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## “Cutting bronze” in Italy during the 4th-3rd centuries BC: from the word to realia

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# ÉTUDES CELTIQUES



CNRS EDITIONS

DOSSIER

Du métal pesé à la monnaie antique,  
entre mondes celtique, ibérique et italique

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# “CUTTING BRONZE” IN ITALY DURING THE 4TH-3RD CENTURIES BC: FROM THE WORD TO REALIA

BY

Nicole GUILLEUX  
& Pierre-Marie GUIHARD

This paper results from the collaboration of two scholars both belonging to the same CNRS research group, the CRAHAM, but involved the first – Nicole Guilleux – in linguistics and the second – Pierre-Marie Guihard – in numismatics. At the starting point of this study is an interrogation concerning an odd item on display in Rome at the National Museum located in the Baths of Diocletian. Among various samples of bronze ingots, a bronze artefact can be noticed looking like a big “chocolate bar” in shape; it is left uncommented in the showcase. It reminded the linguist of the etymology of the Latin verb *aestimāre* as originated in the phrase *\*aes temnere* “cut bronze”. Concerning the repository this “bar” belongs to, Gneccchi in a paper published in 1893<sup>1</sup> points out that “i pezzi di bronzo costituenti il ripostiglio rappresentano diversi degli stadi per cui il metallo passava successivamente”, and the ingot displayed in Rome is a bar intended for being cut into pieces that would become coins. Even though the repository is dated to the 3rd c. AD<sup>2</sup> and is linked with a workshop for coin-making, this study led us to a concerted research. We are thus presenting the results hereafter: first, a reappraisal of the etymological data concerning *aestimāre*; then, an analysis focused on the archaeological documentation in order to establish whether the realia confirm the etymology of the verb.<sup>3</sup>

## 1. “Cutting bronze” as etymology of *aestimāre* is well-founded but ill-circulated

### 1.1. *Aestimāre* (archaic *aestumāre*) and its lexical cognates

*Aestimāre* and its cognates originally belong to the technical and economical lexicon. It is why they are not expected to appear with their original meaning neither in

1. GNECCHI, 1893, p. 275. We owe this reference to the kindness of Professor Michele Asolati.

2. All dates are BC unless stated otherwise as here.

3. Nicole Guilleux wrote the first part of this paper, and Pierre-Marie Guihard the second. It is a great pleasure for us to express our thanks to Diane Rego for improving our English.

archaic epic poetry nor in tragedy. And it turns out they are not attested in archaic inscriptions either. The compound *ex-īstimāre* (that appears before *aestimāre* in Latin texts) is used as an economical term in Plautus' comedies (3rd-2nd c.), mainly in "The Prisoners" (*Captivi*), a play concerning slavery and prisoners of war, hence buying, selling and ransoming persons.

Afterwards, the meaning of the verbs *aestimāre* and *ex-īstimāre* evolved. First is the meaning "determine, estimate the extrinsic value of a thing": Plautus provides examples of *ex-īstimāre*, and Classical authors examples of *aestimāre*; the phrase *litem alicui aestimāre* (Ascon. ad Verr. I.13.38) "estimate the damages (a person will pay)" appears in the context of a lawsuit. Second, the notion of value is extended to other material situations or to individuals to which or to whom people "pay attention"; and finally the reference to value is forgotten when the verb means "judge, think" (Varr., Tac. Sen...).

Both the concrete and the figurative meanings can coexist in Latin as well as in other languages, but the concrete meaning, if attested, gradually disappears. In Latin, there are several similar cases of this kind of semantic change from a concrete action to a mental process: in the same lexical area as *aestimāre*, *arbitrāri* "witness", becomes "examine, consider"; *censēre* "tax, estimate" (as a *ensor*) turns into "judge, advise, believe"; and *putāre* "clean, trim, prune..." to "reckon, judge, think...". It is even a more general trend as shown, for example, by *delirāre* "deviate from the furrow" hence "be crazy" or by the collocation *sermonem serere* "have a conversation" (namely "plait a series of plaited words").<sup>4</sup>

Besides, *aestimāre* originates few words, essentially nominal derivatives that are mainly action and agent nouns; their meaning is closely linked to the verb: *aestimātio* "estimating of a thing according to its extrinsic value, appraisalment" (Cic. +); "valuation" of a danger, of circumstance (Liv., Tac.); *aestimātia* (Digest.), *aestimium* (Hyg. Grom.) "appraisalment"; *aestimātor* "valuer, appraiser" (Cic.), *aestimātorius* "regarding a taxer" (Digest.).<sup>5</sup>

## 1.2. Pinpointing the etymology of *aestimāre*

*Aestimāre* is formed as most of the *-āre* Latin verbs: as well as *causāri* "plead, debate..." or *liberāre* "free, release from slavery", which are respectively derived from *causa* "cause, reason..." or *liber* "free", *aestimāre* must be derived from a nominal stem. Here we are dealing with a nominal compound *\*ais-tómos* "bronze cutter", probably belonging to archaic Latin. Although this process is rare, it is exemplified at least by

4. BRACHET, 2009, 2013; GUILLEUX, 2017.

5. From the unique prefixed verb derived from *aestimāre*, *ex-īstimāre* (< *\*ex-aestimāre*), are derived *ex-īstimātio* "judgment, opinion" (Cic. +), "reputation..." (Cic., Caes., Suet., Digest.), and *ex-īstimātor* "judge, critic" (Cic.).



*aucupārī*.<sup>6</sup> The first part of *\*ais-tómos* is the name of bronze, *\*ais*-<sup>7</sup> (see the archaic ablative AIRID – CIL I, 38 –, AIRED – CIL I, 3151), and the second *\*-tóm(o)-* “who cuts” is related to the *\*tem-/tom-* i.e. root “cut”, hence Greek τέμνω “cut”, τομός “cutting, sharp”, ἄτομος “uncut, indivisible”, Middle Irish *tamnaid* “cuts down, beheads”...<sup>8</sup>

The hypothesis of *aestimāre* as based on *\*ais-tómos* is not only sound from a morphological point of view; it is also a solid suggestion regarding semantics. Such a nominal compound is a well-formed agent noun according to the standard of comparative grammar: it corresponds to a widely attested model in the Indo-European languages, such as English *bookseller*, German *Briefträger* “postman” or Ancient Greek ὑλοτόμος [hulotómos] “woodcutter”, not to mention examples from Sanskrit or Avestan that warrant such compounds are archaic and productive creations. Consequently, *\*aistómos* means “*is qui aes temnit (= secat)*”, namely “one who cuts bronze” and as a compound, it refers to a person having technical skills and function. Moreover, *\*aistómos* can be compared to the agent noun *libripens* that originally means “*is qui libram pendit*” that is “one who causes the scale(s) to hang down”.

### 1.3. The etymology of *aestimāre* as “cutting up bronze” gradually developed but it is still ill-circulated

Some unsustainable etymologies have been proposed.<sup>9</sup> In 1889, Havet made the first reliable suggestion.<sup>10</sup> Establishing an irrefutable etymology for *aestimāre* was however a very long process. Noticing that *aestimāre* is an *a*-stemmed verb, Havet considers it based on the agent noun *\*ais-tema-s* “coupe-bronze”, which is a well-founded hypothesis from the morphological point of view, but which is practically wrong since such a type of compound does not correspond to the standards of nominal composition. Meillet 1959 (DELL, s.v. *temno*, p. 680) rejects Havet’s suggestion arguing contradictorily the *\*tem-/tom-* root is not attested in Latin. Hamp<sup>11</sup> resumes Havet’s proposal by revising it: the first member should rather be *\*a(i)es-* and the second member *\*-tómos*, a better form of *\*tem-/tom-* root in a compound noun according to the rules of comparative grammar. So *\*ais-tómos/ \*aes-tómos*<sup>12</sup> is

6. See HAVET, 1889, p. 23: *auceps* (< *\*aui-ceps*) “bird-catcher, spy” has given the verb *aucupārī* properly “go bird-catching” (Varr. RR 1.23.5; Digest. 41.1.3), and figuratively “chase, watch for” (Plaut., Cic. +...).

7. HAMP, 1990 starts from *\*a(y)es-tomos*, which is more accurate from a comparative point of view. It remains however difficult, if not impossible, to demonstrate it is the genuine etymon.

8. LIV<sup>2</sup>, s.v. *tem-h<sub>1</sub>-*, p. 625.

9. References to the Gothic verb *aistan* “estimate” (mentioned as unacceptable in LEW 1910<sup>2</sup>, p. 18) and to *aeruscāre* (EDL, p. 21) are not satisfactory since the concrete meaning of *aestimāre* is not taken into account.

10. HAVET, 1889, p. 23.

11. HAMP, 1990.

12. Choosing from these two etymons depends on general considerations about the formation of Latin words, which debate is irrelevant here.

the probable antecedent of *aestimāre*. Guilleux<sup>13</sup> reminds, pace Meillet, *\*tem-* root is attested in Latin, as testified in the DELL under *templum* (“marked out space”, hence “sacred enclosure, temple”), (*con-*)*temnō* “despise”,<sup>14</sup> and *tondeō* “shear, crop, shave” (< *\*tom-d-ē-*). Finally, in the DHELL<sup>15</sup> the data concerning the lexical family of *aestimāre* are well summarized, but ultimately the suggestion that there is no need for the agent noun *\*ais-tómos* appears deceitful. Indeed, this choice overlooks the necessity of postulating, in the context of economical valuation during the archaic period, the intervention of an human agent cutting bronze.

As a provisional conclusion, reliable arguments can be put forward to support the etymology of *aestimāre* as a derivative from the agent noun *\*ais-tómos* “bronze cutter”. First, it is a well-founded etymology from morphological, phonetic and semantic points of view. Second, the supposed *\*ais-tómos* is supported by a parallel agent noun belonging to the economical vocabulary: *libri-pens* literally “one who causes the scale to hang down”, hence “one who weighs” bronze, and along with Havet<sup>16</sup> “le coupe-bronze” can be described as “celui qui, avant l’introduction du monnayage, partageait des barres de bronze en quantités proportionnelles à la valeur des marchandises”. Third, the semantic change of *aestimāre* from “cut bronze” to “estimate” belongs to a trend in Latin, exemplified by verbs such as *putāre*, the meaning of which evolves from “clean, trim...” to “reckon, think over, regard”.

## 2. From the word to realia<sup>17</sup>

The etymology of *aestimāre* proposed above points to the technical and economic field, and more precisely to an agent in charge of cutting bronze. As a result, do we have to understand *aestimāre* literally?

### 2.1. Cutting bronze in the context of weighed metal economy

To properly understand what is at stake with the original meaning of *aestimāre*, one must consider the use of weighed bronze as an instrument of exchange in Rome after the 5th c. The proposed interpretation for *aestimāre*, the formation of which dates back to the 3rd c. at the latest, is indeed justified in the context of a weighed metal economy,<sup>18</sup> instead of a counted one as suggested by Varro:

13. GUILLEUX, 2003.

14. The metaphorical meaning of (*con-*)*temnere* “scorn, despise” is embedded in the INSULT = CUT metaphorical matrix: see GUILLEUX, 2017, p. 4 and n. 6 on parallel English phrases such as *cutting remarks*.

15. DHELL *existimatio* 6.2.

16. HAVET, 1889, p. 23.

17. I thank Charles Parisot and Jérémie Chameroy for their advice.

18. LEROUXEL, 2015 (especially p. 113-125) studies in detail the issue of weighed bronze.



“It was once the custom to pay by the use of a pair of scales; a trace of this remains even now in the Temple of Saturn, because it even now has a pair of scales set up ready for weighing purposes.”<sup>19</sup>

Pliny the Elder mentions the weighing of bronze along with a reference to Timaeus (ca 350-ca 260):

“The Roman nation did not even use a stamped silver coinage before the conquest of King Pyrrhus. The *as* weighed one pound [...]; this is the reason why a fine is specified in ‘heavy bronze’ [...]. King Servius was the first to stamp a design on bronze; previously, according to Timaeus, at Rome they used raw metal.”<sup>20</sup>

This extract deals with *aes grave*, which would be anachronistic if the phrase was read in its usual numismatic acceptance. It is necessary to accept the more general meaning of “heavy bronze mass” that underlines the opposition between bronze and *argentum signatum* mentioned before. Moreover, the comment “*Libralis adpendebatur assis*” interestingly refers to the establishment of a measurement system, which is also mentioned by Pseudo-Aurelius Victor, in a chapter focused on Servius Tullius:

“He (Servius Tullius) established measures, weights, and divisions of classes and centuries.”<sup>21</sup>

Thus we can better understand the passage of Pliny: Servius Tullius established a general measurement standard for bronze values by creating the bronze pound.<sup>22</sup> In parallel, archaeological evidence provides us with substantial information about the development of a metal measurement technology in Italy. From the 7th c. onwards, the discoveries of weights and scales in the peninsula (FIG. 1) reflect precisely the evidence coming from literature.<sup>23</sup>

Latin vocabulary is also of great interest. Many words in the field of financial activities belong to the lexical group of *pendō*<sup>24</sup> “let the scale hang”, hence “weigh”: among others *dēpendō* “pay”, *impēdium* “fee, interest”, *compendium* “accumulated money”, and *expēsum* “expense”. Furthermore, Pliny<sup>25</sup> following Varro,<sup>26</sup> proposes a sound etymology for *stipendium* “military salary”, which implies an antecedent \**stipi-pendium*, literally “amount resulting from the weighing (of a quantity of metal)”. According to Livy, the creation of the *stipendium* dates from the time when

19. “Per trutinam solui solitum : vestigium etiam nunc manet in aede Saturni, quod ea etiam nunc propter pensuram trutinam habet positam” (LL, V, 183, 2).

20. “Populus Romanus ne argento quidem signato ante Pyrrhum regem devictum usus est. Libralis adpendebatur assis [...]; quare aeris gravis poena dicta [...]. Servius rex primus signavit aes ; antea rudi usos Romae Timaeus tradit” (HN, XXXIII, 13).

21. “Mensuras pondera classes centuriasque constituit” (De viris, VII, 8).

22. CRAWFORD, 1974, p. 35-37 and LEROUXEL, 2015, p. 119 accept the idea that Servius Tullius pioneered this innovation.

23. NIJBOER, 1998, p. 301-318.

24. DELL, p. 494-495.

25. HN, XXXIII, 43.

26. LL, V, 182.



FIG. 1. Weights and scales hoards in Italy, 7th c.  
(according to NIJBOER, 1998, p. 301-318 – DAO J.-C. Fossey, CRAHAM).

Anxur was captured and Veii was besieged, i.e. from the end of the 5th c.<sup>27</sup> Thus the practice of the *stipendium* predates the early Roman coinage: the troops' salary was distributed in a fixed quantity of metal, which is precisely recorded in the anecdote of trolleys loaded with heavy bronze ingots to pay the soldiers besieging Veii.<sup>28</sup> According to Livy, pay (*stipendium*) and tax (*tributum*) were introduced at the same time.<sup>29</sup> If we accept that the *tributum-stipendium* forms the basis of public finances

27. Liv., IV, 59, 9-11; 60, 8. This information is transmitted by Dio. Sic., XIV, 16, 5. See CRAWFORD, 1985, p. 22-23.

28. Liv., IV, 60, 6.

29. Liv., IV, 59, 11; 60, 8. On the interpretation of these passages, see HUMM, 2005, p. 375-397, and especially p. 378: "sur le plan institutionnel, la création du *tributum* est étroitement liée à celle du *stipendium*, qui est lui-même lié à la création de l'armée manipulaire."



during the Republican period, the adoption of a measurement standard in weighed bronze would therefore be an important phenomenon in the institution of the city.

Although some historians do not recognize the weighed bronze as a means of payment in commercial transactions,<sup>30</sup> I follow François Lerouxel who draws attention to several literary passages attesting that people used bronze weighed in a scale for payments.<sup>31</sup> Varro says it explicitly:

“It was once the custom to pay by the use of a pair of scales.”<sup>32</sup>

The procedure of *mancipatio* as described by Gaius is known to predate the law of the Twelve Tables (in the middle of the 5th c.):

“In the presence of no less than five Roman citizens of full age and also of a sixth person, having the same qualifications, known as the *libripens* [scale-holder], to hold a bronze scale, the party who is taking the mancipation, holding a bronze ingot, says: ‘I declare that this slave is mine by Quiritary right, and he purchased to me with this bronze ingot and bronze scale’. He then strikes the scale with the ingot and gives it as a symbolic price to him from whom he is receiving by the mancipation.”<sup>33</sup>

The legal process has a symbolic value, and its extreme technicality,<sup>34</sup> a mere contact of the bronze with the scale, indirectly refers to the weighing of bronze as a means of payment. The ritual has retained neither the form nor the original meaning of the operation, namely the weighing of bronze, that Gaius discusses a little further on:

“The bronze ingot and scale are used because formerly only bronze money was in use; [...]. The value of these pieces was reckoned not by counting but weighing.”<sup>35</sup>

However, the use of bronze in the exchanges flourishing during the 5th c. could not have spread immediately. Pliny probably refers to it when he writes that “at Rome they used raw metal [aes rude]”<sup>36</sup> before Servius Tullius (578-535). It is obvious that the population was aware of the role of bronze in the economy.

30. ZEHACKER, 1973, p. 199-222 according to whom the bronze weighed would only correspond to a unit of account and actual payments would be made in precious metals or livestock.

31. LEROUXEL, 2015.

32. “Per trutinam solui solitum” (LL, V, 183, 2).

33. “[...]: adhibitibus non minus quam quinque testibus civibus romanis puberibus et praeterea alio eiusdem condicionis, qui libram aeneam teneat, qui appellatur libripens, is qui mancipio accipit, rem tenens ita dicit: ‘HVNC EGO HOMINEM EX IVRE QUIRITIVM MEVM ESSE AIO ISQVE MIHI EMPTVS ESTO HOC AERE AENEAQVE LIBRA’; deinde aere percutit libram idque aes dat ei a quo mancipio accipit quasi pretii loco” (*Institutes*, I, 119).

34. HUMBERT, 2018, p. 35-36.

35. “Ideo autem aes et libra adhibetur, quia olim aeris tantum nummis utebantur, [...] eorumque uis et potestas non in numero erat, sed in pondere” (*Institutes*, I, 122).

36. “Servius rex primus signavit aes; antea rudi usos Romae Timaeus tradit” (HN, XXXIII, 13). VAN ALFEN, 2017, p. 51-54 rightly highlights this aspect.

In Italy, and anywhere else in the Mediterranean area, the adoption of the minted coin results from an evolution beginning when various objects were already loaded with a monetary dimension.<sup>37</sup> Bronze used as money in Italy is found in several deposits located in the northwest half of the peninsula, and buried between the end of the Bronze Age and the beginning of the Iron Age. The objects made of bronze, which are deliberately gathered here, are various, just as their quantity,<sup>38</sup> from a few pieces to several thousands, such as the well-known San Francesco hoard at Bologna (7th c.).<sup>39</sup> Such a build-up of objects clearly aimed at capitalizing bronze, in a way that can be described as monetary, beyond the specific function of each object. Moreover the frequent inclusion of worn and fragmented objects cannot have any other possible interpretation. This suggests that the development of bronze trade since Protohistory contributed to its widespread use in the economic sphere.

We can now focus on the relationship between the verb *aestimāre* and the archaeological data.

## 2.2. *Aestimāre* and the Roman ingots

The first attestation of the verb *aestimāre* corresponds to the period of development of the early Roman coinage.<sup>40</sup> Thus, from the end of the 4th c. onwards coined bronze and coined silver with a Latin legend appeared, supplemented at the beginning of the following century by cast heavy bronze bars (or ingots) and cast heavy bronze discs (known today as *aes grave*). The ingots are of great interest for us.

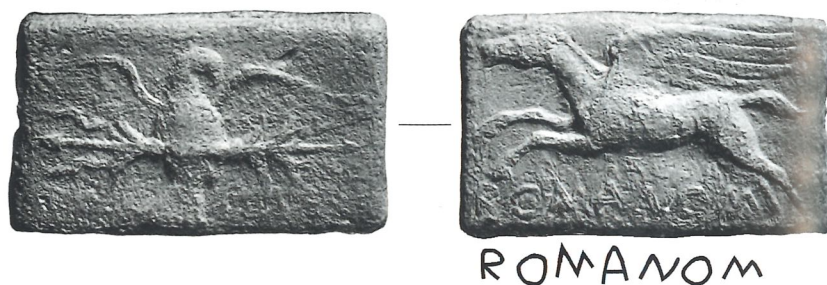


FIG. 2. Roman ingot (RRC 4/1) from Velletri with the inscription ROMANOM (according to HAEBERLIN, 1910, plate 26, n. 3).

37. See Descat's (= DESCAT, 2001) in the conference "Pré, paléo, proto, para, péri, qu'est-ce que la monnaie ?" See also the contributions gathered in *Hacksilber to Coinage* (BALMUTH, 2001) passim. The question of the metal and the standard to define the use of the unminted coinage in the Iberian Peninsula is addressed in CALLEGARIN, GARCÍA-BELLIDO, 2012, p. 119-126.

38. See the review in PALLOTTINO *et al.*, 1986, p. 87.

39. BENTINI, MAZZEO, 1993 with previous bibliography.

40. CRAWFORD, 1985; BURNETT, 2012, p. 297-304 (with a useful chronological table p. 306-307); HORSNAES, 2018.



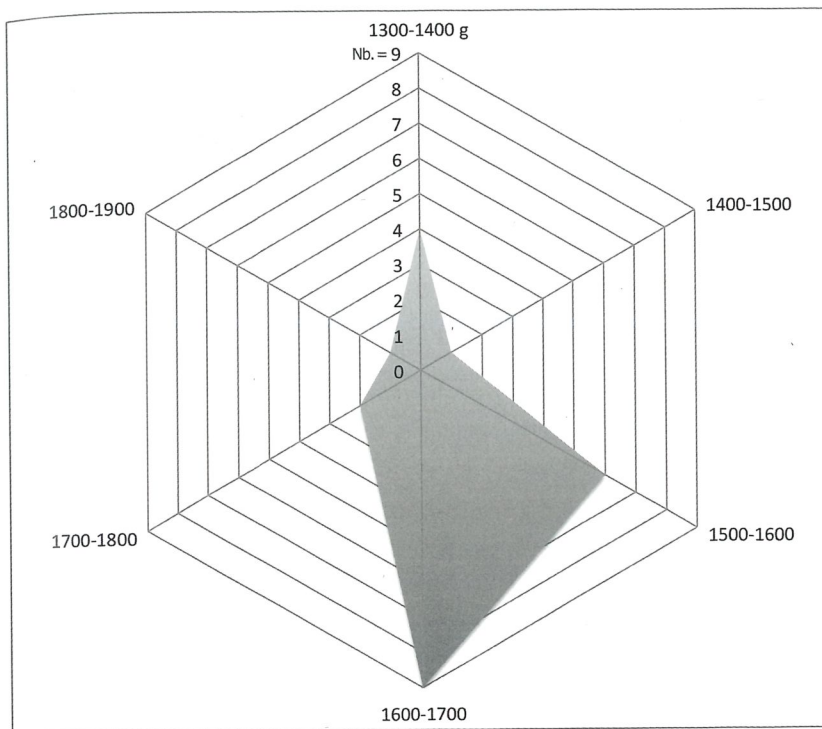


FIG. 3. Weights of Roman ingots (based on the weight data in HAEBERLIN, 1910).

Nowadays these ingots are labelled in a somewhat misleading manner as *aes signatum*. They present different models of matched animals or objects, which help us dating them.<sup>41</sup> Their attribution to the Romans is confirmed through their legend ROMANOM ("of the Romans", archaic genitive equivalent to Classical Latin *Romanorum*, FIG. 2). Moreover, these ingots have recorded weights that generally vary between 1.5 and 1.6 kg corresponding to 5 pounds (FIG. 3);<sup>42</sup> their circulation is concentrated in the area of Rome (FIG. 4).

41. See BURNETT, 2012, p. 302. For example the presence of an elephant could point out to the war against Pyrrhus (282-271).

42. However, the weights show a fairly wide range, which leaves one wondering about the precision of the practice.

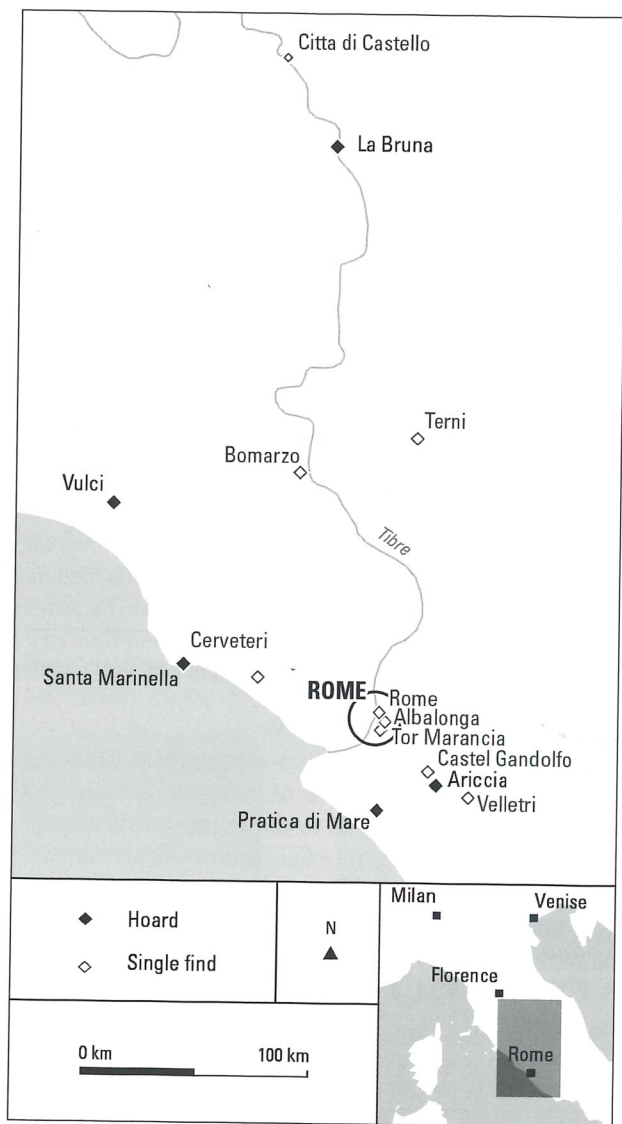


FIG. 4. Roman ingots hoards in Italy (according to RRCH, 1-10, 13, 16, 21; DESJARDINS, 1857; CESANO, 1942; MOLINARI, 2011 – DAO J.-C. Fossey, CRAHAM).



Even though in our modern eyes these ingots would seem cumbersome and above all impractical to use, it was not the case for their contemporaries. The numerous finds made in Central Italy and their frequent hoarding prove their common use as medium of exchange (cf. FIG. 4). They did not shock their contemporaries either because they could be shared when they were weighed. Physical handlings, which can be observed with the naked eye, leave no doubt as to their intentional nature. A systematic laboratory examination of the slices must however be undertaken to allow a more accurate interpretation of these manipulations. What were the fragmentation practices in short? Was it to break or slit a piece of metal more carefully? In any case the observation of the artefacts collected by J. Haeblerlin<sup>43</sup> or of the one conserved in Berlin<sup>44</sup> enables us to assert that some ingots were deliberately divided into two pieces (FIG. 5). Others are simply fragmented into smaller pieces, a process which is well attested, particularly with the fragments included in Haeblerlin's publication<sup>45</sup> or with those used by T. L. Camparette<sup>46</sup> reconstructing an ingot of the RRC 6/1 type (FIG. 6).



FIG. 5. Roman ingots (RRC 7/1, 12/1) divided in two (according to HAEBERLIN, 1910, plate 54, n. 1 and plate 60, n. 5) [without scale].

43. HAEBERLIN, 1910, plate 54 n. 1-2 (Type RRC 12/1).

44. Münzkabinett der Staatlichen Museen zu Berlin, 18201104: <https://ikmk.smb.museum/object?id=18201104> (Type RRC 7/1), consulted on 2019.02.13.

45. HAEBERLIN, 1910, plate 54 n. 6-8 (Type RRC 12/1), plate 58 n. 2-7 (Type RRC 5/1), plate 61.

46. CAMPARETTE, 1918, plate II.

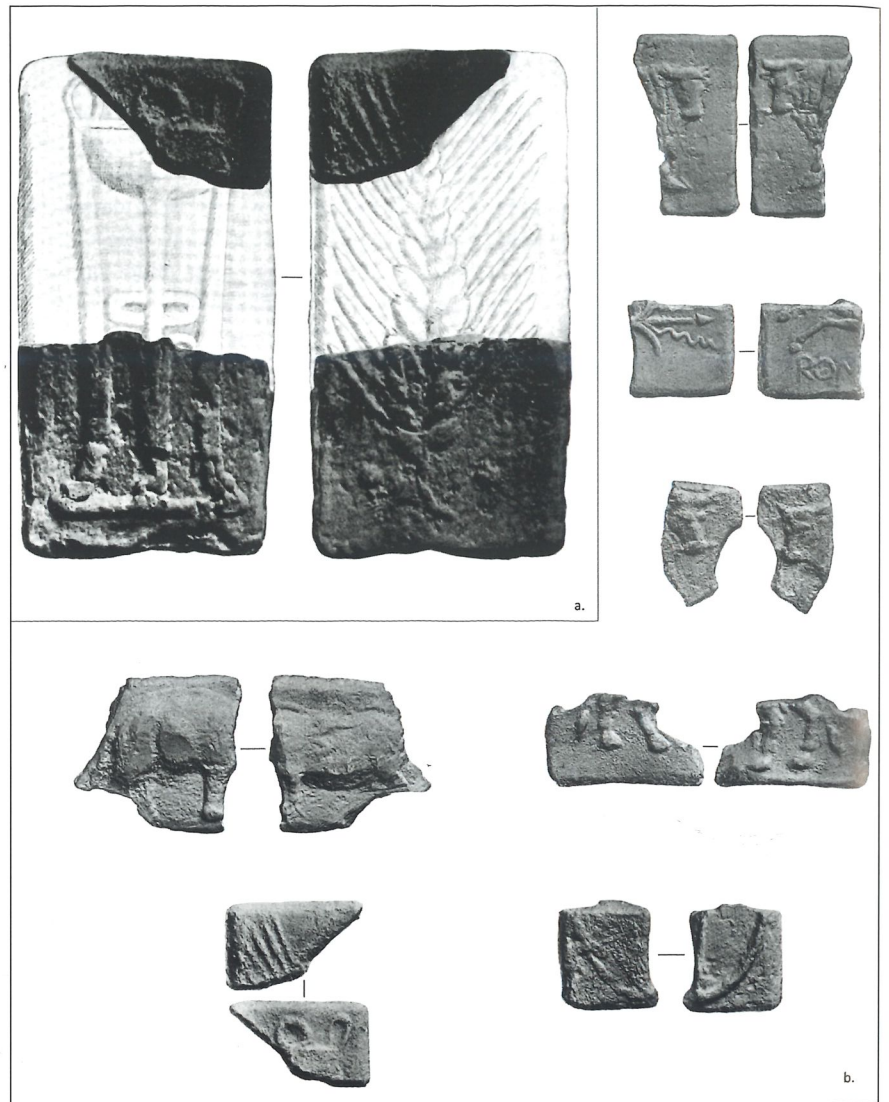


FIG. 6. Various Roman ingots fragmented into small pieces (according to a/ CAMPARETTE, 1918, plate II; b/ HAEBERLIN, 1910, plates 58, 60 and 61) [without scale].

A similar ingot conserved in Paris<sup>47</sup> confirms our conclusion since two of its corners have clearly been removed by an oblique cutting (FIG. 7).

47. BNF: <http://catalogue.bnf.fr/ark:/12148/cb41972365h> (Type RRC 5/1), consulted on 2019.02.13.





FIG. 7. Roman ingot (RRC 5/1) from the Bibliothèque nationale de France, Département Monnaies, Médailles et Antiques, REP-426 (1248,45g; 103 × 156mm). ark:/12148/btv1b104208298.

If we rely on the find evidence, the splitting of Roman ingots appears to be widespread. The review of ancient hoards compiled in the RRCH makes it possible to identify, in a given corpus, the repeated presence of ingot fragments (FIG. 8), to which the fragments recently recorded in the Pratica di Mare hoard can be added.<sup>48</sup> Otherwise

	<i>Aes rude</i>	Ingots		<i>Aes grave</i>	
		Non-Roman ingot	Roman ingot		
			Whole	fragment	
Tor Marancia (RRCH 1)			1		
Castelgandolfo (RRCH 2)			1		
Città di Castello (RRCH 3)			1		
Velletri (RRCH 4)			2		
Albe (RRCH 5)				1	
Bomarzo (RRCH 6)			1		
Rome (Tibre) (RRCH 7)				1	
Cerveteri (RRCH 8)	X	2		1	
Terni (RRCH 9)				1	
Vulci (RRCH 10)	X	1+		1+	1+
Ariccia (RRCH 13)	X	1	2	2	9
La Bruna (RRCH 16)	X		6	2	8
Santa Marinella (RRCH 21)				1	17

FIG. 8. Ingots hoards from RRCH.

48. MOLINARI, 2011, p. 830.

some differences emerge. Thus FIG. 8 points out that fragmentary ingots are on average more frequent in hoards containing *aes grave* as shown by the Ariccia hoard. Even though the production of Roman ingots may have begun at the end of the 4th c., the production of *aes grave* seems to start in the 3rd c. It would therefore be necessary to postulate a link between cutting *aes signatum* and introducing *aes grave*, especially since the same weight standard is used in both types. *Aes grave* included several denominations, all based on the same weight unit (the as), which originally weighed one Roman pound (about 324 g). With a weight of five pounds, the Roman ingots corresponded to multiples of 5 as, enjoying a high purchasing power. Consequently, their cutting would only make sense in a divisional system where the reference to a stable standard (the Roman pound) helps extending the use of weighted bronze. However, the introduction of a value mark on *aes grave* makes it possible to specify a point. Theoretically, this value mark could have exempted users from weighing them.<sup>49</sup> If it were the case, it would be a first step towards a “modern economy”, in which coins would be more easily counted, but not weighed one by one. In this perspective, one could assume that the Roman ingots were cut to correspond to a specific *aes grave*.

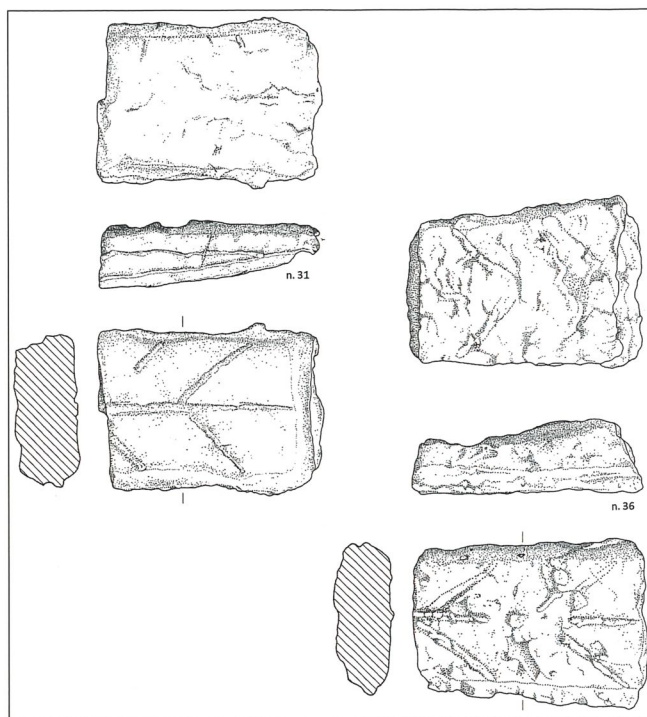


FIG. 9. “Ramo secco” ingots from Castelfranco (according to NERI, 1998, p. 54, n. 31; p. 59, n. 36) [without scale].

49. One pellet = Uncia, two pellets = Sextans, three pellets = Quadrans, four pellets = Triens, S = Semis, I = As. See also THOMSEN, 1978.



It would still be necessary to have a look at the so-called “ramo secco” ingots (that is “dead branch”), of Etruscan origin; they predate the Roman ingots, and their production started in the 6th c. Their presence in hoards containing *aes grave* indicates they were still in use until the 3rd c.<sup>50</sup> Unlike Roman ingots, made of an alloy of copper and tin, they were unrefined and still contained a high proportion of iron.<sup>51</sup> We must also notice that these ingots appear to us as rectangular pieces of metal (FIG. 9). As the wide distribution of the weights among the specimen from Castelfranco shows,<sup>52</sup> they apparently do not refer to any weight standard whatsoever (FIG. 10) but it is difficult to imagine how pieces of bronze ingots could be used without having first been weighed. In addition, the extremities of the ingots often bear thick cuts perpendicular to the decorative patterns, which suggests post-manufacturing fracture operations (cf. FIG. 9). If the ingots were worth what they weighed, it would be plausible to admit they also were cut according to need. However, this hypothesis seems highly unlikely, as revealed by its testing by a scientific team led by G. L. Garagnani and C. Martini.<sup>53</sup> Metallographic analysis of the extremities of several ingots showed that the metal had solidified in contact with a refractory material. G. L. Garagnani and C. Martini consider there is only one possible conclusion: layers of sand were introduced between the casting layers at the time of manufacturing in order to obtain directly distinct metallic parts without having to break the entire bar.<sup>54</sup> No standardized mechanical action is to be assumed: it would be a particular metallurgic process.

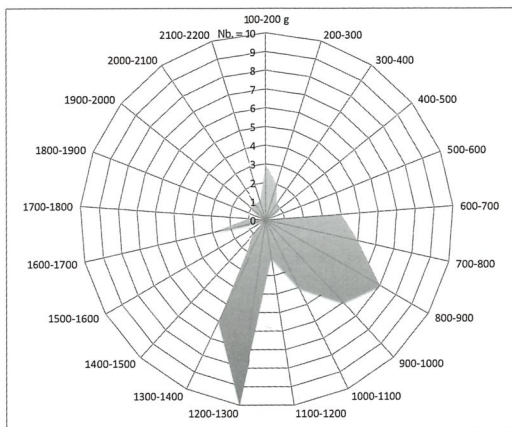


FIG. 10. Weights of “ramo secco” ingots from Castelfranco (according to NERI, 1998).

50. A “ramo secco” type ingot was discovered at the sanctuary of Bitalemi in Gela (Sicily) in an archaeological context dated between 570 and 540 due to the presence of Greek ceramic: see PELLEGRINI, MACELLARI, 2002, p. 20-21 and p. 106-108. The approximate dating between the 6th and 4th/3rd c. of these ingots is based on several archaeological contexts gathered in NERI, 1998, p. 123-124 (tab. 1-2) and, with more details, in PELLEGRINI, MACELLARI, 2002, p. 23-117.

51. NERI, 1998, p. 169-172; PELLEGRINI, MACELLARI, 2002, p. 152-154; FENZI *et al.*, 2011.

52. NERI, 1998.

53. PELLEGRINI, MACELLARI, 2002, p. 147-157.

54. PELLEGRINI, MACELLARI, 2002, p. 149-150. Contra NERI, 1998, p. 179-182.

To conclude, we can claim that the cutting of the so-called “ramo secco” ingots cannot be ascertained, contrary to what is generally accepted. On the other hand, the hypothesis of a cutting concerning specifically Roman ingots must be seriously considered and is, from our point of view, compatible with the etymology proposed for *aestimāre*. This etymology moreover introduces the idea of an agent, the *\*aistomos*, in charge of cutting bronze, in a context where other individuals – known as “*libri-pendes*” – were empowered to weigh bronze. The intervention of specific professionals to cut bronze is all the more appropriate if Roman ingots take place within a real monetary system which, at the beginning, had to meet the most compelling needs, that is to support Rome’s cultural and economic affirmation.<sup>55</sup> There is no doubt that when the Roman people set up the city, cutting bronze must have been operated by professionals appointed by the city.

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55. BURNETT, 1988, p. 17-22.



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