thurino) *inscriptam, quae dono a me principi data inter cubiculi Lares colitur.* On this passage, see Carter 1982, p. 95, who explains that the image "was almost certainly a learned fake made much later, probably after the emperor's death", but "convincing enough to fool Hadrian – it is not surprising that it appealed to his recondite and antiquarian tastes".
171. Kienast 1996, p. 129.
172. Charisius, in *Grammatici Latini*, vol. 1, p. 222 Keil (Leipzig 1857). This passage is misunderstood by Birley 1997, p. 201. Note that Hadrian respected the hierarchy, asking for a silver shield, while Augustus had been awarded a golden one.

Hadrian did not have a biological son; his first heir, L. Aelius Caesar, whom he had adopted in AD 136, died on 1 January 138. However, an alternative was at hand. Since Hadrian was very ill already at that point, he opted for a more promising solution that time, viz. for a two-step strategy. On 25 February 138, Hadrian adopted the future emperor Antoninus Pius, on condition that his successor designate adopted both M. Annius Verus (the future emperor Marcus Aurelius) and the son of L. Aelius Caesar, L. Ceionius Commodus (the future emperor Lucius Verus).[173] Of course it has not gone unnoticed in scholarship that Hadrian seems to have modelled the elaborate arrangements for his succession on an Augustan precedent: "The 'two tier' adoption of 138 is, indeed, reminiscent of Augustus' plans",[174] who, on 26 June of AD 4, around four months after the death of Gaius Caesar, adopted both his grandson Agrippa Postumus and his son-in-law Tiberius, who himself had to adopt Germanicus as joint second-stage heir with his own son Drusus.[175] A state ceremony involving Hadrian, his new Caesar (and son) Antoninus Pius and the future emperors Marcus Aurelius and Lucius Verus is shown on the slab of the so-called "adoption scene" of the Parthian Monument from Ephesus, kept in Vienna.[176] This relief is the only depiction of the ceremony that has come down to us: while there are two medallion types with the portraits of Hadrian and Aelius Caesar respectively, commemorating the latter's adoption in AD 136 through a scene on their reverses,[177] no similar coin or medallion types were issued for the adoption (or *adrogatio*) of Antoninus Pius.[178]

Taken all together, an attribution of the enigmatic, anonymously restored C. L. CAESARES denarius issue to Hadrian's rule makes sense from the historical point of view; especially the 'two tier' adoption of 138 could have provided an occasion for the issue. The 'restored' Augustan cistophori produced under Hadrian in Asia may constitute an important numismatic parallel. As on our

173. On this adoption, see Rohden 1894, col. 516 with references to the literary sources, especially HA Hadrian 24.1 (*Hadrianus [...] adoptavit Arrium Antoninum, qui postea Pius dictus est, et ea <qui>dem lege, ut ille sibi duos adoptaret, Annium Verum et Marcum Antoninum*) and 26.6; HA Pius 4.5f. (5: *adoptionis lex huiusmodi data est, ut quemadmodum Antoninus ab Hadriano adoptabatur, ita sibi ille adoptaret M. Antoninum, fratris uxoris suae filium, et L. Verum, Aelii Veri, qui ab Hadriano adoptatus fuerat, filium, qui postea Verus Antoninus est dictus.*). See also Birley 1997, p. 294f.

174. Birley 1997, p. 296.

175. On the arrangements for the succession of Augustus, see Kienast 1999, p. 138f.; on the adoption of Germanicus, which Tiberius was forced to carry out, see Suet. Tib. 15.2 and Cal. 1; Tac. ann. 1.3 and 4.57; Cass. Dio 55.13.2.

176. See Oberleitner 2009, vol. 1, p. 215-222, and vol. 2, p. 40-43; Landskron 2006, p. 162-166; Oberleitner 2006, p. 17-23, and Taeuber 2006, p. 25f.

177. Mittag 2012, nos. Hadr 101 and Hadr 130 (reverse legend: CONCORDIA), p. 101f., 174 and 184: Hadrian and Aelius (both togate) clasping hands, behind them the personification of Concordia.

178. For the types issued for the Caesars under Hadrian in general, see Strack 1933, p. 166-174.

denarii, the quality of the portraits on the restored cistophori varies greatly, with – as in our case – only very few dies featuring an accomplished portrait of Augustus.[179] On most others, the influence of contemporary imperial portraiture is obvious, and while it is true that on many of the cistophorus obverses depicting 'Augustus' the facial features of Hadrian are unmistakable, the impossibility to pin down exactly an influence of Hadrian's portrait on the Augustus portraits of the C.L. CAESARES denarii *RIC* Augustus 208 by no means excludes the chronological attribution proposed here: it seems reasonable to surmise that the denarii were struck at the mint of Rome, whose engravers were probably more versatile stylistically (and more capable of disguising the features of their current master) than the die-sinkers at a workshop in the province of Asia.

Of course, the weight standard of our coins at first sight seems to speak against a second century date. As pointed out above, a frequency table of *RIC* Augustus 208 shows a peak in the region between 3.70g and 3.74g: while no recent in-depth metrological studies of denarii of Hadrian are available, the data we have indicate that this emperor's silver coins were normally struck on the Neronian standard, with a theoretical denarius weight of just c. 3.41g, like the denarii of his predecessor Trajan.[180] We propose to interpret the unexpectedly high weight of *RIC* Augustus 208 as a result of the mint's attempt to imitate not only the types and legends, but also the higher weight standard of the coins they restored. This is against the practice observed, e.g., by the authorities responsible for the Trajanic restitution issues (produced on the weight standards then current), but in accordance with the fact that our C.L. CAESARES denarii do not bear a legend which made the restitution explicit: they apparently were produced to resemble the prototypes not only regarding their design, but also weight-wise.

A Hadrianic date of the C.L. CAESARES denarii is in accordance not only with the degree of wear of the specimen in the Măgura hoard, but also with an important technical detail of these denarii, viz. their die-axis. As described above, the restored C.L. CAESARES denarii show a strong tendency towards a die-axis of 12/1 o'clock, but there are also coins with an axis of 6 o'clock; apart from that, a small group shows an irregular axis of 8-10 o'clock. From Vespasian to Trajan, the die-axis of coins from the mint of Rome was almost invariably fixed at 6 o'clock or around 6 o'clock (c. 5-7 / 8 o'clock). Exceptions to this rule are few and far between.[181] The 6 o'clock die-axis was strictly observed also in the reign of Hadrian, but only up to a certain point in time, from which onward

179. For example the obverse die used to strike the coin depicted by METCALF 1980, pl. 24, no. 350.
180. See DUNCAN-JONES 1994, p. 222f. and 225-227; cp. also BUTCHER, PONTING 2012, p. 70-72 (just on the fineness).
181. They include one group of AD 73 with a die-axis of (mostly) 12 o'clock: *RIC* Vespasian 542-561. For an alleged sub-group of this group, see METCALF 2015 (to be used with caution).

both the 6 o'clock and the 12 o'clock die-positions were in use side by side in all the metals (gold, silver and *aes*). Strack dated the parallel use of the 6 o'clock and 12 o'clock axes to the period AD 134-138,[182] while Mattingly preferred AD 132 as the starting date for the parallel use of the two axes;[183] recent work on Hadrian's coinage suggests that the 12 o'clock die axis trend set in earlier still, around AD 130.[184] If the die-axis of our anonymous restorations of the C. L. CAESARES denarii reflects current practice of the Roman mint, they cannot have been minted before a date late in Hadrian's reign, in the 130s.[185] Hence, these technical data seem to confirm the dating advocated above on historical grounds.

11. Comparative metallurgical analyses

In conclusion, the proposed Hadrianic attribution of the restored C. L. CAESARES coins must be examined on the basis of the results of the metallurgical analyses conducted on six specimens of the group. The relatively large body of recent analytical data on Roman imperial silver coinage today available[186] gives us the opportunity to compare our new data with it.

In the first instance, the comparison concerns the two trace elements most strongly associated with the silver, for which data are available across the various batches of different analyses, viz. gold and bismuth. Figure 8 exhibits the concentrations of these two elements scaled to silver, for our six specimens of the C. L. CAESARES coins and for 657 denarii minted from AD 64 onward to the reign of Nerva (AD 96-98). Most of the silver coins struck between the years 64 and 98 have Au / Ag ratios ranging from 0.2% to 1.0% and Bi / Ag ratios of less than 0.1%, while the six restored denarii contain less gold (Au / Ag between 0.04% and 0.17%) and generally more bismuth (Bi / Ag between 0.05%

182. Strack 1933, p. 21, 31 and 38.
183. Mattingly 1936, p. cxvii and cxxiii.
184. The occurrence of this axis then gradually decreased towards the end of his reign. Thanks for information on this topic are due to Richard Abdy (pers. comm.). See Étienne, Rachet 1984, p. 355f.; the 12 o'clock axis also occurs under Antoninus Pius.
185. It is important to note that, according to the documentation kindly made available by Richard Abdy, the die-axis of 10 o'clock is attested among the Hadrianic coins with a non-6 o'clock die-axis. In the silver coinage, this axis is attested for the denarius type *RIC* Hadrian 209 (rev. FELICITATI AVG / COS III PP, galley), for example (on the Paris specimen).
186. The data were obtained by different teams of researchers with different analytical methods – that are, however, cautiously assumed to provide comparable results. AAS: Butcher, Ponting 1998; ICP-AES or ICP-MS: Butcher, Ponting 2011; 2012; 2014 data are available for download on the website of the Archaeology Data Service <http://archaeologydataservice.ac.uk/archives/view/coins_lt_2005/> (comparison between AAS and ICP for main elements: Butcher, Ponting 2014, p. 126); µ-XRF or µ-SRXRF on cross-sections of denarii: Woytek et alii 2007 and Rodrigues et alii 2011; FNAA (and not LA-ICP-MS as erroneously stated in the publication): Besombes 2008, p. 28.

and 0.23%). It is, consequently, highly unlikely that the restored denarii were struck during the period from AD 64 to 98, and we need to compare them with the silver issues of Trajan, Hadrian and Antoninus Pius instead.

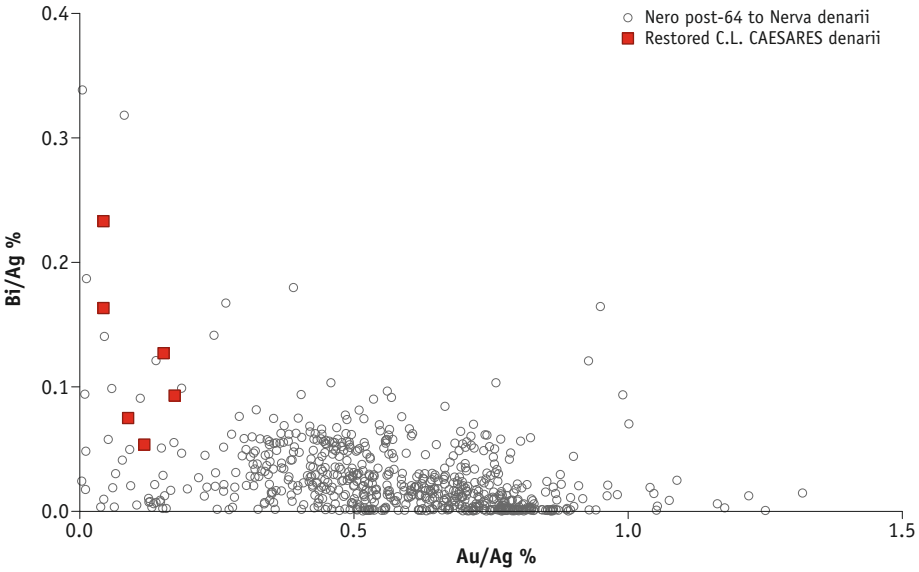

Figure 8 - Scatterplot of gold and bismuth scaled to silver for the restored C. L. CAESARES denarii and for denarii minted between AD 64 and 98 (all available mints).[187]

The evolution of the gold and bismuth contents in the imperial silver issues minted under these emperors can be summarised as follows. During the reign of Trajan, there appears to have been a shift in the overall composition of the alloy used to produce denarii (figure 9). His coins dating to the second consulate (AD 98-99) have a gold and bismuth pattern[188] resembling that of the period spanning from Nero's reform to Nerva, whereas the coins struck during his fifth consulate (AD 103-111) contain significantly less gold.[189] The denarii of Hadrian as a whole form a better defined group, characterised by low gold

187. Data: Butcher, Ponting 2014.
188. See also figures 5 and 6 in Rodrigues et alii 2011, p. 988.
189. Already noticed by Rodrigues et alii with their data (Rodrigues et alii 2011, p. 987f.). The corresponding values for bismuth were discarded from our comparison because they appear to be abnormally low, as may be seen from the following averages calculated for the Bi / Ag ratios in two groups of more than 20 COS V denarii of Trajan: 0.055 (μ-SRXRF data from Rodrigues et alii 2011) against 0.16 (AAS data from Butcher, Ponting 1998).

(Au / Ag < 0.25%) and low bismuth (Bi / Ag < 0.25%).[190] The denarii of Antoninus Pius are different: their alloy is characterised by increases both in the gold and in the bismuth contents.[191] The data visualised in figure 9 leave no doubt: the COS V denarii of Trajan (AD 103-111) as well as the denarii of Hadrian are the issues the trace metal profile of which shows the best consistency with the anonymously restored C. L. CAESARES denarii.

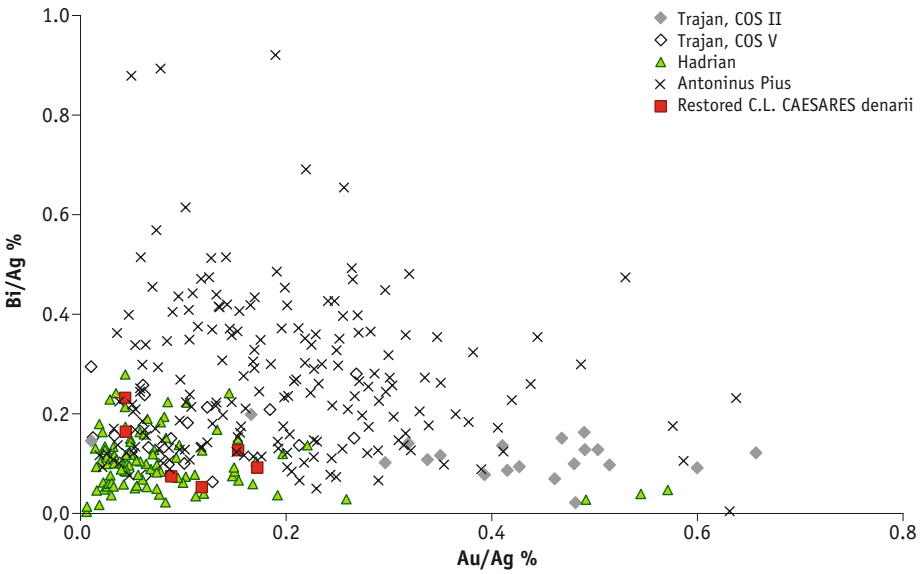

Figure 9 - Scatterplot of gold and bismuth scaled to silver for the restored C. L. CAESARES denarii and for denarii minted by Trajan, Hadrian and Antoninus Pius (Rome mint).[192]

A closer look at the lead and gold contents of the silver coins proves valuable, too, especially when the data on which Rodrigues et alii 2011 commented (covering also Trajan's COS VI period) are added to the comparison.[193] Denarii with a concentration of both these elements in an order of magnitude similar to the restored C. L. CAESARES denarii can sometimes be found as early as Trajan's second consulate, become more numerous over time and may be seen to be the norm for his fifth and sixth consulates, as well as under Trajan's successor Hadrian (figure 10). Hence, the analysis of the lead and gold contents

190. Butcher, Ponting 2012, p. 77.
191. Butcher, Ponting 2012, p. 79.
192. Data for Trajan from Butcher, Ponting 1998; data for Hadrian and Antoninus Pius kindly shared with us by Matthew Ponting.
193. Data unpublished so far; B. Woytek files.

confirms that the anonymously restored C.L. CAESARES issue should have been struck in the late Trajanic period (COS V-COS VI) or under Hadrian. It would doubtless be useful to continue the comparison of the trace element contents also for the elements assumed to have originated in the copper.[194] However, there are unfortunately no reliable pertinent data for the Trajanic coinage, and the comparison with coins minted by Hadrian alone yields no relevant results.

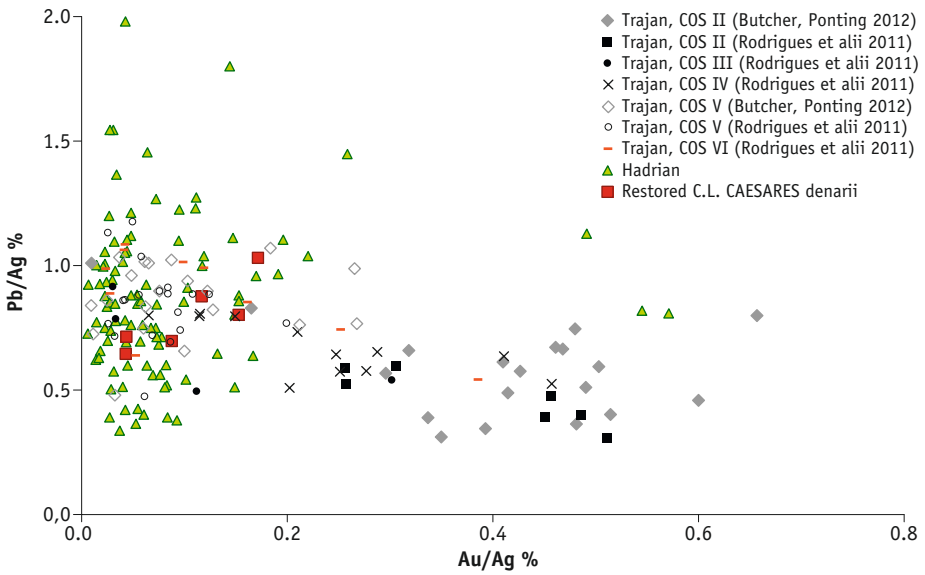

Figure 10 - Scatterplot of gold and lead scaled to silver for the restored C.L. CAESARES denarii and for denarii minted by Trajan and Hadrian (Rome mint).

The last step in our comparison concerns the fineness of the coins. Previous studies have established that there was a switch in the silver alloy used for denarii under Trajan in AD 100, from about 90% fine to 80% (the "First Neronian Standard"),[195] and that the silver standard used by Hadrian fluctuated roughly between 80% and above 70%.[196] As outlined above, the restored C.L. CAESARES coins seem to have been struck more or less on the 80% standard. Thus, a global "reign-by-reign" comparison of the fineness appears to be of little use in determining whether the C.L. CAESARES coins are Trajanic or Hadrianic in date.

194. Such as arsenic (As), nickel (Ni), antimony (Sb), tin (Sn) and zinc (Zn): see figure 4 for all the elements determined for the C.L. CAESARES denarii *RIC* Augustus 208.
195. Woytek et alii 2007; Besombes 2008; cp. for the pre-reform period also Butcher, Ponting 2014, p. 418f.
196. Butcher, Ponting 2012, p. 70f.

However, it is very rewarding to take a closer look at the fineness during specific periods of the denarius production of Trajan and Hadrian. Especially under Hadrian, significant differences are apparent. On the basis of the data assembled in figure 11, it becomes clear that the restored C. L. CAESARES denarii best match the fineness of denarii minted under Trajan, after the emperor had entered upon his fourth consulate (AD 101-117), and the fineness of one class of Hadrian's denarii struck at the very end of his reign, around AD 134 / 135 to 138.[197] It is most probably in the latter time frame that their production is to be placed.

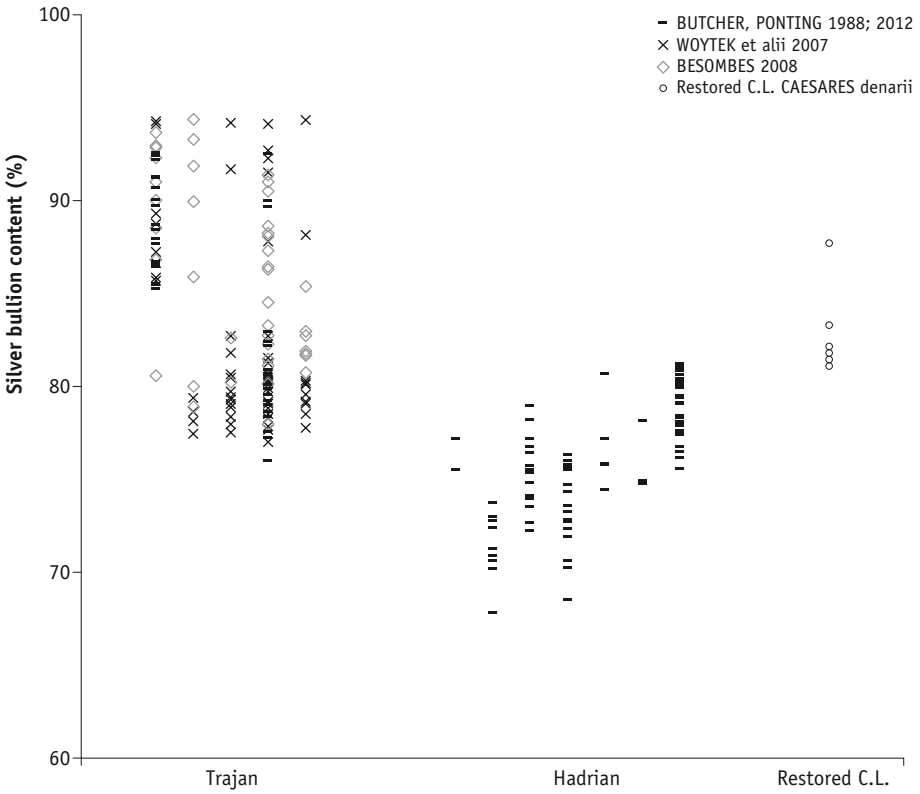

Figure 11 - Silver bullion content measured for the restored C. L. CAESARES denarii, compared with published data for denarii of Trajan (cos II, III, IIII, V, VI) and Hadrian (AD 117, AD 118 and Classes A, B, E, C, D).[198]

197. Dating of Mattingly's "Class D" of denarii of Hadrian; quoted from Butcher, Ponting 2012, p. 72.
198. Data for Trajan sourced from Butcher, Ponting 1998; Woytek et alii 2007; Besombes 2008; data for Hadrian kindly shared with us by Matthew Ponting; classification of Hadrian's issues as in Butcher, Ponting 2012.

APPENDIX

Selected elemental analyses of ancient counterfeits of denarii and antoniniani made of copper alloys, arranged by increasing tin content. The FNAA and LA-ICP-MS analyses were performed at the IRAMAT – Centre Ernest-Babelon.

Prototype	Archaeological site	Analytical method	Cu	Sn	Pb	Zn	Ag	Reference
Denarius of Trajan	Lyon (France)	FNAA	95.0	2.9	1.7	<0.03	0.06	Cécillon et alii 2011
Unidentified denarius	Avenches (Switzerland)	FNAA	88.8	5.5	5.4		<0.01	Frey-Kupper 1999, p. 83
Antoninianus of Gordianus III	Avenches (Switzerland)	FNAA	74.4	7.3	17.7		0.05	Frey-Kupper 1999, p. 83
Denarius of Septimius Severus	?	LA-ICP-MS	65.7	21.9	4.1	7.8		Unpublished analysis[199]
Denarius of Septimius Severus	Châteaubleau (France)	FNAA	72.0	23.0	4.4	0.8		Pilon 2004, p. 241
Antoninianus of Gordianus III	Châteaubleau (France)	FNAA	72.0	24.0	4.3	0.1		Pilon 2004, p. 241
Antoninianus of Philippus I	Châteaubleau (France)	FNAA	74.0	24.0	2.4	0.1		Pilon 2004, p. 241
Denarius of Trajan	?	LA-ICP-MS	73.0	25.7	1.2			Unpublished analysis[200]
Denarius of Septimius Severus	Châteaubleau (France)	FNAA	69.0	27.0	3.5	0.4		Pilon 2004, p. 241
Denarius CL CAESARES RIC *Augustus 208*	*?*	*SEM-EDX*	*76.8*	*12.9*	*10.2*			(this study)

199. This coin (no. 0.33871) was loaned for analysis by the RGZM (Mainz), in the framework of a joint Master training of Guillaume Blanchet in Mainz and Orléans; it was also analysed in Germany by this student with XRF on a polished area: Cu 59.8%; Sn 34.6%; Pb 1.3%; Zn 3.6%; Ag 0.2%. It should be noted that the silver content detected in the XRF analysis probably results from a silvering, as to be seen from SEM-EDX analysis. We would like to thank G. Blanchet for allowing us to quote his work.

200. A cross-section of this coin had previously been analysed using XRF (see Uhlir et alii 2007, no. 70, p. 89 and 98): Cu 70.8%; Sn 28.7%. A further analysis using LA-ICP-MS was undertaken in order to establish the lead concentration in the alloy.

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Illustrations

The dies are reproduced in 200%.

Obverse dies

I: cat. no. 1 II: cat. no. 5 III: cat. no. 9 IV: cat. no. 13
V: cat. no. 15 VI: cat. no. 18 VII: cat. no. 23 VIII: cat. no. 24
IX: cat. no. 25 X: cat. no. 26

Reverse dies

1: cat. no. 5 2: cat. no. 7 3: cat. no. 9 4: cat. no. 12
5: cat. no. 15 6: cat. no. 16 7: cat. no. 18 8: cat. no. 20
9: cat. no. 23 10: cat. no. 24 11: cat. no. 25 12: cat. no. 26
13: cat. no. 27

Comparanda

A Augustus, aureus, *RIC* 206: NAC 78, 26 May 2014, no. 810 (7.83g)
B Augustus, denarius, *RIC* 207: Rauch 94, 9 April 2014, no. 734 (3.80g)
C Augustus, denarius, *RIC* 207: M. Hervera – Soler & Llach 1084, 18 December 2014, no. 126 (3.85g)
D Augustus, denarius, *RIC* 207: Rauch 95, 30 September 2014, no. 338 (3.81g)
E Augustus, aureus, *RIC* 207: Helios 3, 29 April 2009, no. 81 (7.90g)
F Augustus, aureus, *RIC* 207: Giessener Münzhandlung 191, 11 October 2010, no. 2022 (7.77g)
G Augustus, denarius, *RIC* 210: CNG 75, 23 May 2007, no. 971 (3.68g)
H Augustus, denarius, *RIC* 210: Lanz 147, 2 November 2009, no. 240 (3.73g)
I Augustus, denarius, *RIC* 207: Klassische Münzen Dr. Michael Brandt (Tübingen), stock no. 150108 (3.72g; 20mm)
J Augustus, denarius, *RIC* 207: Roma Numismatics Ltd. E-Sale 21, 31 October 2015, no. 683 (3.82g)
K Augustus, denarius, *RIC* 212: Roma Numismatics Ltd. E-Sale 22, 28 November 2015, no. 480 (3.75g)
L Augustus, denarius, *RIC* 211: Stacks, 9 January 2015, no. 3116 (3.76g)
M Nero, sestertius, *RIC* 356: London, British Museum, reg. no. R.9919; *BMC* Nero 116 (23.21g; 6h)
N Cassius and Lentulus Spinther, denarius, *RRC* 500/1: CNG Electronic Auction 352, 3 June 2015, no. 396 (3.83g)
O Trajan, restored aureus (Augustus), *MIR* 854: Paris, BnF; Besombes 2008, no. 477
P Octavian, aureus, *RIC* 544: NAC 59, 4 April 2011, no. 870 (8.15g)
Q Denarius imitating the C.L. CAESARES issue of Augustus; Martin 1974, p. 83, no. A7: Oxford, Ashmolean Museum (3.61g; 5h)
R [Morell] 1752, vol. 3, "Nummi argentei Imp. Vespasiani Tab. VII, no. 24
S Vespasian, denarius, *RIC* 1344: Yale University Art Gallery, inv. 2004.52.1
T Vespasian, denarius, *RIC* 1344: Padova, Museo Bottacin, inv. 2209
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Plate 1


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Plate 2

Plate 3 - Obverse dies I-VIII (× 2).

Plate 4 - Obverse dies IX-X and reverse dies 1-6 (× 2).

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Plate 5 - Reverse dies 7-13 (× 2).

Plate 6 - Comparanda.

Plate 7 - Comparanda.