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A GROUP OF FALSE ROMAN COIN DIES

Plates 13–16

In the last few years a group of seemingly ancient coin dies appeared on the European market. Some of them have been acquired by public institutions, others by private collectors. In this paper we comment on a sample of 16 dies, 14 of which in our opinion are representative of the whole group.[1]

All the dies were made of a copper-alloy (see below). They are more or less cylindrical objects with a diameter of 2.35-2.96 cm and a height of 0.7-1.54 cm; they weigh between 28.8 and 60.3 grams. The form and size of the dies show that they imitate those which were inset in iron cases.[2] Some of them show clear traces of hubbing (nos. 5-8)[3], while the others were probably cut conventionally. We examined 7 obverse and 9 reverse dies which can only be distinguished by the coin types, while there is no possibility to differentiate between upper and lower dies. The dies copy denarii of Titus and Domitianus, an aureus of Marcus Aurelius Caesar, antoniniani from Philip I to Volusianus and finally the reverse of a Constantinian siliqua. Such a long chronological spread is immediately suspicious. It seems impossible that ancient forgers of the 4th century AD would have produced antoniniani or even Flavian denarii. However, the homogenous technical characteristics also exclude the possibility that we are dealing with an ancient assemblage of dies which were produced over a very long period of time. The composition of the metal clearly confirms this assumption (see below). There are no clear traces of wear and we assume that the flaws are due to the nature of the production process. Consequently, we cannot be sure if the dies were actually used, had been meant to be used at all, or if they were made only to be sold as genuine ancient coin dies on the antiquities market.

Since ancient coin dies are rare survivors into the present and are consequently regarded as particularly important numismatic objects and, furthermore, because this group has an unlikely chronological profile, it was decided to ascertain their chemical composition.[4] The analyses were conducted by M. Ponting at the Fitch Laboratory of the British School at Athens.

1 We are indebted to Johan van Heesch (Bibliothèque Royale de Belgique, Brussels), Benedikt Zäch (Münzkabinett der Stadt Winterthur) and Gordian Weber (Köln) for their assistance and the permission to analyse the dies in their collections.

2 For the type see M. AMANDRY, Les coins monétaires et les monnaies, in: Masques de fer. Un officier romain du temps de Caligula (Paris 1991), pp. 95-99; R. TYLECOTE, The Prehistory of Metallurgy in the British Isles (London 1986), p. 118.

3 'Hubbing' is the method of die production whereby a genuine coin is used to make a negative image of itself in a metal punch which in turn is used as a die to reproduce exact copies.

4 For dies in antiquity in general, see: C.C. VERMEULE, Some Notes on Ancient Dies and Coining Methods (London 1954); W. MALKMUS, Addenda to Vermeule's Catalog of Ancient Coin Dies: Parts 1-5. SAN 17, no. 4, 1989; 18, nos. 1-4, 1990-1993.

Analytical Method
A sample of metal was obtained by drilling into the side of each die and collecting the turnings. A 1 mm diameter drill was used and the first two millimetres or so of material were discarded to avoid corroded or otherwise non-representative material. The approx. 25 mg of metal were then dissolved in acids according to the procedures in Hughes et al. (1976)[5] and made up to 25 mls. This solution was then analysed for 12 elements using a Perkin Elmer Plasma 400 inductively coupled plasma atomic emission spectrometer (ICP-AES). The instrument was calibrated using commercial single element standard solutions, and precision and accuracy were calculated by running a certified standard reference metal (211) at the beginning and end of the batch. Instrumental precision is usually <3% for all elements above detection limits, with this figure increasing as detection limits are approached. Actual precision of analysis (reproducibility of a given analysis by element) is approximately 1-2% for major elements, 5-10% for minor elements and 10-20% for trace. Accuracy is 1-5% for majors and minors and about 10% for trace, with this figure again worsening as the detection limit for the particular element in question is approached.

Results
The analysis *(Table 1)* shows that, except for two, all the dies are made of essentially a binary alloy of copper and zinc with significant traces of manganese and iron. The compositions of these 14 dies are also all virtually identical, suggesting that all the

no.	*Tin*	*Arsenic*	*Zinc*	*Anti-mony*	*Lead*	*Cobalt*	*Nickel*	*Gold*	*Manga-nese*	*Iron*	*Copper*	*Silver*	*Total*
1	0.16	0.002	37.9	0.002	0.25	0.001	0.146	0.017	1.680	0.261	60.7	0.016	101.2
2	0.13	0.001	38.1	0.001	0.34	0.003	0.157	0.022	1.165	0.247	60.7	0.008	100.8
3	0.81	0.003	37.9	0.048	2.68	0.001	0.051	0.000	0.011	0.237	56.9	0.146	98.9
4	0.25	0.001	37.5	0.001	0.17	0.003	0.152	0.006	0.444	0.595	59.9	0.008	98.8
5	0.30	0.005	39.2	0.002	0.21	0.001	0.152	0.004	0.528	0.580	60.4	0.044	101.5
6	0.20	0.004	39.3	0.003	0.14	0.001	0.093	0.002	0.325	0.346	59.7	0.049	100.2
7	0.26	0.005	37.8	0.002	0.69	0.001	0.261	0.005	0.581	0.707	57.9	0.012	98.2
8	0.29	0.001	37.4	0.001	0.23	0.004	0.151	0.008	0.475	0.570	59.4	0.008	98.3
9	0.39	0.002	36.3	0.006	0.72	0.002	0.283	0.006	0.579	0.891	61.5	0.020	100.7
10	0.23	0.001	38.8	0.003	0.17	0.001	0.216	0.003	0.445	0.530	58.0	0.008	98.4
11	0.37	0.007	36.5	0.003	0.38	0.001	0.144	0.005	0.562	0.616	59.3	0.011	97.9
12	0.14	0.004	37.0	0.001	0.26	0.000	0.124	0.018	1.135	0.269	59.2	0.008	98.2
13	0.32	0.001	37.3	0.001	0.15	0.007	0.281	0.016	0.609	0.644	59.5	0.008	98.5
14	0.33	0.008	39.7	0.004	0.33	0.000	0.100	0.005	0.539	0.584	58.8	0.129	100.5
15	0.18	0.005	39.2	0.002	0.62	0.001	0.207	0.003	0.416	0.563	58.9	0.017	100.1
16	5.21	0.045	4.7	0.134	2.90	0.001	0.211	0.000	0.002	0.458	80.9	0.045	94.7

Table 1

[5] M.J. Hughes, M.R. Cowell, P.T. Craddock, Atomic Absorption Techniques in Archaeology. Archaeometry 18, 1976, pp. 19 – 37.

dies are the product of the same workshop using the same alloy. This is rather unexpected given the apparent time span covered by the dies.

The alloy composition of the majority does not conform to any known alloy employed in antiquity, but does conform almost exactly to a modern 'manganese bronze'. This alloy is listed in the American Society for Metals (ASM) Handbook as C86500 and C86400.[6] Manganese bronze has a composition of 58-59% copper, 38-39% zinc, 1% iron and 0.5-1% manganese, and up to 1% lead (if 'Leaded manganese bronze'). It is an alloy which has excellent casting properties and is very hard. The ASM handbook lists it as being specified for marine propellers and fittings and applications 'which require strength and hardness'.[7] These features were certainly noticed during sampling.

The zinc content is worthy of comment in its own right as ancient copper-zinc alloys never exceed 28% zinc. This was due to the limitations of the available technology, which remained essentially unchanged until the 18th century, when a process was developed to increase the zinc content to 33%.[8] It was only with the advent of metallic zinc initially from the Far East in the 18th and 19th centuries that higher zinc levels became possible. Thus, even without the tell-tale 'manganese bronze' composition, the relatively large amounts of zinc in these alloys would indicate a modern date.

Of the two dies which do not conform to a manganese bronze composition, one (no. 3, aureus of Marcus Aurelius) is a true brass containing 2.7% lead, and almost certainly modern, having a zinc content of 38%. The other (no. 16, Constantinian siliqua) is made of a leaded 'gunmetal' containing 5.2% tin, 4.7% zinc and 2.9% lead. This type of composition could be ancient, an idea which receives some support from the significantly higher levels of arsenic (0.045%) and antimony (0.134%) present. Leaded gunmetals of similar composition are commonly encountered in the analysis of later Roman copper-alloy metalwork.[9] The lower total (only 95%) may also suggest an ancient origin with well-developed inter-granular corrosion resulting in the inclusion of corroded material in the sample. However, such a composition, although adequate, would not lend itself particularly well for use as a coin die and is somewhat different from the compositions of genuine coin dies in the literature. Furthermore, the die has a rather artificial-looking patination and seemingly modern traces of filing. Visually this is the least convincing piece of the whole group. Consequently, although its composition could well be ancient, we doubt its authenticity.

Genuine-if in most cases unofficial-Roman bronze coin dies that have been analysed are invariably made of a high tin bronze, an alloy that would be very hard, but also brittle. The results of the hitherto published analyses are given below in Table 2:

6 H. BAKER (ed.), American Society for Metals, Metals Handbook (Ninth Edition, Ohio 1978).

7 See n. 6 above, p. 387.

8 P.T. CRADDOCK, Early Metal Mining and Metal Production (Edinburgh 1995), pp. 292-302.

9 P.T. CRADDOCK, Three Thousand Years of Copper-Alloys: From the Bronze Age to the Industrial Revolution, in: The Application of Science in the Examination of Works of Art (Boston 1985), pp. 61-63.

Element (Wt. %)	*Republican die in Madrid*[10]	*Republican die from Tilisca*[11]	*Republican dies in Frankfurt*[12]	*Augustan die from Nîmes*[13]	*Augustan die from Nîmes*[14]	*Hadrianic die from Verulamium*[15]
Copper	77.5	60.6	47.0 / 54.0	75.1	75.0	73.8
Tin	21.9	28.2	52.0 / 45.0	23.1	21.3	14.5
Lead	0.65	0.7	0.5 / 0.6		0.7	6.55
Zinc	0.1				1.7	2.81
		10.5				
Iron				0.2	0.47	
Antimony				0.9		
Bismuth				0.3		

Table 2

Conclusion

On the basis of this analysis it is quite certain that the majority of the analysed coin dies are modern forgeries.[16] However, the alloy would be quite suitable for making a die, as its hardness and modern applications indicate. This may suggest that the dies originated in a forger's workshop where they had been used to strike modern forgeries. Many such workshops are known to exist in Syria and Lebanon, and the reuse of naval brasses is quite consistent with access to the coast and the political instability of the past five decades.

Together with the chronological problems mentioned above, the chemical analyses prove beyond reasonable doubt that 14 of the 16 dies under consideration form a homogenous group of modern forgeries. Of the remaining two dies, one (no. 3) is a modern forgery of a different alloy, whilst the other (no. 16) may from its composition well be ancient. In this case, however, we doubt its genuineness for other reasons (see above).

[10] Victoriatus die (216-211 BC) in Madrid, Spain (M.P. GARCIA-BELLIDO, A Hub from Ancient Spain, NC 146, 1986, pp. 76-84.)

[11] Denarius die (130 BC) found at Tilisca, Romania (N. LUPU, Aspekte des Münzumlaufs im vorrömischen Dakien, JNG 17, 1967, p. 114). Produced by hubbing.

[12] Denarius dies of Marc Antony (32/31 BC), obverse and reverse (surface analysis by XRF). Museum für Vor- und Frühgeschichte, Frankfurt (F. BERGER, Münzstempel, in: D. STUTZINGER, Museum für Vor- und Frühgeschichte – Archäologisches Museum Frankfurt am Main. Archäologische Reihe 16. Neuerwerbungen des Museums aus den Jahren 1986-1999 (1999), Nr. 85. We are grateful to Frank Berger and Dagmar Stutzinger for this information.

[13] Denarius die found at Nîmes, France; probably official (AMANDRY [n. 2 above], no. 56).

[14] Denarius die (15-10 BC) found at Nîmes, France; probably official (*ibid.*, no. 57)

[15] Denarius die (134-138 AD) found at Verulamium - St. Albans, England (TYLECOTE [n. 2 above], p. 118). The analysis of a die copying the reverse of a denarius of Caracalla which was found at Aquincum (Budapest) shows that it, too, consists of bronze with a high tin content (no exact results published); K. BIRÓ-SEY, Roman Die from the Civilian City of Aquincum, in: Studia Paulo Naster Oblata I (Leuven 1982), pp. 199-204.

[16] This is not the first case of a group of chronologically inconsistent dies appearing on the market; cf. G. DEMBSKI, Münzfälscherstempel aus der Türkei. MÖNG 33, 1993, pp. 98-100. The fact that most of these dies combine an iron ring with a base metal core shows that the two groups do not come from the same source.

Catalogue of the dies

1: (Denarius); obverse of Titus (Rome 79-80 AD).
IMP TITVS CAES VESPASIAN AVG P M; laureate head l. within circle of dots.
Diam. 28.0 mm, height 7.0 mm, 28.8 g. Münzkabinett Winterthur, Inv. R 66.

2: (Denarius); reverse of Domitianus (Rome 85 AD).
IMP VIIII COS XI CENSO-RIΛ POTESTΛT P P; Minerva stg. l., holding thunderbolt and spear; at her feet a shield, within circle of dots. Cf. RIC II, p. 161, no. 66 c (but Minerva as on no. 37).
Corroded; slightly off-centre. Diam. 23.5 mm, height 14.5 mm, 42.2 g. Israel Museum, Inv. 95.2.14810.

3: (Aureus); reverse of Marcus Aurelius Caesar (Rome 157-158 AD).
TR PO-T XII - COS II; Apollo stg. l. with patera and lyre, within circle of dots.
RIC III, p. 88, nos. 474 (a-d).
Diam. 25.3 mm, height 10.0 mm, 36.6 g. Private coll.

4: (Antoninianus); obverse of Philip I (Rome 247-249 AD).
IMP PHILIPPVS AVG; radiate bust r., draped, cuirassed.
Diam. 28.0 mm, height 10.0 mm, 37.8 g. Israel Museum, Inv. 95.2.14811.

5: (Antoninianus); obverse of Philip I (Rome 247-249 AD).
IMP PHILIPPVS AVG; radiate bust r., draped, cuirassed. Produced by hubbing the same coin as on the following die.
Diam. 29.6 mm, height 9.5 mm, 42.6 g. Private coll.

6: (Antoninianus); obverse of Philip I (Rome 247-249 AD).
IMP PHILIPPVS AVG; radiate bust r., draped, cuirassed. Produced by hubbing the same coin as on the preceding die.
Corroded; diam. 28.8 mm, height 11.0 mm, 42.4 g. Private coll.

7: (Antoninianus); reverse of Philip I (Rome 248 AD).
SAECVLARES AVGG; goat walking l.; VI(?) in ex., within circle of dots. RIC IV.3, p.70, no. 23. Traces of hubbing.
Diam. 25.8 mm, height 10.4 mm, 34.8 g. Private coll.

8: (Antoninianus); obverse of Philip II (Rome 247-249 AD).
IMP M IVL PHILIPPVS AVG; radiate bust r., draped, cuirassed. Traces of hubbing.
Diam. 26.5 mm, height 13.0 mm, 43.7 g. Israel Museum, Inv. 95.2.14812.

9: (Antoninianus); reverse of Philip II (Rome 246-247 AD).
AETERNIT IMPER; Sol, radiate, walking l., l. hand raised, holding whip, within circle of dots. RIC IV.3, p. 97, no. 226.
Diam. 26.7 mm, height 12 mm, 45.8 g. Cabinet des Médailles, Brussel, Inv. II, 83.535.

10: (Antoninianus); reverse of Philip II (Rome 248-249 AD).
LIBERALITAS AVGG III; Philip I and II seated l. RIC IV.3, p. 97, no. 230.
Diam. 24.3 mm, height 11.0 mm, 34.2 g. Private coll.

11: (Antoninianus); obverse of Otacilia Severa (Rome c. 244-246 AD).
MARCIA OTACIL-SEVERA AVG; draped diademed bust on crescent r., within circle of dots.
Diam. 28.0 mm, height 12.0 mm, 60.3 g. Münzkabinett Winterthur, Inv. R 65.

12: (Antoninianus); reverse of Otacilia Severa (Rome c. 246-248 AD).
IVNO CONSERVAT; Iuno stg. l. with patera and sceptre, within circle of dots. RIC IV.3, p. 83, no. 127.
Diam. 26.6 mm, height 10.2 mm, 37.8 g. Private coll.

13: (Antoninianus); reverse of Trebonianus Gallus (Rome 251-253 AD).
AETERNITAS AVGG; Aeternitas stg. l., holding phoenix on globe, l. hand raising skirt. RIC IV.3, p. 162, no. 30.
Diam. 24 mm, height 10 mm, 26.6 g. Israel Museum, Inv. 95.2.14813.

14: (Antoninianus); obverse of Volusianus (Rome 251-253 AD).
IMP CAE C VIB VOL(VSIANO A)VG; radiate bust r., draped, cuirassed.
Diam. 26.9 mm, height 9.9 mm, 37.4 g. Private coll.

15: (Antoninianus); reverse of Philippus I.-Volusianus (Rome 244-253 AD).
AEQVITAS AVGG; Aequitas stg. l., holding scales and cornucopiae, within circle of dots. RIC IV.3, p.71, no. 27(b) et al.
Diam. 26.3 mm, height 11.5 mm, 44.2 g. Private coll.

16: (Siliqua); reverse of Constantine II Caesar, Constans Caesar or Constantius II Caesar (Siscia 326-327 or 334 AD).
VICTORIA-CAESARVM; Victory walking l., holding wreath and palm branch; in ex. SIS, within circle of dots. RIC VII, p. 452, nos. 212-213 or p.455, nos. 233-234.
Diam. 25.2 mm, height 15.4 mm, 57.1 g. Private coll.

Zusammenfassung

Metallanalysen an einer Gruppe von 16 scheinbar römischen Münzstempeln ergaben, dass die Mehrheit aus einer zinkreichen, manganhaltigen Kupferlegierung besteht. Die Metallzusammensetzung zeigt, dass es sich dabei um neuzeitliche Objekte handelt.

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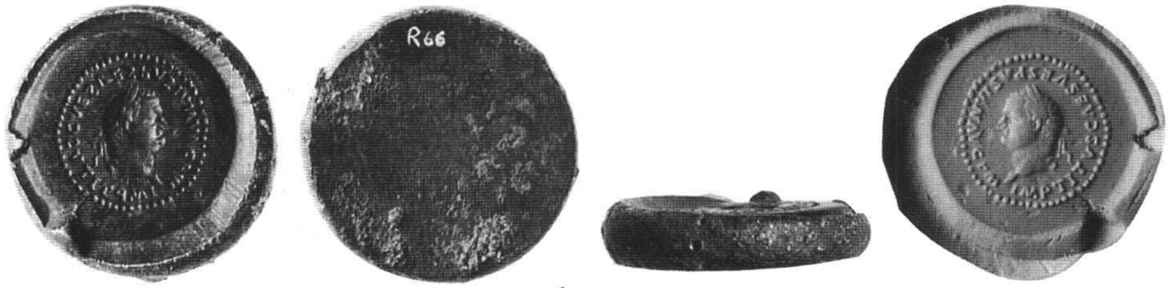

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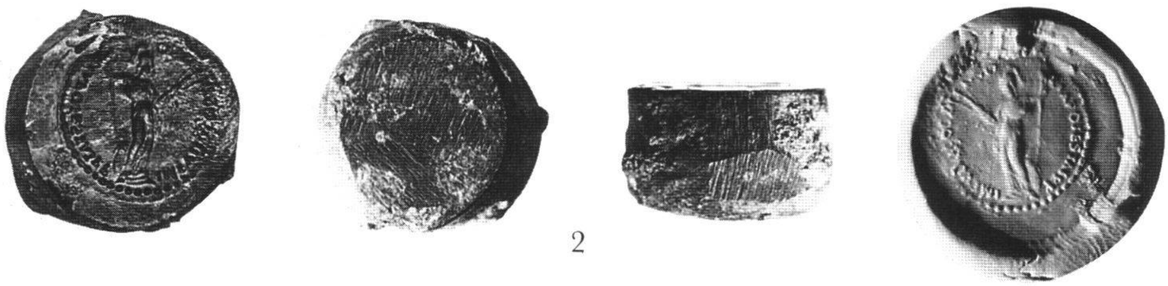

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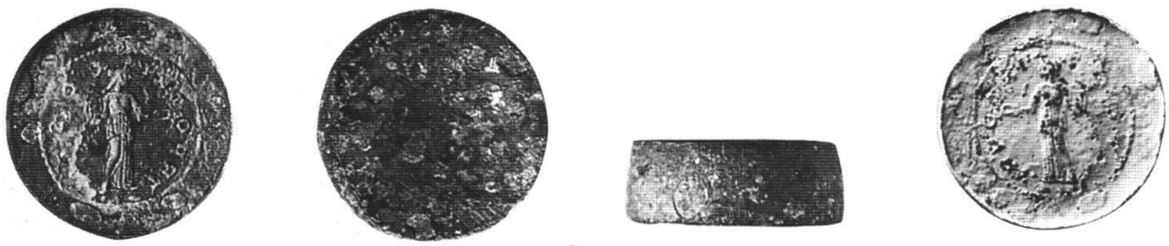

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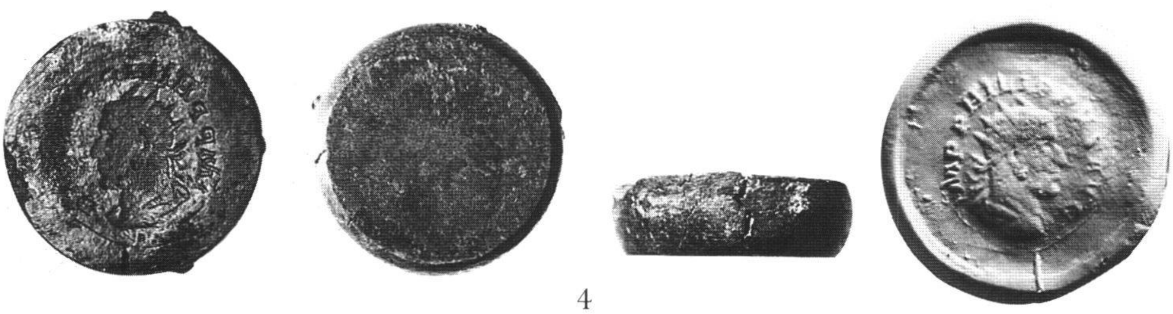

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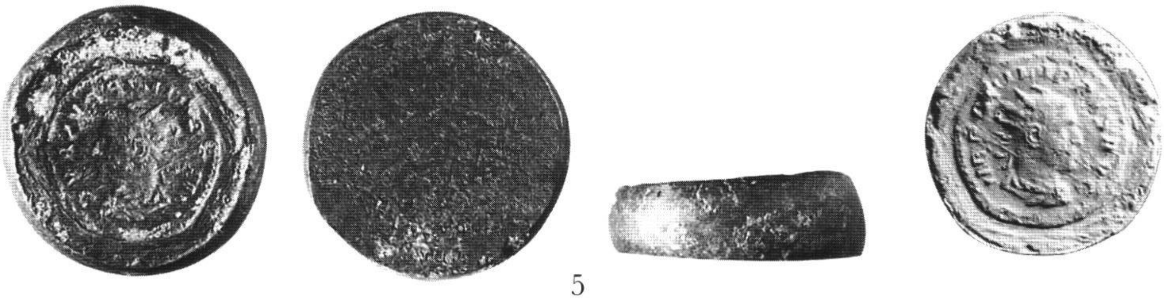

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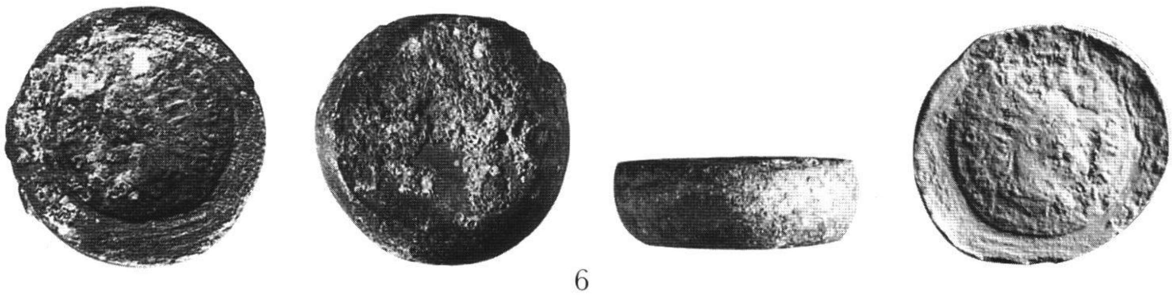

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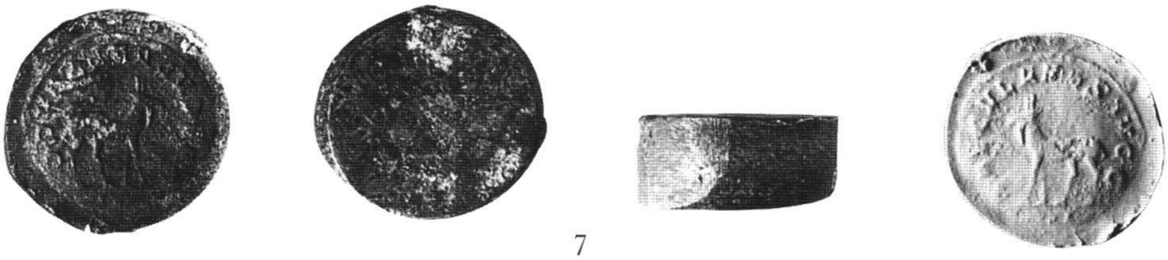

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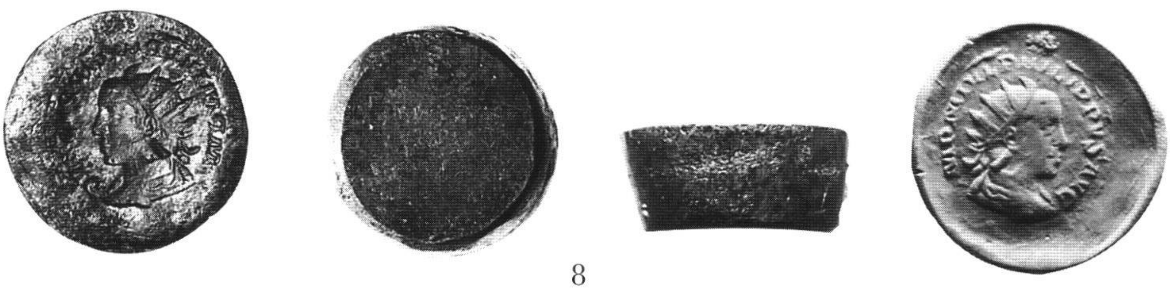

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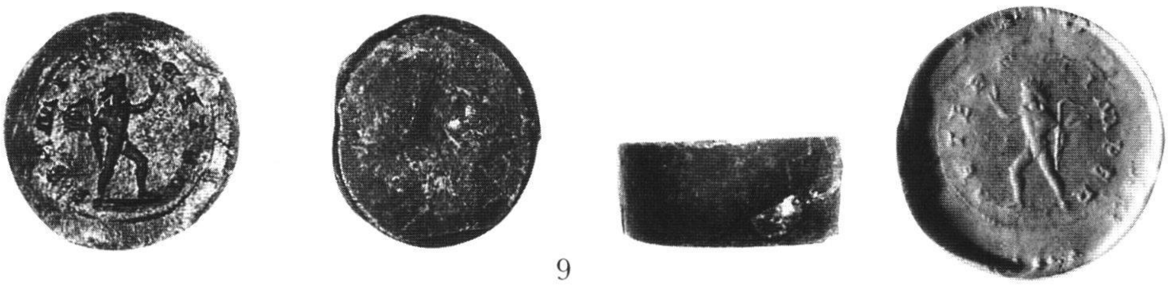

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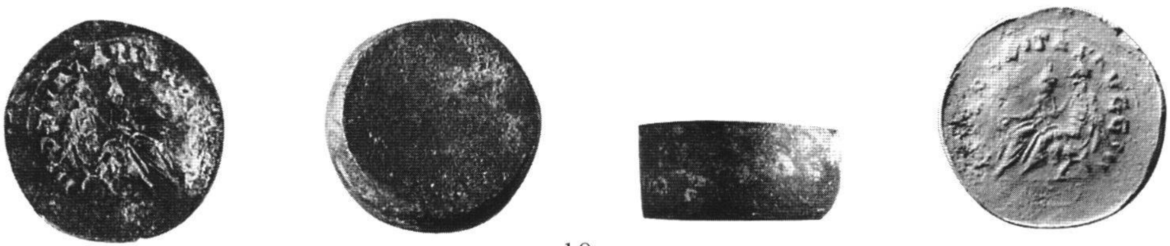

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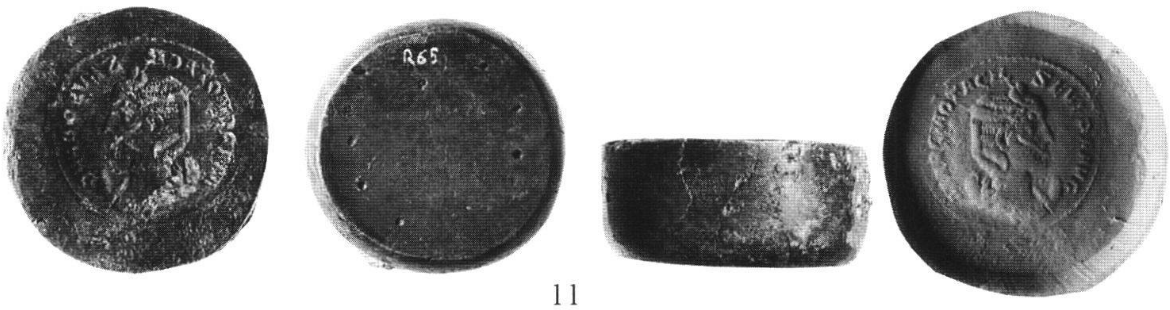

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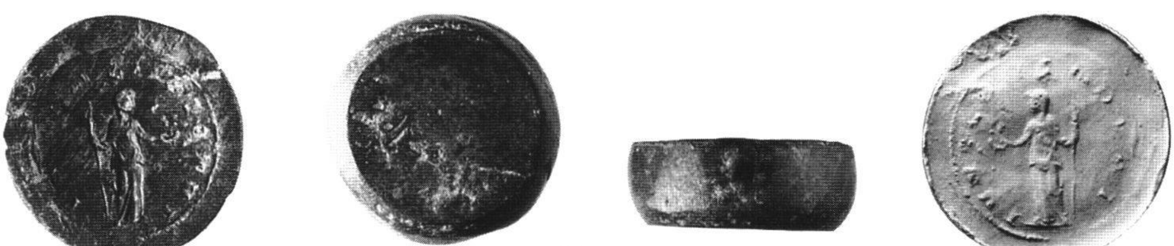

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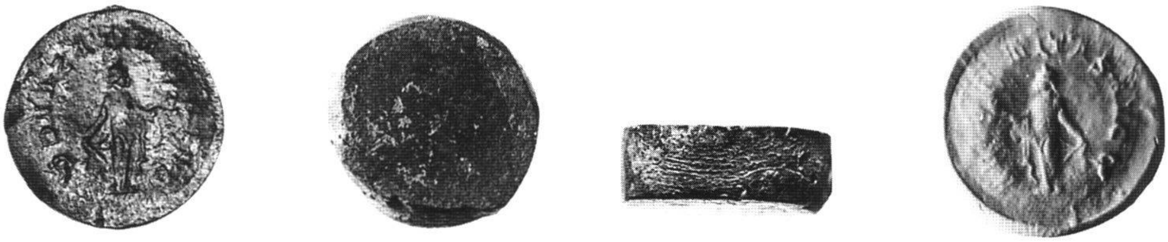

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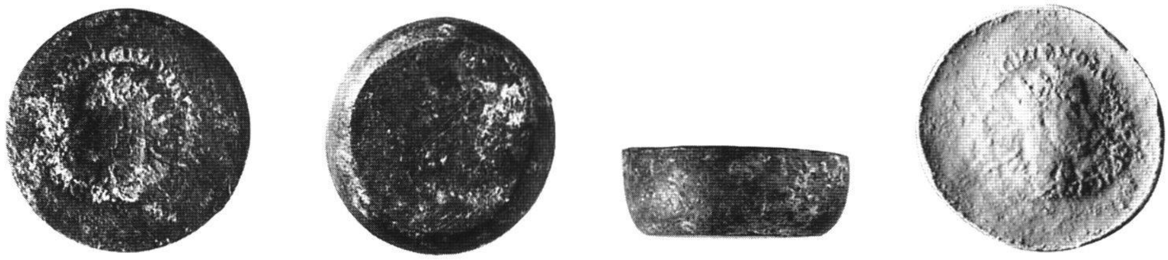

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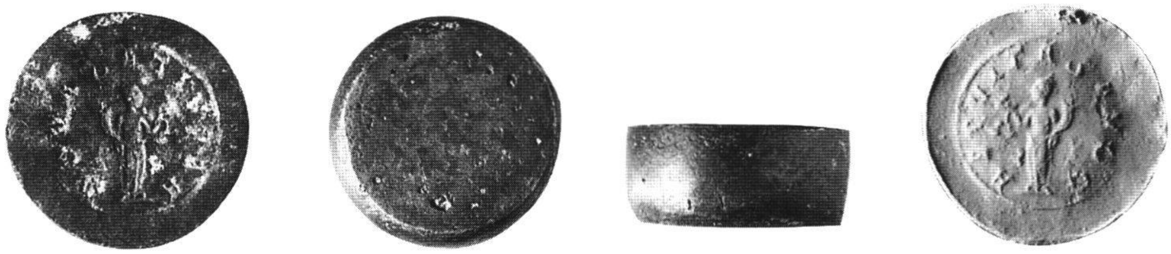

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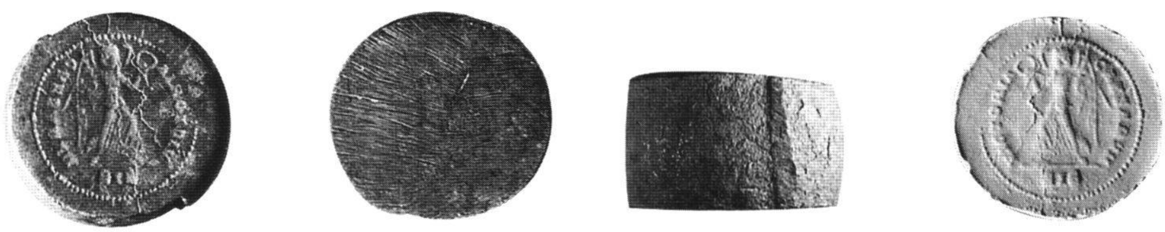

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