ROMAN MILITARY EQUIPMENT

M. C. BISHOP and J. C. N. COULSTON

ROMAN MILITARY EQUIPMENT
from the Punic Wars to the fall of Rome

Rome's rise to empire is often said to have owed much to the efficiency and military skill of her armies and their technological superiority over barbarian enemies. But just how 'advanced' was Roman military equipment? What were its origins and how did it evolve?

The authors of this book bring together a wealth of evidence from all over the Roman Empire – excavated examples as well as pictorial and documentary sources – to present a picture of what range of equipment would be available at any given time, what it would look like and how it would function. They examine how certain pieces were adopted from Rome's enemies and adapted to particular conditions of warfare prevailing in different parts of the Empire. They also investigate in detail the technology of military equipment and the means by which it was produced, and discuss wider questions such as the status of the soldier in Roman society.

The result is a very detailed and authoritative handbook, which, together with the specially prepared drawings, illustrates each element in the equipment of the Roman soldier, from his helmet to his boots, his insignia, his tools and his weapons.

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Jacket illustrations:
(Front) The Oberammergau dagger.
(Back) A selection of drawings by M. C. Bishop.

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To Hazel, Martha, and Oliver

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Frontispiece: Stela of P. Marcius Probus, a *custos armorum*. He is shown wearing a *paenula* and carrying a staff of office and a book of writing tablets, both perhaps symbolic of his rank. Depicted around him are (*clockwise from bottom left*) a small round shield, a curved rectangular shield, a crested Italo-Corinthian helmet, a dagger and belt with straps and crescentic terminals, a bundle of shafted weapons (?), and a cuirass. Probably first century AD, from Bergamo, Italy (not to scale).

PREFACE AND INTRODUCTION

The last attempt to examine Roman military equipment from the Republic to the late Empire in a single, substantial volume was made by Couissin in 1926. Our own recent booklet provided only a summary, within a very restricted format which precluded the use of references. We wish to bring the field of Roman military equipment studies to a wider audience, and the primary aim of the present book is to demonstrate that the subject provides a window into the practical workings of the Roman army. Moreover, we believe that it can elucidate the place of soldiers and military institutions within Roman culture and society as a whole and thus have broad implications for an understanding of the Roman world.[1]

A study with the present title could either delineate and discuss separately the various classes of equipment (armour, shields, swords etc.), or it could adopt a more historical perspective. We have deliberately chosen the latter approach, not only because it enables us to explore various pertinent technological and sociological issues in their appropriate contexts, but also because it permits us to stand back and view the development of Roman equipment throughout our period. We are aware that this is an ambitious project, but it is vital to attempt it because Roman military artefact studies have traditionally been subordinated to narrow art-historical discussions, or marginalized as 'typology-fodder'.

It is a commonly held view that Rome's rise to empire owed much to the efficiency and military skill of her armies. Often implicit in this opinion is the notion of Roman technical and technological superiority over 'barbarian' adversaries. One of the purposes of the present book is to investigate just how 'advanced' Roman military technology was in contemporary terms. Central to this are the origins of Roman equipment, its evolution, and the interrelationships between soldiers, the arms production 'industry' and the wider society of which the army was just a part.

What is meant by the term 'military equipment'? There is no general agreement amongst scholars and a definition is most easily made in negative terms. There are grey areas within which objects could be either civilian or military, according to their context, which is only to be expected, since the Roman army included within its ranks many of the trades to be found in civilian life. Cart fittings are a case in point: soldiers used wagons and carts of various kinds, but these vehicles were not necessarily 'military' in design. Fittings are found in both military and civilian contexts without distinguishing features.

Thus, there is little advantage in defining a rigid specification for what is, and is not, 'military equipment'. Some readers may find our criteria to be arbitrary, but, for the purposes of the present volume, military equipment excludes standards, siege engines, draught harness and wagon fittings. Tools and clothing are only briefly discussed, whilst items of personal adornment, such as brooches, are generally omitted.

The historical limits – from the beginning of the second century BC to the beginning of the fifth century AD – accord with Rome's rise to, and decline from, dominance in the Mediterranean world. They also coincide with the bulk of the published archaeological evidence: to have started earlier or continued later would have required not only more space, but also a radically different approach to the source material.

We have assumed that the reader has a basic knowledge of the Roman army and will refer to the standard texts. No apology is made for mixing modern and ancient place-names but we have endeavoured to be consistent, and the perplexed reader will find a map and topographical list immediately after this preface. In most instances, line illustrations have been used in preference to photographs because they are capable of conveying more information than a single photograph and it is easier to scale them accurately. We have been careful to reference facts wherever possible, whilst trying to keep the notes to a manageable size. We have also sought to avoid the pseudo-technical Latin terminology which abounds in publications on the Roman army.[2]

A great many people have given us their support

and guidance during discussion, library research and fieldwork. We are grateful to all the following, and apologize for any unintentional omissions: Lindsay Allason-Jones, Julian Bennett, George Boon, John Casey, Hugh Chapman, Neil Christie, Amanda Claridge, Joanna Close-Brooks, Charles Daniels, Mike Dawson, John Dore, Phil Freeman, John Gillam†, Stephen Greep, Bill Griffiths, Nick Griffiths, Jenny Hall, Mark Hassall, Sonia Chadwick Hawkes, Bill Hubbard, Anne Hyland, George Jobey, Christine Jones, David Kennedy, Lawrence Keppie, Bill Manning, Edward McEwen, David Nicolle, Georgina Plowright, Colin Richardson, Alan Rushworth, Ian Scott, Brian Shefton, David Smith, Margaret Snape, Pat Southern, Simon Tomson, Graham Webster, John Wilkes, Roger Wilson, and Peter Wiseman.

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There is insufficient space to name all the museums and their staffs who have aided our research, but we are warmly grateful to all of them. We are also indebted to the staff in the Ashmolean Library, Oxford; the Joint Library of the Hellenic and Roman Societies, London; and the British School at Rome.

Illustrative material has been used with the kind permission of the following: the Bibliothèque Nationale, Paris (Pl. 3b); the Bodleian Library (Pl. 8); the Trustees of the British Museum (Pl. 3a); Peter Connolly (Fig. 10); Simon James (Pl. 4c); the Landesdenkmalamt Baden-Württemberg (Pl. 2a); Jaap Morel (Fig. 42); the Prähistorische Staatssammlung, München (Pls. 1 and 2b); the Rheinisches Landesmuseum, Bonn (Pl. 2a); and Roger Wilson (Pl. 7b). Yale University Art Gallery and the Arts and Recreation Division of the City of Dundee District Council very kindly allowed previously unpublished material to be illustrated. Unless otherwise stated, all line illustrations are by MCB.

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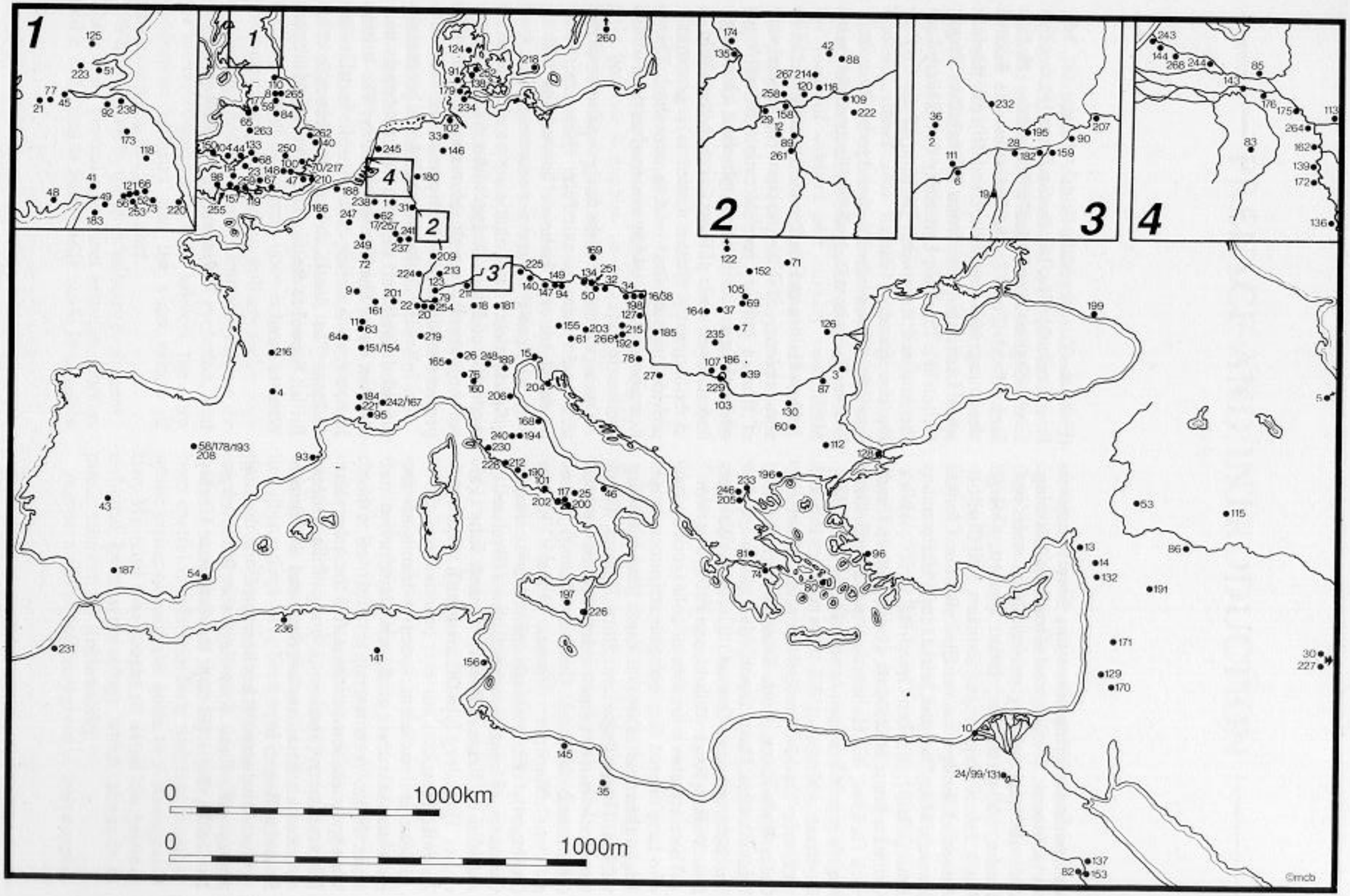
Ryton and Newcastle upon Tyne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MAP AND LIST OF PLACES

Place-names mentioned in the text.

No. on Map	Site	Modern Country
1.	Aachen	Germany
2.	Aalen	Germany
3.	Adamklissi	Romania
4.	Agen	France
5.	Ai Khanoun	Afghanistan
6.	Aislingen	Germany
7.	Alba Iulia	Romania
8.	Aldborough	Great Britain
9.	Alesia	France
10.	Alexandria	Egypt
11.	Alléríot	France
12.	Alzey	Germany
13.	Antioch	Turkey
14.	Apamea	Syria
15.	Aquileia	Italy
16.	Aquincum	Hungary
17.	Arlon	Luxembourg
18.	Auerberg	Germany
19.	Augsburg	Germany
20.	Augst	Switzerland
21.	Bar Hill	Great Britain
22.	Basel	Switzerland
23.	Bath	Great Britain
24.	Belmesa	Egypt
25.	Benevento	Italy
26.	Bergamo	Italy
27.	Berkasovo	Yugoslavia
28.	Bertoldsheim	Germany
29.	Bingen	Germany
30.	Bishapur	Iran
31.	Bonn	Germany
32.	Bratislava	Czechoslovakia
33.	Bremen	Germany
34.	Brigetio	Hungary
35.	Bu Njem	Libya
36.	Buch	Germany
37.	Buciumi	Romania
38.	Budapest	Hungary
39.	Bumbeşti	Romania
40.	Burgh Castle	Great Britain
41.	Burnswark	Great Britain
42.	Butzbach	Germany
43.	Cáceres el Viejo	Spain
44.	Caerleon	Great Britain
45.	Camelon	Great Britain
46.	Canosa	Italy
47.	Canterbury	Great Britain
48.	Carlingwark Loch	Great Britain
49.	Carlisle	Great Britain
50.	Carnuntum	Austria
51.	Carpow	Great Britain
52.	Carrawburgh	Great Britain
53.	Carrhae	Turkey
54.	New Carthage	Spain
55.	Carthage	Tunisia
56.	Carvoran	Great Britain
57.	Casacco	Italy
58.	Castillejo	Spain
59.	Castleford	Great Britain
60.	Čatalka	Bulgaria
61.	Celje	Yugoslavia
62.	Celles-les-Warennes	Belgium
63.	Chalon	France
64.	Chassenard	France
65.	Chester	Great Britain
66.	Chesters	Great Britain
67.	Chichester	Great Britain
68.	Cirencester	Great Britain
69.	Cluj	Romania
70.	Colchester	Great Britain
71.	Concești	Romania
72.	Coolus	France
73.	Corbridge	Great Britain
74.	Corinth	Greece
75.	Costești	Romania
76.	Cremona	Italy
77.	Croy Hill	Great Britain
78.	Dakovo	Yugoslavia
79.	Dangstetten	Germany
80.	Delos	Greece
81.	Delphi	Greece
82.	Der el-Medineh	Egypt
83.	Deurne	Netherlands
84.	Doncaster	Great Britain
85.	Doorwerth	Netherlands
86.	Dura-Europos	Syria
87.	Durostorum	Bulgaria
88.	Echzell	Germany
89.	Eich	Germany
90.	Eining	Germany
91.	Ejsbøl	Denmark
92.	Elginhaugh	Great Britain
93.	Emporion	Spain
94.	Enns	Germany
95.	Entremont	France
96.	Ephesos	Turkey
97.	Ephyra	Greece
98.	Exeter	Great Britain

No. on Map	Site	Modern Country
99.	Fayum	Egypt
100.	Fulham	Great Britain
101.	Gaeta	Italy
102.	Galdenberg bei Cuxhaven	Germany
103.	Gamzigrad	Yugoslavia
104.	Gelligaer	Great Britain
105.	Gherla	Romania
106.	Gomadingen	Germany
107.	Gornea	Romania
108.	Grafenhausen	Germany
109.	Grosskrotzenburg	Germany
110.	Guisborough	Great Britain
111.	Gundremmingen	Germany
112.	Hadrianopolis	Turkey
113.	Haltern	Germany
114.	Ham Hill	Great Britain
115.	Hatra	Iraq
116.	Heddernheim	Germany
117.	Herculaneum	Italy
118.	High Rochester	Germany
119.	Hod Hill	Great Britain
120.	Hofheim	Germany
121.	Housesteads	Great Britain
122.	Hromowka	Ukraine
123.	Hüfingen	Germany
124.	Illerup	Denmark
125.	Inchtuthil	Great Britain
126.	Independenţa	Romania
127.	Intercisa	Hungary
128.	Istanbul	Turkey
129.	Jerusalem	Israel
130.	Karaagach	Bulgaria
131.	Kasr el-Harit	Egypt
132.	Khisfine	Syria
133.	Kingsholm	Great Britain
134.	Klosterneuberg	Austria
135.	Koblenz	Germany
136.	Köln	Germany
137.	Koptos	Egypt
138.	Kragehul	Denmark
139.	Krefeld	Germany
140.	Künzing	Germany
141.	Lambaesis	Algeria
142.	Lanchester	Germany
143.	Leeuwen	Netherlands
144.	Leiden-Roomburg	Germany
145.	Leptis Magna	Libya
146.	Liebenau	Germany
147.	Linz	Austria
148.	London	Great Britain
149.	Lorch/Lauriacum	Austria
150.	Loughor	Great Britain
151.	Lugdunum/Lyon	France
152.	Lunca Mureşului	Romania
153.	Luxor	Egypt
154.	Lyon/Lugdunum	France
155.	Magdalensburg	Austria
156.	Mahdia	Tunisia
157.	Maiden Castle	Great Britain
158.	Mainz	Germany
159.	Manching	Germany
160.	Mantova	Italy
161.	Mavilly	France
162.	Mehrum	Germany
163.	Mercey	France
164.	Micia	Romania
165.	Milan	Italy
166.	Misery	France
167.	Mondragon	France
168.	Montefortino	Italy
169.	Mušov	Czechoslovakia
170.	Nahal Hever	Israel
171.	Nawa	Syria
172.	Neuss	Germany
173.	Newstead	Great Britain
174.	Niederbieber	Germany
175.	Niedermörmter	Germany
176.	Nijmegen	Netherlands
177.	Northwich	Great Britain
178.	Numantia	Spain
179.	Nydam	Denmark
180.	Oberaden	Germany
181.	Oberammergau	Germany
182.	Oberstimm	Germany
183.	Old Carlisle	Great Britain
184.	Orange	France
185.	Orgovány	Hungary
186.	Orşova	Romania
187.	Osuna	Spain
188.	Oudenburg	Netherlands
189.	Padova	Italy
190.	Palestrina	Italy
191.	Palmyra	Syria
192.	Pecs	Hungary
193.	Peña Redonda	Spain
194.	Perugia	Italy
195.	Pfunz	Germany
196.	Philippi	Greece
197.	Piazza Armerina	Italy
198.	Pilismarót	Hungary
199.	Pitsunda	Georgia
200.	Pompeii	Italy
201.	Port bei Nidau	Switzerland
202.	Pozzuoli	Italy
203.	Ptuj	Yugoslavia
204.	Pula	Yugoslavia
205.	Pydna	Greece
206.	Ravenna	Italy
207.	Regensburg	Germany
208.	Renieblas	Spain
209.	Rheingönheim	Spain
210.	Richborough	Great Britain
211.	Risstissen	Germany
212.	Rome	Italy
213.	Rottweil	Germany
214.	Saalburg	Germany
215.	Ságvár	Hungary
216.	Saintes	France
217.	Sheepen	Great Britain
218.	Simris	Sweden
219.	Sitten	Switzerland

No. on Map	Site	Modern Country
220.	South Shields	Great Britain
221.	St Remy	France
222.	Stockstadt	Germany
223.	Strageath	Great Britain
224.	Strasbourg	France
225.	Straubing	Germany
226.	Syracuse	Italy
227.	Tang-i-Sarvak	Iran
228.	Tarquinia	Italy
229.	Tekije	Yugoslavia
230.	Telamon	Italy
231.	Thamusida	Morocco
232.	Theilenhofen	Germany
233.	Thessalonike	Greece
234.	Thorsbjerg	Germany
235.	Tibiscum	Romania
236.	Tipasa	Algeria
237.	Titelberg	Luxembourg
238.	Tongres	Belgium
239.	Traprain Law	Great Britain
240.	Trasimene	Italy
241.	Trier	Germany
242.	Vachères	France
243.	Valkenburg	Netherlands
244.	Vechten	Netherlands
245.	Velsen	Netherlands
246.	Veria	Greece
247.	Vermand	France
248.	Verona	Italy
249.	Versigny	France
250.	Verulamium	Great Britain
251.	Vienna	Austria
252.	Vimose	Denmark
253.	Vindolanda	Great Britain
254.	Vindonissa	Switzerland
255.	Waddon Hill	Great Britain
256.	Wehringen	Germany
257.	Weiler	Luxembourg
258.	Wiesbaden	Germany
259.	Winchester	Great Britain
260.	Wisby	Sweden
261.	Worms	Germany
262.	Worthing	Great Britain
263.	Wroxeter	Great Britain
264.	Xanten	Germany
265.	York	Great Britain
266.	Zengövarkóny	Hungary
267.	Zugmantel	Germany
268.	Zwammerdam	Netherlands

1

THE REPRESENTATIONAL EVIDENCE

Introduction

Before the nineteenth century, representations of soldiers in Roman art were virtually the only source for antiquarian studies of Roman military equipment. Until Robinson's re-evaluation of the pictorial sources in the 1970s, stone sculpture was used to form a conceptual framework into which the artefactual evidence was fitted, often unsatisfactorily, rather than the actual objects leading the enquiry. In particular, the great propaganda monuments of Rome dominated the field. After Robinson published his *Armour of Imperial Rome*, representational sources came to occupy a more subordinate position. However, over-reaction against them is to be avoided and their value for equipment studies should be evaluated.[1]

Certain questions must be asked of every representation. What was its intended function? Who was the artist involved, and what were his likely objectives? For whom would he have worked and what were their requirements? What was the artist's technical and cultural background? What type of stone was he working with and what degree of carved detail could it sustain? In individual cases some of these questions may be impossible to answer, but they help in the construction of conceptual models for production, supply, patronage and artistic intent, all of which might bear on content, and thus on interpretation of the equipment represented.

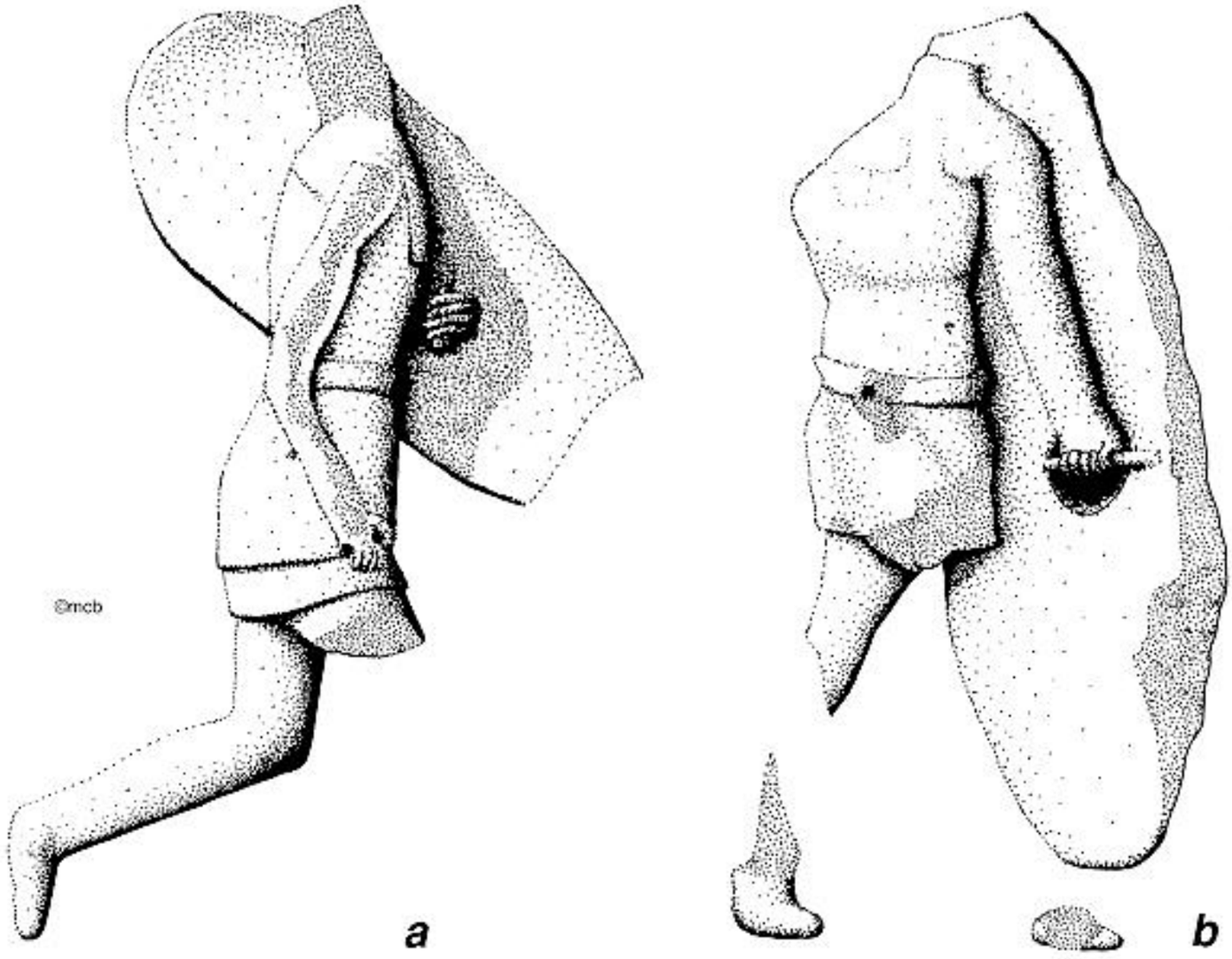
Ideally, the study of stone sculpture involves the first-hand examination of individual pieces. If this seems obvious, then it must be said that many scholars rely solely upon photographic publication without personally examining the material. Naturally, there are practical and financial limitations to field and museum work, but however 'famous' and well-published the piece, it ought to be revisited wherever possible. Indeed, it is very difficult to take one photograph of a stone sculpture which shows all of its detail. Again ideally, each sculpture should be published with a series of general and detail photographs taken in a variety of lighting conditions. Above all, it should be drawn in a manner which records all the features and deals with it as an archaeological artefact.[2]

A very extensive literature deals with the representational evidence. Much of it is useful for the context and dating of finds and for their present location, but only a small proportion of publications deal directly with the military equipment content. Most of the major propaganda monuments are dealt with in monographs, whilst smaller pieces are often to be found in museum catalogues or in the regional corpora. However, the geographical coverage of the latter is generally limited to western and central Europe, with Spain, North Africa and the Levant poorly represented. This situation will doubtless improve, especially due to the *Corpus Signorum Imperii Romani*.[3]

For present purposes, the representational sources may be conveniently reviewed in a number of very broad categories: propaganda monuments; funerary monuments; miscellaneous and non-Roman sculptures; and minor works. These groupings are neither mutually exclusive nor to be seen in any way as an order of value. The prominence accorded to stone sculpture is of course a result of its durability in comparison with other media.

Propaganda sculpture

Most Roman sculptures were in some sense created with propaganda intent, whether on a triumphal arch commemorating an emperor's victory, or on a gravestone advertising the deceased man's status and achievements. In this study 'propaganda' is taken to mean works with a specific public message erected by rulers, public officials or emperors. Soldiers appear principally in representations of imperial journeys (*profectiones, adventus*), ritual sacrifices, the public burning of debt-records, speeches to the troops (*adlocutiones*), battles and triumphal processions. Naturally, the largest viewing public was in the capital, so most propaganda monuments were erected in Rome or Constantinople.[4]



1 Details from the Aemilius Paullus monument (Delphi). *a* Legionary running; *b* legionary standing. (Not to scale.)

The major limitation of propaganda works for present purposes is that they were largely the product of metropolitan sculptors, often men trained in a Hellenizing style, whose knowledge of military matters was restricted to the guard units in Rome. They were concerned to display the human form unobscured, for example, by large cheek-pieces, shields or horses. Moreover, the human figures were often composed in stereotyped groupings which owed more to religious ceremony, court ritual or writhing Greek battle motifs than to the realities of Roman warfare. The minutely accurate rendering of military artefacts was unlikely to have been the main objective. On the other hand, sculptors were often consummately skilled at naturalistic carving, and in Rome they invariably worked with the finest marbles, the compact structure of which took the highest degree of carved detail.[5]

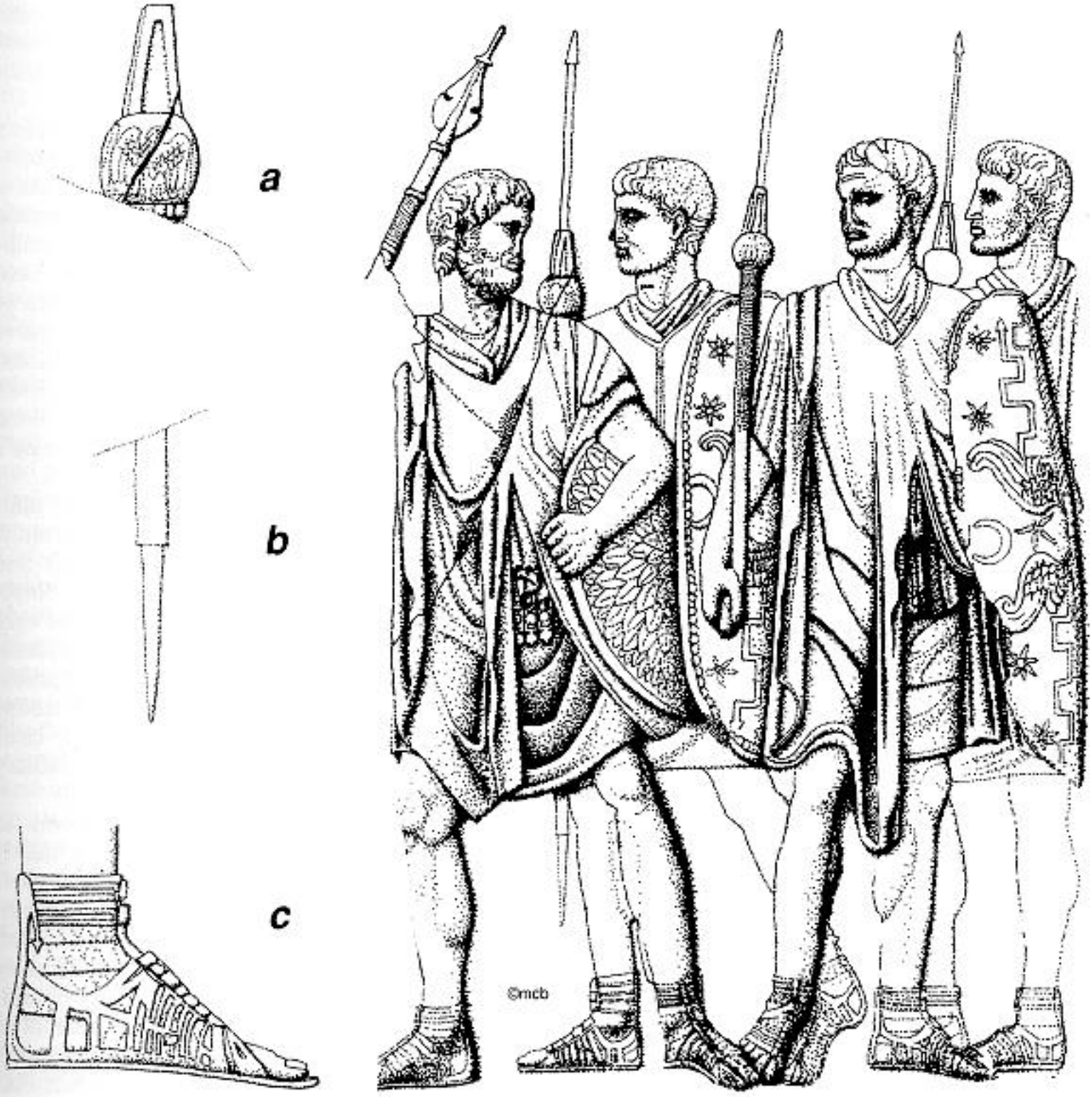
In the atmosphere of public service and political rivalry of the Republic few propaganda monuments bearing military figures were erected. Exceptions are the so-called Altar of Domitius Ahenobarbus in Rome (see Fig. 19), which depicts soldiers attending ritual sacrifice (first century BC), and the Monument of Aemilius Paullus (Fig. 1) erected by the Greeks at Delphi to commemorate the victor of Pydna (168BC). Both show Roman mailed infantry with long, curving oval shields.[6]

During the Julio-Claudian period there were plenty of celebrated successes but few monuments with figural sculpture, and fewer still with representations of soldiers. The arch at Orange (probably of Tiberian date) has Romans and Gauls, infantry and cavalry, in Hellenistic-style combat scenes on its attic. Mail and scale armour, contemporary helmet forms and legionary shields appear. On the piers of the arch, piles of equipment (*congeries armorum*) provide interesting 'still life' representations of shields, standards and saddlery. Other exceptional depictions of armoured soldiers were probably carved on the Arch of Claudius in Rome but, if surviving fragments are correctly ascribed, the figures were in archaizing style with Hellenistic helmets, muscled cuirasses and hoplite-

grip shields. Only one group, the Louvre 'Praetorians' panel, now with an assured Claudian (not Hadrianic) dating, was affected by contemporary equipment practices.

What did develop as an important propaganda genre was the depiction of the emperor with his military escort as he would have been seen in triumph or moving around the capital. This appears first on coins (see below, p. 32), but from the Flavian period onwards also in monumental sculpture. Soldiers are equipped with military belts, shields and weapons, but hardly ever with helmets or body armour. Prime examples are the Flavian Cancelleria Reliefs (Fig. 2), as well as the '*Anaglypha Traiani*', the Hadrianic Chatsworth Relief, all from Rome, and panels on Trajan's Arches at Pozzuoli and Benevento.[7]

This unarmoured convention continued into the late Empire, but depiction of soldiers at war changed radically with, and after, the erection of Trajan's Column in Rome (AD113). For the first time in the capital a vast number of armoured soldiers in contemporary equipment were represented on one monument. A 200 m- (656 ft-) long spiral frieze winds up the column shaft in anticlockwise fashion, bearing 2639 carved human figures at half life-size (Pl. 5). These take part in a loose narrative of Trajan's two Dacian wars (AD101–2 and 105–6). They represent citizen



2 Details from Cancelleria Relief A, Rome. *a Pilum* weight; *b pilum* butt; *c caliga* and sock. (Not to scale.)

troops wearing the earliest indisputable '*lorica segmentata*' in Roman art, auxiliary infantry and cavalry in mail, irregular troops, and the various enemy ethnic types. Amongst the latter are Sarmatian cavalry, virtually the only armoured barbarians to appear in Roman art. Clear distinctions are made between citizens and *peregrini* in equipment, standards (the auxiliaries generally have none) and military roles. The rare involvement of citizen troops in fighting contributes to the presentation of Trajan's skilled generalship.[8]

The Column stands on a pedestal, the four sides of which are carved with captured barbarian equipment, presumably modelled on *spolia* from Trajan's triumph. Whilst the artists may have devised their own space-filling decoration on shields and helmets, they faithfully reproduced small details of single- and double-handed Dacian swords (*falces*), *draco* standards, helmets, archery equipment and scabbard-fittings.[9]

Robinson's main contribution to Trajan's Column studies was to point out that the traditional interpretation of auxiliary armours as made of hardened leather was mistaken, and that metallic mail was everywhere depicted. Moreover, the detailed fittings of '*lorica segmentata*' prove to be useless and misleading for reconstructing this armour form. The column's main shortcoming is that the sculptors were unfamiliar with much of their subject matter. With such a large number of figures they were forced to work in a shorthand of 'figure types' (citizen soldier, auxiliary, officer etc.). This categorization served to distinguish visually the status of individuals, but it may also have imposed an unrealistic degree of equipment uniformity. Some figure types, such as archers with long skirts, were artificially created using barbarian *spolia*.[10]

Until recently Trajan's Column has dominated most fields of Roman army studies, particularly where castrametation and equipment were concerned. Taking into consideration stylization, sculptors' mistakes and recent developments in artefactual studies, the column does not offer much independent information. The latter may be summarized as the presence and equipment of certain irregular troop types and barbarians, and the visual appearance of contemporary standards, tents and artillery.

Another Trajanic monument in Rome is represented by four panels reused on the Arch of Constantine and various fragments scattered amongst museum collections. This is the 'Great Trajanic Frieze' which depicts Trajan accompanied by Roman infantry wearing '*lorica segmentata*', and cavalry. There is some controversy about the sculpture's original context, but the majority view favours a position within Trajan's forum complex. Many features of horse-harness, scabbard and belt-fittings, and *falces* may be paralleled by artefacts and non-metropolitan sculptures. Great attention to detail is a function of the more than life-size scale.[11]

All the soldiers wear an 'Attic' form of helmet characterized by a narrow neck-guard and a plate across the front of the bowl. This type is very common in propaganda sculpture and it is quite different from the majority of contemporary artefacts, suggesting that Hellenistic artistic licence was at work. However, 'brow-plate' helmet finds do exist. Standards and unit emblems on the Frieze probably identify all the men as Praetorians, and guard units in Rome may have used such helmets.[12]

A further monument associated with Trajan's Dacian wars is the Tropaeum Traiani at Adamklissi, for which epigraphic evidence suggests a date of AD108/9. It consisted of a great rotunda decorated with a metope frieze and other sculptures. Some 49 of the original 54 metopes have survived and each is sculpted with a vignette of Danubian warfare. The confinement of figures within rectangular frames imposed limitations, but the attention to verifiable equipment detail suggests that military sculptors executed these reliefs, providing a perfect foil to Trajan's Column.[13]

The metopes have most in common with military gravestone figures (see below, p. 26) and show legionary troops in mail and scale armour (see Fig. 50), not '*lorica segmentata*'. Helmets correspond with known artefacts and drilled holes were used as an unmistakable mail convention. Overall, the metopes show less uniformity of equipment than does Trajan's Column, and citizen troops bear the brunt of the fighting. However, clear distinctions between legionary and auxiliary equipment are maintained.

Trajan's Column deeply influenced second- to third-century sculptors in Rome. This is clearly demonstrated by some *congeries armorum* reliefs which were carved into the Antonine period with progressive stylization and diluted ethnic content. Every post-Trajanic monument in Rome depicting armoured soldiers cannot be evaluated in isolation, but must be compared with the column to trace divergences from the original figure types. For example, on two sides of the Antoninus Pius

Column pedestal a *decursio* of cavalry surround a group of Praetorian infantry. The latter wear '*lorica segmentata*' which differ from Trajan's Column armours in having multiple chest-plates and a scalloped undergarment. It can be argued either that these represent real differences in equipment practices, or that they are merely a slide into artistic embellishment.[14]

The greatest plagiarism of Trajan's Column occurred with the erection of the Column of Marcus Aurelius in Rome. No inscription survives on the latter's pedestal so it is undated, and estimates for its completion range from the reigns of Commodus to Caracalla. Again, a spiral relief frieze depicts trans-Danubian warfare, in this case Marcus' Marcomannic wars. Much of the fine carved detail on Trajan's Column is invisible from more than a few metres away, and spiral scenes are crowded. In consequence, sculptures on the Marcus Column were greatly simplified.[15]

The military equipment on the Marcus Column appears at first to follow the conventional citizen/non-citizen distinction but the sculptors played visual games within figure groups by alternating armour types in rhythms of scale–mail–plate. The '*lorica segmentata*' of citizen troops lack the detailed fittings of Trajan's Column but like the Pius Column they often have multiple upper torso plates and a protruding scalloped undergarment or a skirt of protective strips (*pteruges*). Helmets are likewise increasingly stylized; shields are poorly depicted, small and flat, and generally lack detailed decorative blazons. On Trajan's Column most hand-held weapons were provided as metal inserts, but on the Marcus Column they are rendered in stone. All the shafted weapons are spears because slim, stone *pilum* shanks would have been sculpturally impractical. Of greater significance is the appearance of peltiform scabbard-chapes alongside the triangular type which is depicted on Trajan's Column. These, like the *pteruges*, may indeed reflect contemporary equipment changes. Moreover, new figure types were introduced on the Marcus Column, including an auxiliary horse archer, and unarmoured irregular spearmen and archers.[16]

Some of these new armour features also appear on a series of panels dating to the reign of Marcus Aurelius, and reused on the Arch of Constantine in Rome. Arm- and long skirt-*pteruges* indicate the presence of an undergarment worn between tunic and '*lorica segmentata*'. Scale and drilled mail armours correspond with those on earlier monuments, but a new representational convention consists of single drilled holes within a framework of lines. This may be an experiment in mail or a padded undergarment with *pteruges*. A strap with an ivy-leaf terminal hanging from a scabbard is a new feature. Otherwise the equipment on these panels and other fragments of Antonine sculpture is formulaic.[17]

The process of reducing sculpted detail continued through into the Severan period. The Arch of Severus in the Forum Romanum at Rome (AD203) bears four huge rectangular panels depicting the operations around four cities in Severus' eastern wars. Roman soldiers wear muscled cuirasses, mail, scale or '*lorica segmentata*' (the last time the latter are seen in Roman art). All the auxiliaries have armour, except some small groups in tunics alone which correspond to irregular troops on the Marcus Column. Shields are all oval and flat, and the only detail not seen on earlier monuments is a weighted *pilum*. Armoured Roman figures appear on triumphal friezes below the city panels. Despite damage, it is clear that carved detail was not lavished on equipment. In contrast, the arch's pedestal reliefs are more naturalistic and conservative in style. They include soldiers with *paenulae*, who also have short swords and triangular chapes; they would not look out of place on a Trajanic or Hadrianic monument. Overall, the arch combines the increasingly bland conventions derived from Trajan's Column with the unarmoured genre discussed above.[18]

The Arch of Severus at Leptis Magna commemorated the eastern campaigns with one city siege scene. The same armour types appear as in Rome and a *testudo* of shields is copied directly from the Columns of Trajan and Marcus. Large-scale friezes with ritual and processional content include two soldiers in mail and Attic helmets.[19]

The wars and usurpations of the third century created a hiatus in propaganda sculpture between Severus and Diocletian. The latter visited Rome for the first time to celebrate his twentieth anniversary of rule, and military reliefs from two of the associated propaganda monuments survive. The first is the so-called Decennalia Base in the Forum Romanum, which shows unarmoured standard-bearers and officers. A pedestal from the destroyed Arcus Novus (AD293), now at Florence, shows a soldier wearing an Attic helmet and muscled cuirass, clearly demonstrating that, despite declining patronage, Hellenistic conventions continued. A third piece in Tetrarchic style, but of unknown provenance, now in the Vatican Museo Chiaramonti, may come from the same arch. This

shows two soldiers with round shields, conical helmets and long-sleeved mail or scale cuirasses.[20]

Devolution of the imperial office under the Tetrarchs involved the use of multiple, regional capitals, and thus a proliferation of propaganda monuments. Of these, the best surviving is the Arch of Galerius in the palace complex at Thessalonike. Three out of eight piers of a two-way arch still stand, two bearing a total of 28 superimposed relief registers. Genre scenes of battle, barbarian submission and imperial ceremony commemorate both the cohesion of the Tetrarchy and the eastern campaigns waged by Galerius. Three types of soldier are figured: unarmoured with large circular shield and spear; scale-armoured with conical helmet, circular shield and spear; and muscled-cuirassed officers. The carved detail is bland and functional, apart from the shield-blazons.[21]

Although not strictly Tetrarchic, the Arch of Constantine in Rome (AD315) has close stylistic affinities with the monuments just discussed. In the aftermath of Constantine's victorious entry into Rome, the huge arch was erected using materials taken from earlier buildings in a monumental pastiche. The heads of emperors were simply updated by recarving. The relevant fourth-century military contributions were portrait busts in the passageways, a narrow frieze running around the piers and reliefs on the façade column pedestals. The latter show muscled cuirasses and Attic helmets, in the Arcus Novus style, and large oval shields (one with a blazon). The frieze has four types of soldiers: infantry and cavalry with crested Attic helmets, occasionally 'horned', and large or small oval or circular shields, but no body armour; muscled-cuirass officers; unarmoured infantry archers; cavalry with small oval shields, scale armour and Attic helmets. The figures lack small carved details such as shield-blazons.[22]

These Tetrarchic/Constantinian reliefs represent both continuity and change from the Trajan's Column tradition. Not only are details of equipment different, but so is stylistic emphasis. The concern for unobscured display of the human form is less marked, so, for example, tunics are not shortened to reveal more of the legs. In common with the Arch of Galerius, not all the Constantinian shields were scaled down in size. Now that all soldiers were citizens, armour was no longer employed to denote status. However, there was a new emphasis on scale armour which stemmed from its increasing artistic popularity during the third century (see below, p. 28). On the side of continuity, the Attic helmet still appears without any reference to contemporary helmet types, and the unarmoured convention persisted. Muscled cuirasses gained a representational prominence for common soldiers that they had not enjoyed since the Julio-Claudian period. Pedestal reliefs were the most conservative parts of Severan, Diocletianic and Constantinian arches perhaps because more skilled sculptors worked on the larger-scale figures, whilst smaller work was done by less classically trained (sarcophagus?) carvers.

Imperial residence at Ravenna or Constantinople effectively ended traditional propaganda projects in Rome. Thus the last three large-scale monuments relevant to this study are all in Istanbul. These are the Obelisk Base and Column of Theodosius I, and the Column of Arcadius. The obelisk base has reliefs on its four sides depicting the court and public attending hippodrome games. The imperial family is accompanied by unarmoured guardsmen who wear tunics and torques, and carry large plain oval shields and spears.[23]

The Column of Theodosius has been demolished but fragments and antiquarian sketches survive. The pieces depict Roman infantry in long-sleeved tunic, muscled cuirass with *pteruges*, a variant of Attic helmet, and carrying a large round shield with Christian *chi-rho* blazon. Sleeve length, shield size and blazon are contemporary features, but the Hellenistic elements cannot be ignored. Furthermore, shields are seen to be carried not with a central, horizontal grip, but with the traditional Greek hoplite method with a vertical handle just inside the rim.

The Column of Arcadius likewise survives in a few pieces and a more useful set of sixteenth-century sketches. The majority of men were probably unarmoured and carried round or oval shields with geometric and Christian blazons. The main fragment is extremely weathered but the hoplite shield grip is clearly used.

Imperial portrait statues fulfilled an obvious propaganda role, but first- to second-century cuirassed examples are too formalized to provide useful information. Some third-century examples do incorporate contemporary belt types and fittings. Tetrarchic and later porphyry portraits, especially the cuirassed Tetrarchs at Venice and a series of cloaked (*chlamys*) statues, are much more informative about swords and belts.[24]

Funerary monuments

This class includes all representations of soldiers and military equipment in funerary contexts. Most

common are gravestone figures (bust, half-length or full-length) which show the deceased in military attire to advertise his status and profession to people passing the grave. Figures are sometimes associated with larger monuments such as mausolea, and a building could also be decorated with friezes of arms. Sarcophagi might have scenes of battle and barbarian submission on their sides. With both friezes and sarcophagi there is less assurance that the deceased was a soldier in life since warfare and its attributes probably came to symbolize the struggles of life and victory over death.[25]

Depiction of the dead on standing gravestones (*stelae*) had a long history in the Classical Greek and Hellenistic world. Roman examples appear in the later Republican period in Italy. Generally they depict half-figure officers whose rank is made clear by a sword and muscled cuirass with *pteruges*. The *stela* of a centurion from Padova most unusually shows a full-figure man (see Fig. 20). He is unarmoured and carries sword, dagger and centurial staff. In the early first century AD the practice of erecting figural *stelae* spread out from northern Italy (where it continued) to the Rhineland armies. Three main classes of representation developed: standing soldier (full-length and half-figure); riding cavalryman (*Reitertyp*); funerary banquet (*Totenmahl*).[26]

The first of these main classes shows the deceased standing frontally, commonly unarmoured, but wearing military belts and side-arms (see Fig. 143). Sometimes he carries a scroll, sometimes his shield and shafted weapons. This is the equivalent of the 'unarmoured' genre of propaganda sculpture. When a *lorica* is shown it is sometimes carved with scales, as on two examples at Verona. More commonly the stone was smoothed off, ready perhaps to take a fine plaster (*gesso*) and paint coating on which scales or mail rings could be delineated. Robinson convincingly disproved the traditional view that the smooth garments were leather 'jerkins'. To be protective, leather had to be hard and stiff, but the large shoulder-pieces of the gravestone garments indicate that they were flexible. Drilled holes were almost never used as a mail convention, but gesso and paint could have allowed a high degree of detail to be applied to locally available stones. The latter were often softer than the fine-grained marbles used in the capital, but this did not prevent some features being carefully decorated, in particular the belts, scabbards and sheaths. Helmets are seldom worn in order that the man's face be unobscured, but the *stelae* of C. Valerius Crispus (Wiesbaden) and C. Castricius Victor (Aquincum) are two exceptions of the late first to early second century AD (Fig. 3). Rank could be indicated by a muscled cuirass for senior officer, *vitis* for centurion, long staff for *optio*, *signum* for standard-bearer, or horn for musician.[27]

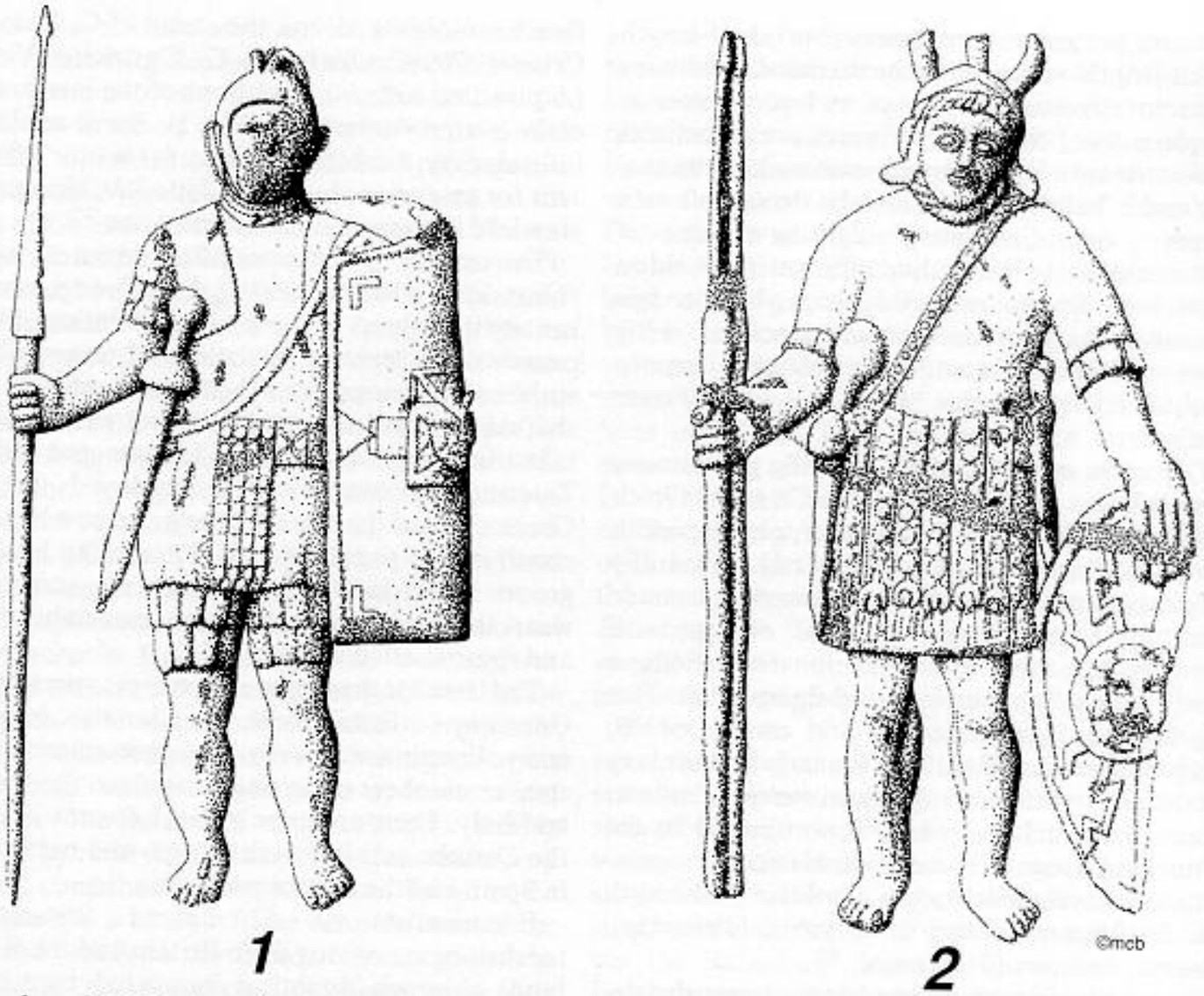
The cavalry gravestones often depict an *eques* riding down a barbarian (Fig. 4,1). The deceased is usually armoured in the plain convention, but is occasionally depicted in scale, and wears a belt, scabbarded sword and helmet. A shield and shafted weapon are carried. Great care is often taken in depicting the horse-harness and saddle. *Totenmahl* stones (Fig. 4,2) employed the old Greek motif of the deceased reclining on a banquet couch in one panel, and his horse being led by a groom (*calo*) in a second. The *calo* sometimes wears the dead man's armour and carries his shield and spare shafted weapons.[28]

The taste for these gravestone types spread from Germany to Britain with the Claudian invasion army. Erection was a regional phenomenon with smaller numbers occurring away from these areas and Italy. There are some in Gaul, fewer still along the Danube and in North Africa, and hardly any in Spain and the eastern provinces.

Examination of 82 figured first-century tombstones surviving from Britain and the Rhineland, although doubtless hampered by various unknown depositional biases, reveals that 38 per cent belonged to infantrymen (13.5 per cent legionary, 13.5 per cent auxiliary, 11 per cent uncertain) and 56 per cent to auxiliary cavalrymen.[29]

Military *stelae* provide an important foil to metropolitan sculpture because so many details of sword-fittings and horse-harness, for example, are verified by artefacts. The gravestone sculptors were certainly familiar with military equipment, and it is likely that a significant proportion of sculptors were serving soldiers or veterans. The knowledge of artist and client could itself engender mutually understood conventions which mislead modern observers. Horses, shafted weapons and shields were scaled down to fit them into the confines of niches. Belt-plates, scabbards and sheaths were decorated with squared rosette motifs – shorthand for the much finer floriate inlaid 'St Andrew's Cross' designs on actual objects.

Numbers of figural *stelae* decrease in the second century, though they seem to gain a wider geographical currency. However, the sculpting of small equipment details declined. Examples from



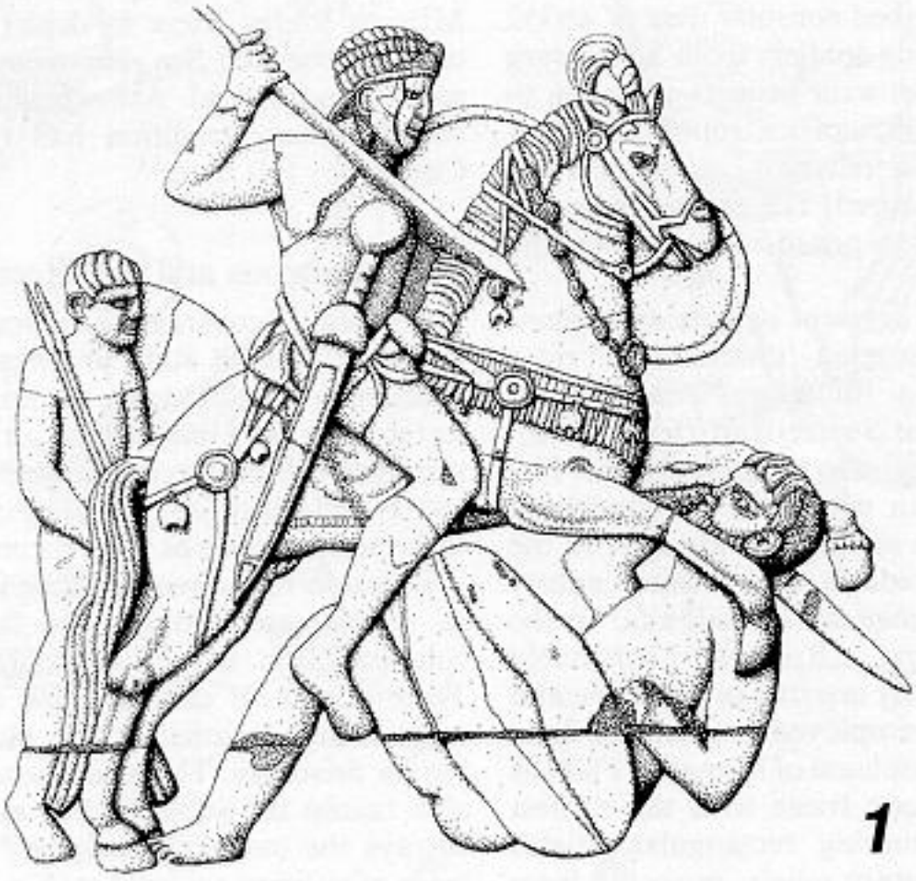
3 Infantry tombstones of the early Principate. *1* Valerius Crispus (Wiesbaden); *2* Castricius Victor (Aquincum). (Not to scale.)

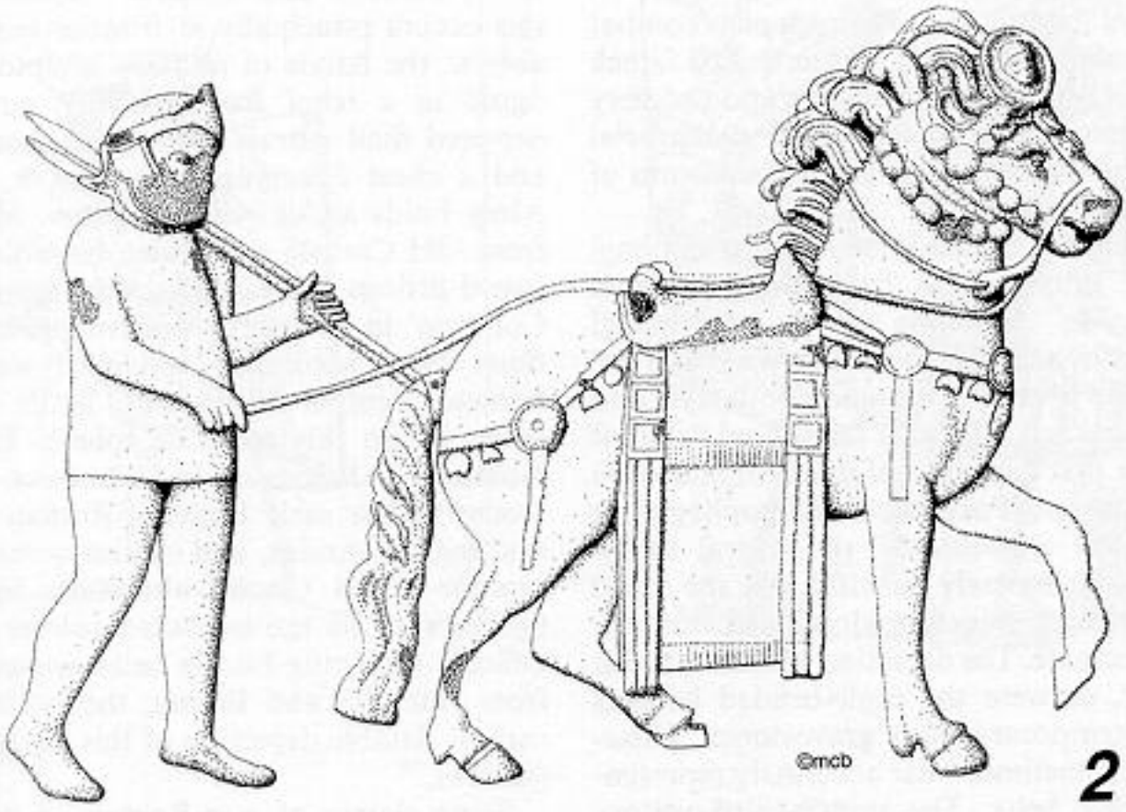
Corinth and Philippi continue the standing soldier and *Reitertyp* genres respectively. Several gravestones occur in northern Britain along the walls of Hadrian and Antoninus Pius, with a particularly fine example at Croy Hill (see Fig. 69). A group of stones from Tipasa in Algeria belonged to Danubian troops campaigning in North Africa during the reign of Pius (see Fig. 70).[30]

The situation changed completely in the early third century when increasing numbers of *stelae* appear (see Figs. 85 and 101). They are most densely distributed in the Upper and Middle Danubian region, and in Rome. It is tempting to ascribe the renaissance of figural gravestones to the political and economic rise of the Danubian soldiery. These men were favoured by Severus' reform of Praetorian Guard recruitment, hence the erection of many *stelae* in Rome. Third-century figural gravestones occur all over the Empire with concentrations at bases of particular strategic importance, such as Alexandria and Apamea. They are very sparse in some other areas, notably Spain, along the Lower Danube and, interestingly, in the Rhineland.[31]

Standing soldiers predominate, and some rider *stelae* are associated especially with the *equites singulares Augusti* in Rome. The latter had always been recruited largely from the Danubian region, and scenes of *calo* and horse(s) appear both in Rome and Pannonia. The vast majority of figures follow the 'unarmoured' convention and the most characteristic feature is the circular ring-buckle at the waist. This is often prominently displayed and, in the absence of an inscription, it is sufficient to identify the wearer as a soldier and the *stela* as a military gravestone. On the best ring-buckle gravestones, care was taken in carving belt- and sword-fittings. However, even with these, there are stylistic simplifications, notably the translation of hinged, heart-shaped baldric terminals into ivy-leaf pendants (see Chapter 7).[32]

Gravestone figures continued to be carved in the Tetrarchic period, after ring-buckles went out of use. Thereafter *stelae* decline in quality, quantity





4 Cavalry tombstones of the early Principate. *1* T. Flavius Bassus (Köln); *2* M. Sacrius Primigenius (Köln). (Not to scale.)

and geographical distribution. They are also less easily datable. Exceptionally, an incised figure at Aquileia has an inscribed consular date of AD352 (see Fig. 121). Standing soldiers from Strasbourg and Linz are crude but wear helmets and seem to have the circular shields of metropolitan sculpture. A few rider *stelae* relate to *catafractarii* but show the men unarmoured. The practice of erecting figural *stelae* appears not to have outlasted the fourth century.[33]

Few figural *stelae* represent equestrian officers. Notable exceptions are an 'unarmoured' rider from Ephesos and a full-figure with muscled cuirass from Sitten in Switzerland (see Fig. 49). Soldiers could also aspire to a funerary altar. For example, a Praetorian centurion is represented flanked by *signa* on a second-century altar in the Vatican Galleria Lapidaria, and a third-century Praetorian holds a *pilum* on a small altar in the Museo delle Terme (Rome). Presumably equestrians were usually interred in mausolea and military imagery was employed in reliefs on these monuments. The mausoleum of Munatius Plancus at Gaeta has a metope frieze with the earliest representations of curving rectangular shields (*c.*20–10BC). Fragmentary reliefs, probably from mausolea at Arlon and Saintes respectively show cavalry in the *Reitertyp* style and infantry in helmets and '*lorica segmentata*'(?). The Augustan mausoleum of the Iulii at St Remy depicts combat between Romans and Gauls in interlocked Greek style, but *pila*, some armour details and saddlery are informative. Even depictions of gladiatorial equipment on mausolea bear upon discussions of military plate-armour.[34]

Lastly, there are the sculpted stone sarcophagi which came into fashion from the Hadrianic period onwards. Antonine 'battle' sarcophagi were inspired by the Marcomannic Wars and are identical to the Marcus Column in both style and equipment depicted. The only additional detail of interest is the first depiction of *draco* standards in Roman use, on the 'Portonaccio Sarcophagus' in and another fine Roman *draco*. Fourth-century Christian sarcophagi ape the Arch of Constantine Milvian Bridge frieze to depict Pharaoh's army crossing the Red Sea. His troops wear the same scale armour and Attic helmets, thus a new contaminatory tradition had replaced Trajan's Column by this time.[35]

Miscellaneous and non-Roman sculpture

This category covers all stone sculpture which did not have Roman state propaganda or funerary functions. For example, a non-imperial stone statue from Alba Iulia depicts an unarmoured life-size third-century AD soldier with ring-buckle belt and sword furniture. *Dona militaria* were shown on honorific statue bases of prominent soldiers.[36]

Pedestals found reused in the Roman town wall at Mainz are thought to have come from colonnades in the Flavian legionary *principia*. Their sides bear carved single or paired figures representing legionaries, an auxiliary and barbarian prisoners. The small, square spaces available cramp the subjects, but attention to detail betrays the (soldier?) sculptors' intimate knowledge of military equipment (Fig. 5).[37]

Military equipment details creep into the depiction of deities whose attributes include armour, swords, shields and shafted weapons. Naturally this occurs principally in frontier regions, probably at the hands of military sculptors. A Mars figure in a relief from Mavilly wears a well-depicted mail cuirass with large shoulder-pieces and a chest fastening-hook, and a Mars from Alzey holds an unweighted *pilum*. Mars statues from Old Carlisle and Aalen have third-century sword-fittings. Equestrian statues topping 'Jupiter Columns' in the north-western provinces sometimes have accurately modelled saddlery and harness. Temple friezes with battle scenes also come within this religious sphere. Examples in museums at Palestrina and Mantova (both from Rome?) show early Imperial

variety of ways, for example using a wooden rivet to attach the shank to the shaft, or not tempering the iron of the shank below the head. Again, modern experiments in throwing *pila* have succeeded in reproducing the sort of bending seen on the shanks of excavated examples.[6]

Since it has always been readily identified with the Roman legionary soldier, the *pilum* has attracted a considerable amount of scholarly attention, largely focusing upon the problem of its origin. Arguments in favour of a Samnite, Spanish or Etruscan origin have been advanced, but no satisfactory conclusion has been reached. There certainly seem to be representations of it on fourth-century BC frescoes from the Giglioli tomb at Tarquinia. However, the fact that two versions of the weapon existed, the heavy and the light, may be indicative of separate traditions that finally converged in Roman armament.[7]

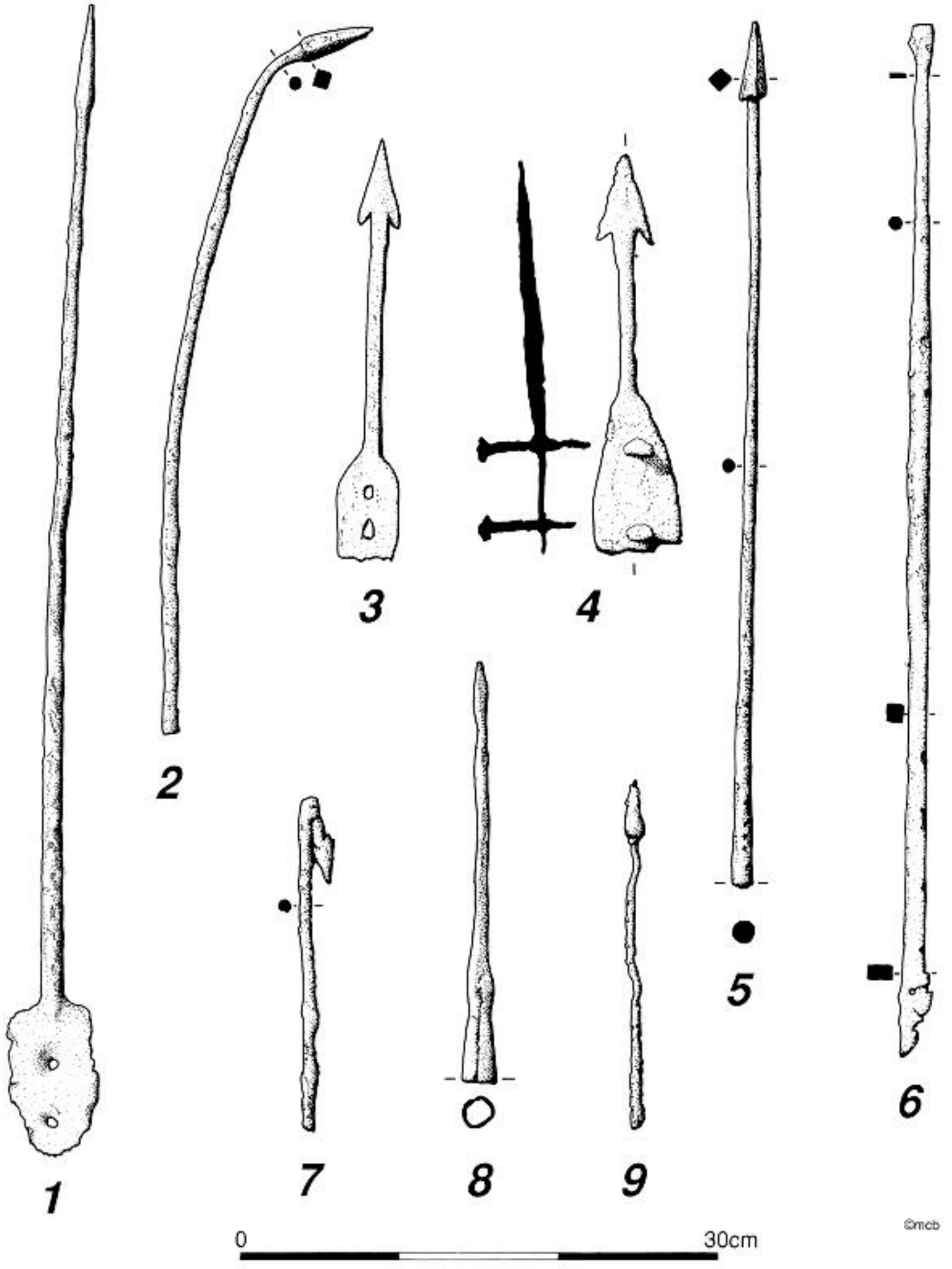
20 Tombstone of centurion Minucius (Padova). (Not to scale.)

The classic description of the Republican *pilum* comes down to us in Polybios' writings, providing the interesting detail that *pilum* heads were apparently barbed and solidly constructed. Heavy and light types are recognizable amongst the few specimens surviving in the archaeological record. The heavy *pilum* tended to be tanged, whilst its lighter cousin was socketed, but socketed heavy *pila* are also known from this period.[8]

Actual examples of the weapon are few and far between, the earliest possibly being those recorded from Telamon in Italy (thought to date to the last quarter of the third century BC), but the best known are those from the Roman camps around Numantia. There are likewise examples from Cáceres el Viejo, and both Alesia and Entremont. Most of the published examples have pyramidal heads and circular-sectioned shanks, although examples with barbed heads are known from Telamon, Alesia and possibly Renieblas.[9]

The most complete of the examples of the heavy *pilum* from Spain is that from Renieblas. With a head 60 mm (2 in) long, a shank of 554 mm (22 in), and a tang 90 mm (3½ in) long and 55 mm (2 in) broad, it was fastened to its shaft by means of two rivets through the tang, 35 mm (1½ in) apart. Other shanks of similar length also survived, at least one of which had a socket, but there were several other examples with a flat tang with rivet holes, and all probably had circular-sectioned shanks. A tanged weapon from Peña Redonda is rectangular in section at the tang, square in the lower part of the shank and circular towards the head, which appears to have been flat.[10]

The lighter *pilum* was usually socketed; complete examples are known from Renieblas and Castillejo. The length of the head of the weapon from Renieblas measured 20 mm (¾ in) to its broadest point, from where it measured 232 mm (9 in) to the socket base, which was 20 mm (¾ in) in diameter. The head of the example from Castillejo was 22 mm (1 in) long, and the shank 250 mm (10 in) to the base of the socket (again 20 mm (¾ in) in diameter).[11] A number of *pila* were found by Stoffel at Alesia in the circumvallation ditches below Mont Réa. Some were large but most were fairly small by comparison with the largest of the Spanish pieces, presumably belonging to the lighter variety of the weapon.[12]



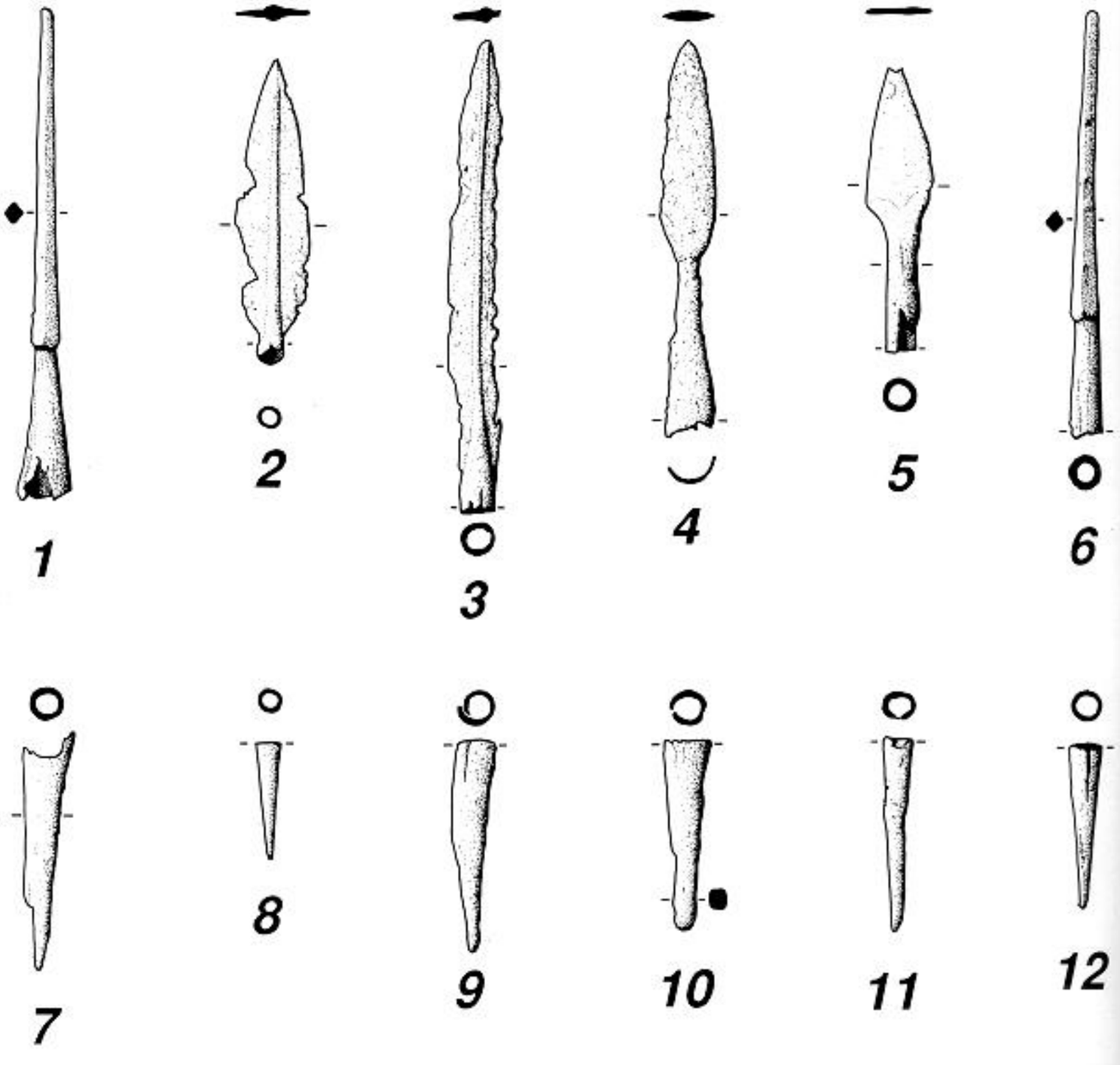
21 Republican *pila*. *1* Numantia; *2* Cáceres; *3* Kranj; *4* Entremont; *5–9* Numantia.

Spears (Fig. 22)

The spear was primarily a weapon for close-order fighting. Unlike the *pilum*, it was not designed to be thrown in a shattering volley before combat was joined (although it *could* be used this way), but instead gave a distinct advantage when fighting against sword-wielding foes. Its unwieldiness was a disadvantage, however, and most Roman spear-armed troops probably also had a sword or dagger. The rear rank of the pre-Marian legion, formed from veteran troops known as *triarii*, were equipped with spears and not *pila*.[13]

The three chief elements of the spear were the wooden shaft (see Chapter 9), the iron head and butt. The head came in a variety of shapes and sizes and its function is self-evident, but the butt would not only have provided a secondary weapon in the event of the head breaking off, but also protected the shaft when it was stuck into the ground. Whilst the range of spearhead forms and

22 Republican spears. *1–6* spearheads (*1–2* Numantia; *3–4* Cáceres; *5–6* Numantia); *7–12* butts (*7* Cáceres; *8* Numantia; *9–10* Cáceres; *11–12* Numantia).



sizes found in this and later periods might appear to indicate a range of types of weapon for different circumstances, the preferences of individual craftsmen must also have played a part in determining the final form.[14]

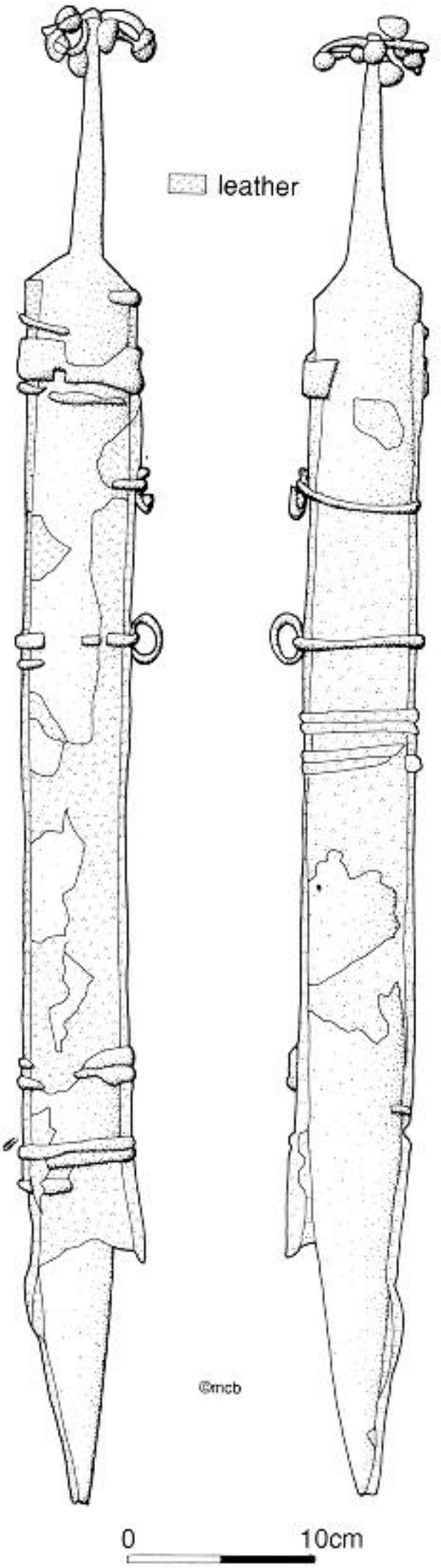
The spearheads of the period are unremarkable and it is impossible to distinguish Roman from allied or enemy weapons. Many forms regularly occur in later periods, such as the curious triangular-sectioned stiletto blades, the function of which is unclear. The conical shape of Republican spear butts was, as later, dictated by ease of manufacture.[15]

Polybios says that the older Roman cavalry spear was too slender and pliant, frequently breaking through nothing more than the motion of the horse, and lacked a spike on the butt. In contrast, the adopted Greek spear was sturdier and its butt could be used as an effective secondary point.[16]

Swords (Fig. 23)

The origin of the *gladius Hispaniensis*, as it has come to be known, is often thought of as quite straightforward: the Romans, encountering the weapon in Spain for the first time were so impressed that they adopted it. Indeed, Suidas stated that it was the form, not the elaborate method of manufacture, that the Romans copied (see Chapter 10). Allied to the blade shape, however, is an implied style of combat, for this is a short sword for close-order fighting, not slashing in the manner of the Celtic long sword. Adoption of this sword, even without its elaborate manufacturing processes, marked the development of new tactics. We may, therefore, presume that it is this Spanish-derived weapon that is worn by the Padova centurion (see Fig. 20).[17]

Only one example of a Republican *gladius Hispaniensis* is yet known, found in excavations on the island of Delos, and associated with destruction by pirates in 69BC. Measuring 760 mm (30 in) in length (including the tang) and around 57 mm (2 in) wide, the sword was still in its scabbard (apparently of leather) with suspension rings and two buckles. Remains of a charred wooden pommel, held in place by seven rivets, were still evident. The pommels of swords, apparently similarly adorned with rivets, are shown on some Republican officers' tombstones.[18]



23 Republican sword. A possible example from Delos.

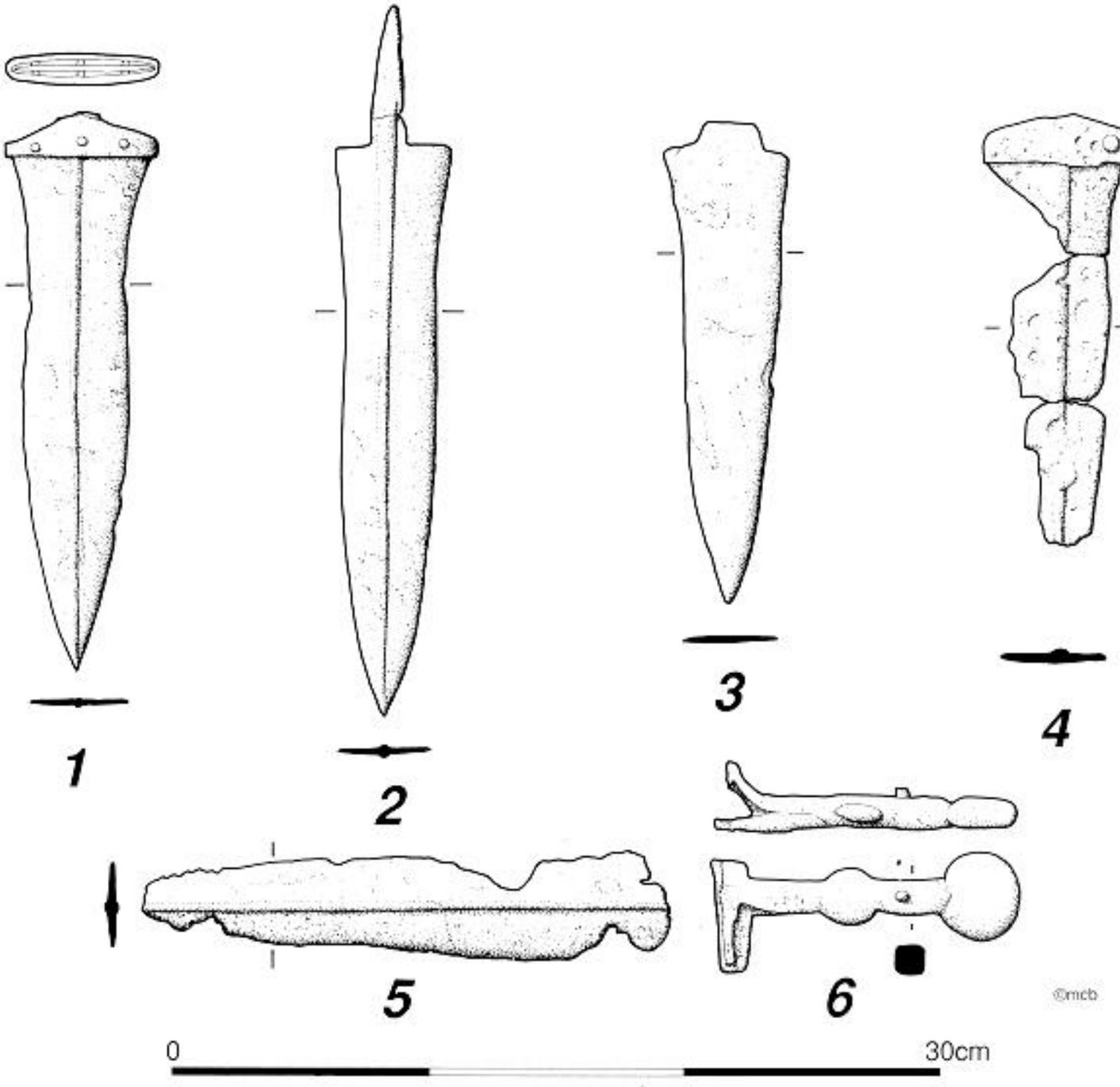
Finds of Celtic long swords in apparently Roman contexts on Spanish sites suggest the use of this weapon by some elements of the Roman forces. Similarly, an example of the Spanish single-edged *falcata*, a more common, native 'Spanish sword', came from Cáceres el Viejo.[19]

Much has been made, both in ancient and modern literature, of the stabbing action necessary to use the Roman short sword successfully, aiming for the stomach or face and coming in under the guard of an enemy brandishing a longer sword overarm. However, Polybios points out that the 'Spanish sword' was as good for chopping as it was for stabbing, and we ought not to allow the fervour of later writers for the stabbing action to mislead us into seeing the sword as unifunctional.[20]

Daggers (Fig. 24)

The dagger as a sidearm for the Roman soldier seems, once again, to have had Spanish ancestry. It is not mentioned by Polybios, but examples from Cáceres el Viejo and Castillejo have close parallels amongst native weapons from the peninsula. The waisted blade (L. 150–200 mm (6–8 in)) had a midrib and a long tip. The handle had a bulbous, almost circular, terminal and a central swelling on an otherwise straight (square-sectioned) handgrip. The hand of the user was protected by a straight handguard riveted through the top of the blade. Precisely this form of dagger is shown on coins commemorating the assassination

24 Republican daggers. *1–3* Numantia; *4–6* Cáceres.



of Caesar in 44BC. It is quite conceivable that the dagger was not in widespread use by Roman troops before the first century BC, given that Polybios ignored it, but it was favoured by their allies (hence its presence on Roman sites). By the time of the destruction of the *legio Martia* in 42BC, the Padova centurion was wearing it (see Fig. 20). Indeed, the Padova relief further reveals that the dagger could be worn horizontally, directly below the waist belt, over the belly.[21]

It has been argued that the dagger from Alesia might be Gallic, but, given the quantities of demonstrably Roman material found there, and the unusual absence of such weapons from Gallic contexts, a Roman identification of this weapon appears secure.[22]

Bows, slings and artillery (Figs. 25–7)

Arrowheads, catapult bolts and stone shot, and slingshot are all archaeologically attested. The last often bore inscribed insults and political slogans cast on to them during manufacture, as with a large group from Perugia. Arrowheads were mostly tanged and of both flat-bladed (some barbed) and trilobate (triple-bladed) forms, whilst socketed catapult bolts had pyramidal heads. Such bolts were recovered from both Spanish and French sites.[23]

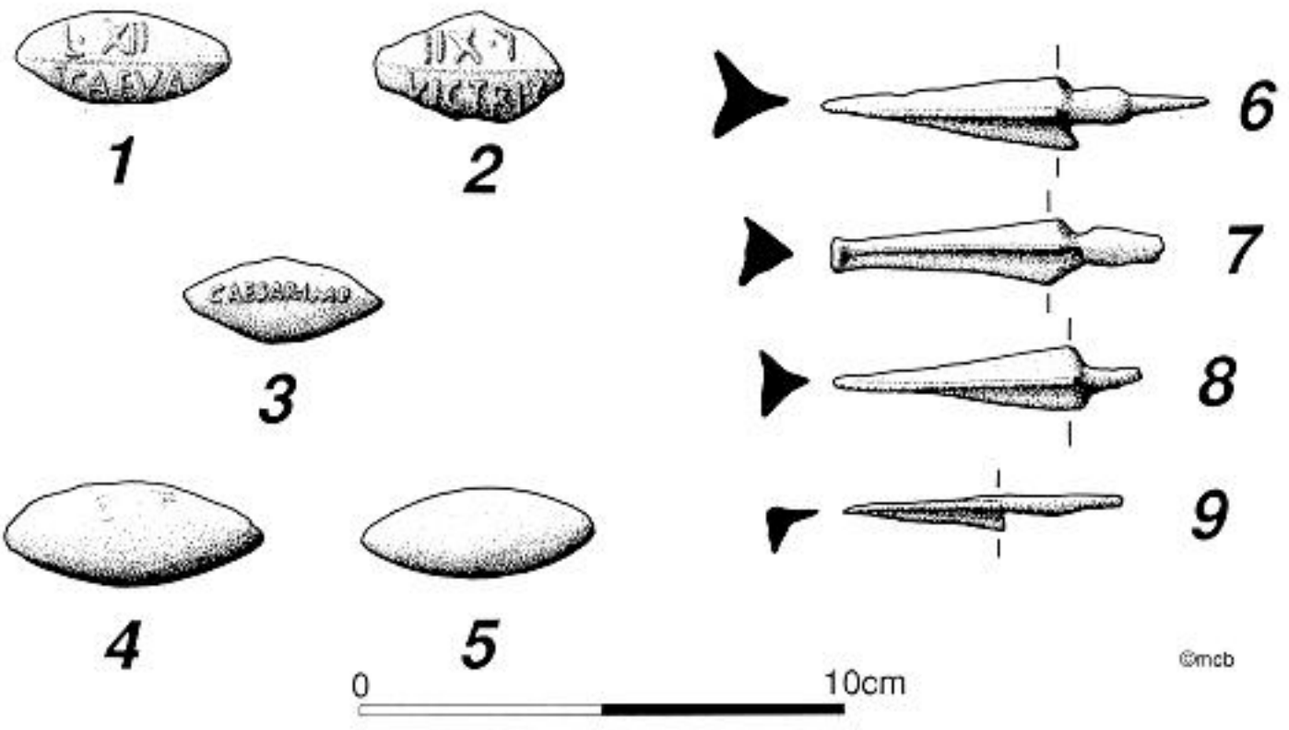
The Romans made use of peoples who traditionally specialized in archery or slinging, whilst they adopted artillery technology wholesale from the Hellenistic Greeks (who became the major enemy after the Carthaginians). Throughout the Roman period, artillery technology was spread by knowledgeable defectors, and this is probably how the Romans acquired it in the first place.[24]

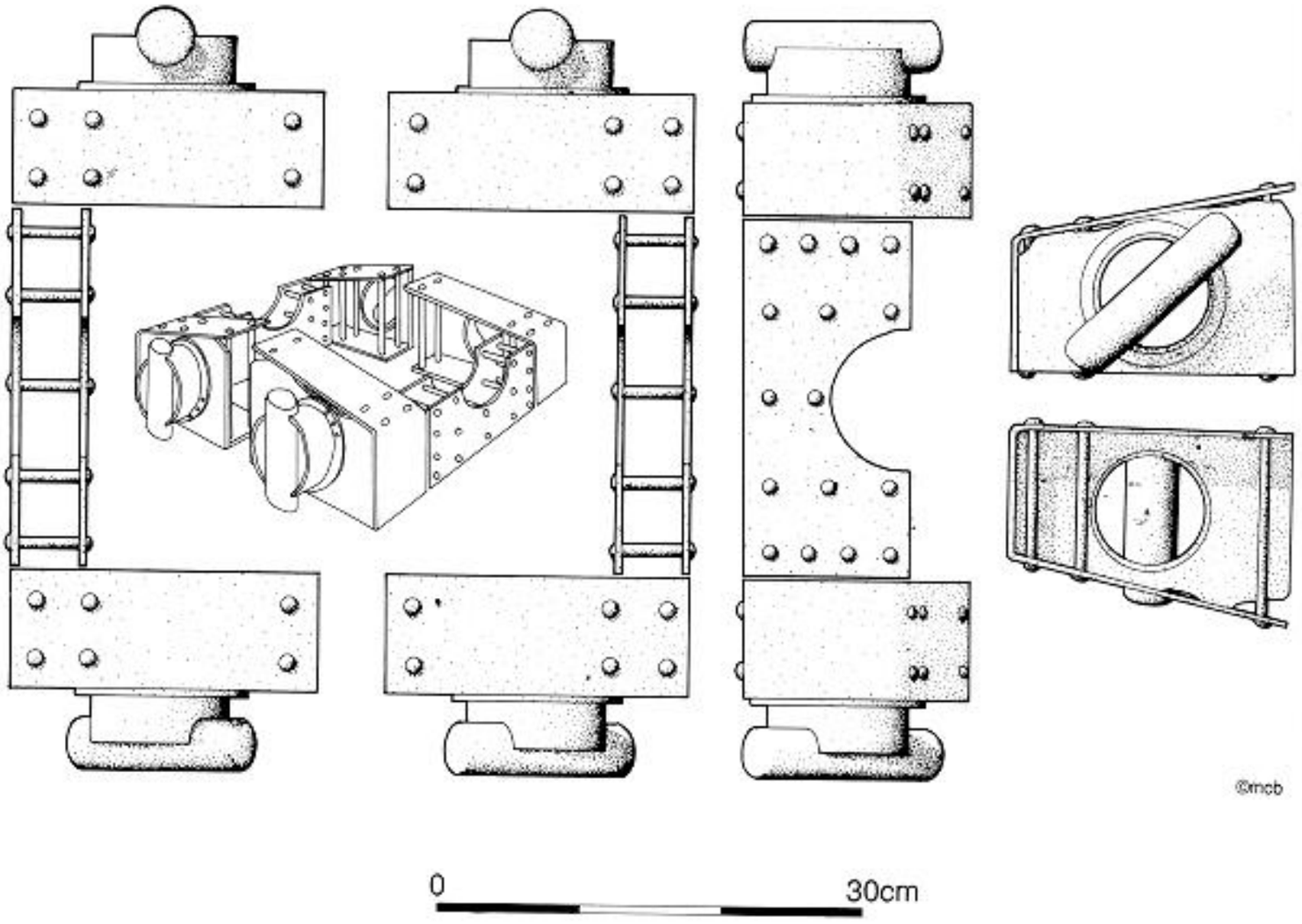
Part of the frame of an artillery piece was excavated at Emporion in Spain, probably dating to the second century BC and possibly associated with the campaigns of Cato. Regardless of whether it was Roman or used against them, it seems to be representative of the artillery in use at the time. Washers of this period also come from Ephyra and from a shipwreck at Mahdia.[25]

Stone shot were found in the circumvallation camps at Numantia, or where they had been fired against the walls of the town itself (indeed, some split shot may be the result of direct impact). They were made from local sandstone and Schulten identified four specific calibres: 10 *mina* (4360 g (154 oz)), 3 *mina* (1308 g (46 oz)), 2 *mina* (872 g (30 oz)), and 1 *mina* (436 g (15 oz)). Ten-*mina* shot were not found in Numantia itself, and Schulten speculated that these may only have been used in the defence of the Roman camps. By contrast, the shot from Cáceres el Viejo were much heavier, ranging from 31 to 88 *mina*, leading Ulbert to suggest that they were designed to be dropped from the walls of the camp, rather than fired from a weapon.[26]

Catapult bolts, like the *pilum*, had square-sectioned pyramidal heads, reflecting their

25 Republican archery and sling missiles. *1–3* Lead slingshot (Perugia); *4–5* baked clay slingshot (Numantia camps); *6–9* trilobate tanged iron arrowheads (Numantia camps).



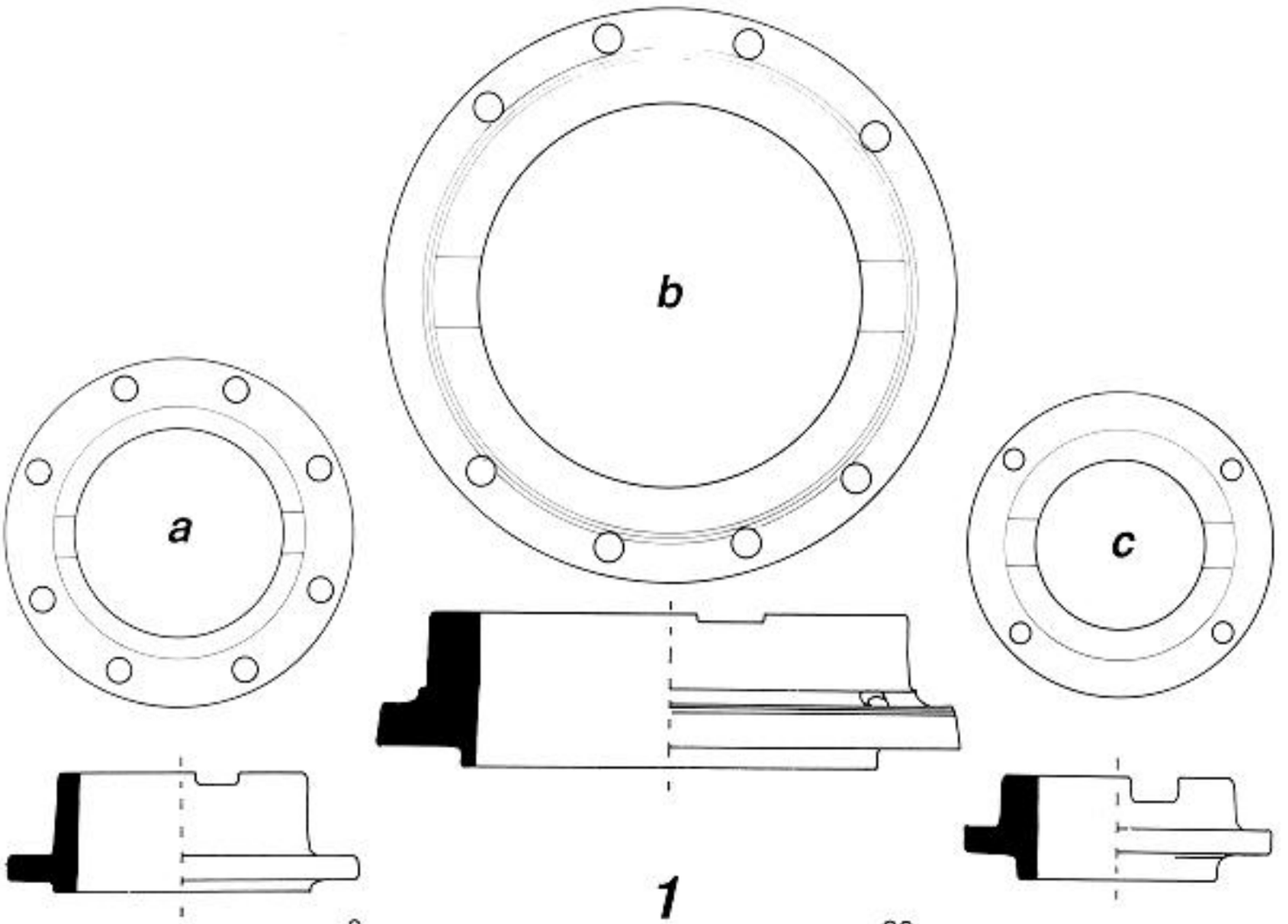


armour-piercing function. Whereas the *pilum* used its weight to provide the impetus for penetration, the catapult bolt relied upon its velocity, and it was precisely this which would militate against the use of a 'leaf-shaped' blade, since any slight inaccuracy in manufacture might lead to the missile diverging from its intended course. It is indeed appropriate that Plautus should refer to the *pilum catapultarium*. The heads of excavated examples normally form about one-third of the length of the metal portion of the missile, although examples have been found where this proportion can be as little as 25 per cent. Socket diameters also vary widely (15–28 mm ($\frac{1}{2}$–1 in)) and, as with the size of stone shot, this may reflect the differing calibres of the machines that shot them.[27]

Modern reconstructions achieve maximum ranges by shooting at an angle approaching 45°, but both bolt- and stone-throwing weapons were probably used in direct shooting, unless it was desirable to lob missiles over a city wall.[28]

26 Republican artillery. Frame and washers from a catapult (Emporion).

27 Republican artillery. *1a–c* Washers (Ephyra); *2a–d ballista* balls of weights of 10, 3, 2, and 1 *mina* (Numantia camps); *3a–f* catapult bolts (*a–d, f* Numantia camps; *e* Cáceres).



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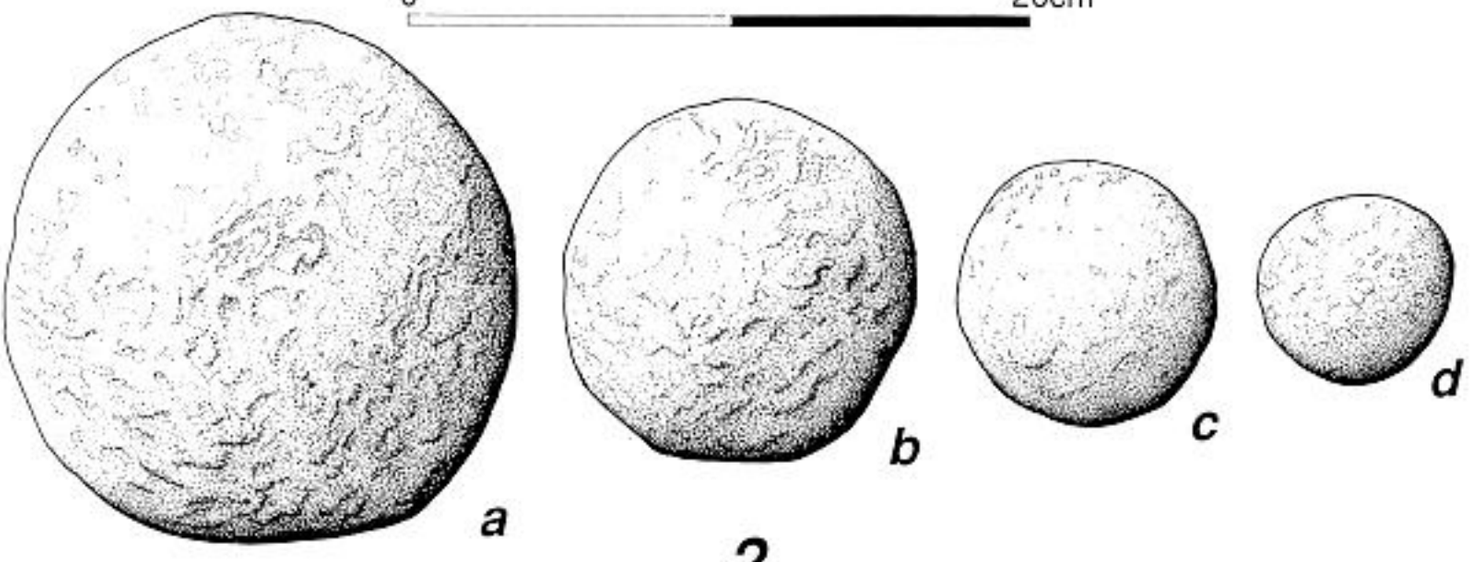

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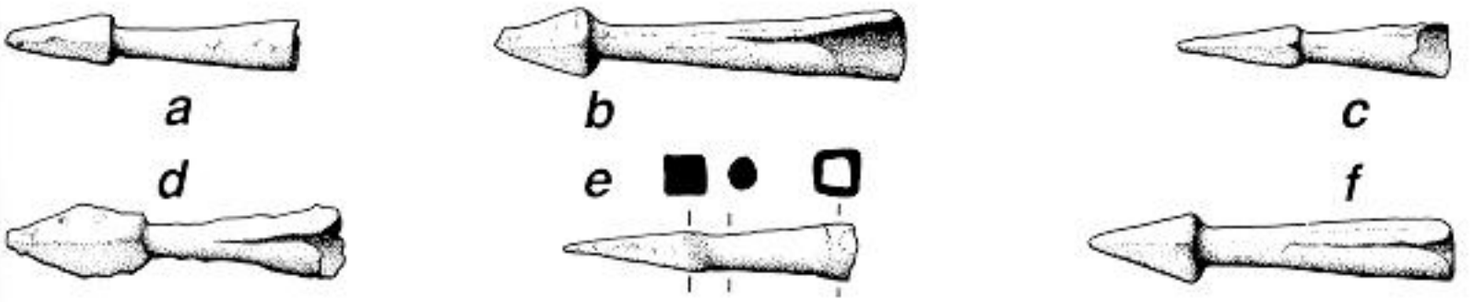


3

Armour

Shields (Fig. 28)

The curved oblong legionary shield (originally called the *scutum*, although this term was soon used for all shields) was an enduring feature of the Roman battle line. Although the shape evolved, it remained basically the same, presumably because it was ideal for the function required of it. Livy says this type of shield was first adopted for all three classes of legionary troops by the Romans during the Latin Wars of the fourth century BC, replacing the round shields previously in use. Representational evidence is now thought to confirm an Italian origin.[29]

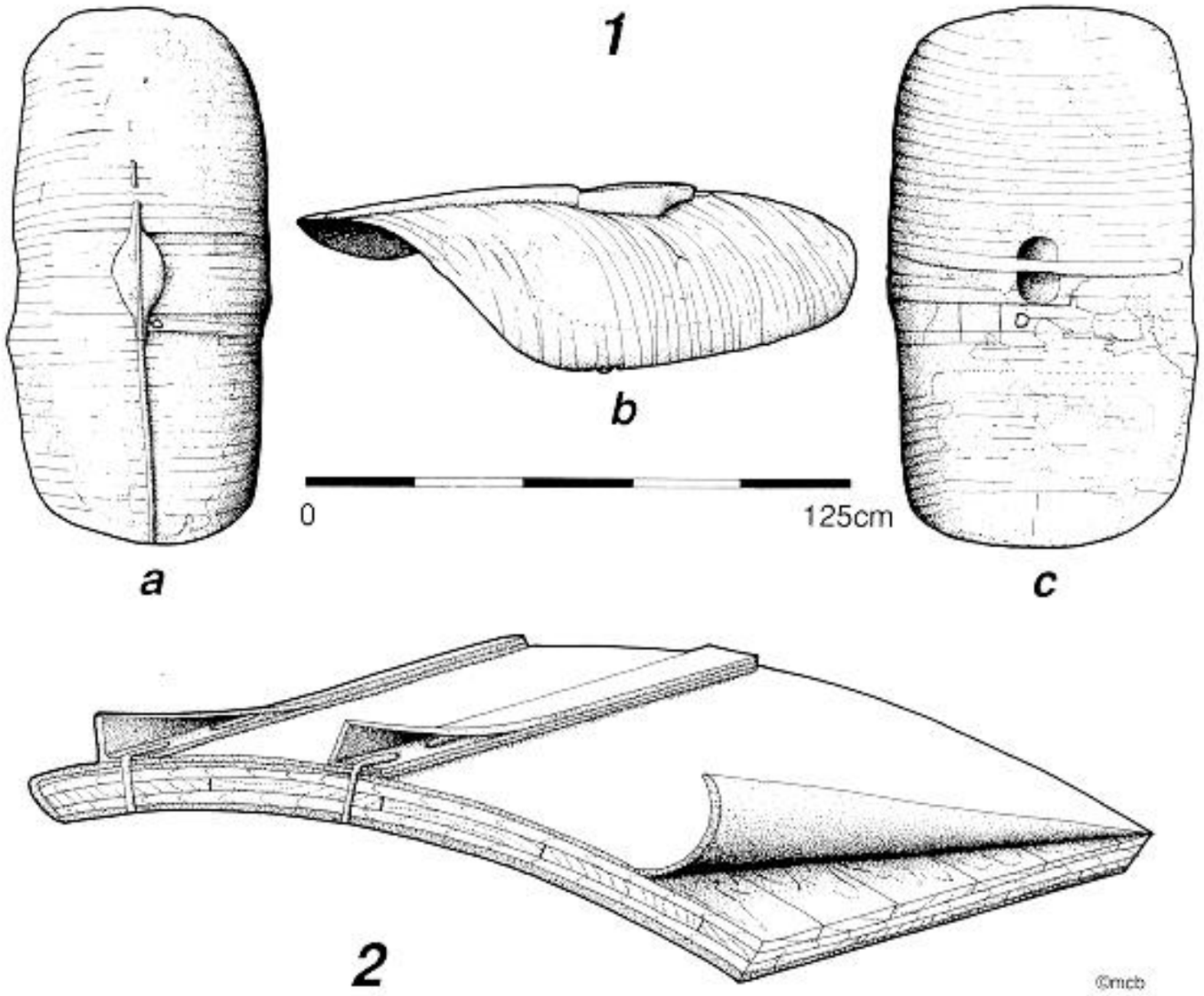
A large, curved plywood shield excavated at Kasr el-Harit in the Egyptian Fayum was originally identified as having belonged to a Celtic mercenary serving with the Ptolemaic forces. However, it is remarkably similar to the sculptural representations of shields carried by soldiers on the altar of Domitius Ahenobarbus and the monument of Aemilius Paullus (see Fig. 1).[30]

Polybios was intrigued by the Roman infantry shield and he stated that it was convex, and measured 4 ft (1.18 m) long by 2½ (0.74 m) broad, with a thickness of a palm's breadth at the rim. He described its construction as follows:

> It consists of two layers of wood fastened together with bull's hide glue; the outer surface is then covered first with canvas and then with calf-skin. The upper and lower edges are bound with iron to protect the shield both from the cutting strokes of swords and from wear when resting on the ground. In the centre is fixed an iron boss, which turns aside the heavy impact of stones, pikes and weighty missiles in general.[31]

By comparison, the shield found in 1900 at Kasr el-Harit, in the Fayum, was 1.28 m long (4 ft; 4.3 Rft) and 0.635 m wide (2 ft; 2.1 Rft), was fashioned from plywood of three layers of wooden strips, possibly birch wood, laid with the outer

28 Republican shields. *1a–c* Example found at Kasr el-Harit; *2* diagrammatic cross-section.



ones horizontal. The nine or ten vertical strips were between 60 and 100 mm (2½ and 4 in) in breadth, the 40 horizontal ones 25–50 mm (1–2 in). An interesting aspect of the shield's form, and one which directly affected the dynamic of its behaviour, was the fact that it was thicker in the centre than at the edges (giving it strength near the boss and flexibility near the rim). Both inner and outer surfaces were covered with lamb's wool felt (the inner covering overlapping that on the outer face by 50–60 mm (2–2½ in)); the edges were not bound with metal. The shield had a wooden 'barleycorn' boss with a vertical rib (*spina*) attached with iron nails above and below it on the shield face, and a horizontal handgrip behind the boss. The remains of the rings used for attaching carrying straps were also found inside the shield. A fragmentary iron boss of similar form came from Renieblas.[32]

Allowing for the sort of variations in detail that circumstances demanded, there seems to be little doubt that the shields described by Polybios, found at Kasr el-Harit, and depicted in monumental sculpture are of a common type. Reconstructions of this type of shield have suggested a weight of around 10 kg (22 lb), heavy but not impossible to wield for a trained soldier.[33]

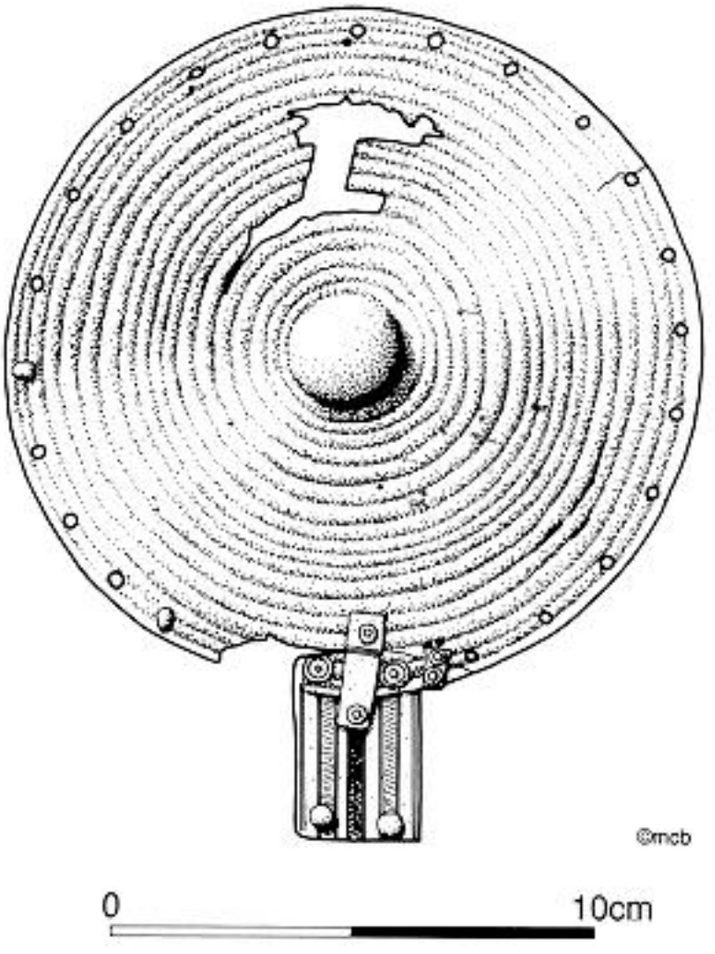
Roman cavalry seem originally to have used circular ox-hide shields, described as resembling sacrificial cakes, typified by the famous relief from the Lacus Curtius. Polybios mentioned, however, that they changed over to the Greek pattern ('firmly and solidly made') because this was superior. It is unclear from his comments when this change occurred.[34]

Body armour (Fig. 29)

Before the first century BC, body armour was very closely linked with social status and wealth. Polybios mentions a brass breastplate, or *pectorale*, saying it was a span (*c.*230 mm (9 in)) square and used by the poorer legionaries. Such breastplates had long seen use in the Italian peninsula. A possible example was found in the 'Camp of Marcellus' near Numantia, but this was circular (diameter 170 mm (7 in)), not square (fragments of others are recorded from the fortifications around the town, of up to 250 mm (9 in) diameter). It consisted of an embossed, circular, copper alloy plate with a raised central boss surrounded by lesser concentric circles, the whole object originally having 25 evenly-spaced rivet holes around its periphery. These apparently served to attach some sort of backing to the plate. At the bottom was a rectangular plate, riveted to the rim and supported by a reinforcing strip, the whole having the appearance of a rather makeshift repair. This was presumably part of the suspension arrangements, and two dome-headed rivets at the end of the plate may have been for attachment of a leather strap.[35]

Those legionaries who met the property qualification wore mail body armour (*lorica hamata*). Ring mail (erroneously 'chain' mail) was developed by the Celts and adopted by the Romans, as Varro asserted, although there seems to have been a change in those who habitually used it, perhaps with it being worn by a greater social range than in Celtic society. Fragments of what might have been copper alloy mail were recovered from Renieblas, but since mail is so rarely deposited in the archaeological record, it is not surprising that we do not have much surviving from the Republic. In all periods a padded undergarment would have been worn beneath mail (sometimes with *pteruges*), of the type described in the *De Rebus Bellicis* (the *thoracomachus*).[36]

One of the reasons for this comparative scarcity, even in later periods, lies in the simplicity of this



29 Republican armour. Breastplate (Numantia).

type of armour. With only interlinking rings to give it form, there was little wear of the component parts and, even when quite severely damaged, it could easily be repaired. In fact, small pieces of mail in the archaeological record may represent damaged fragments which had been replaced.[37]

Sculptural depictions are slightly more helpful, once the conventions used for showing mail in Roman art (see Chapter 1) are taken into account. At Delphi, the monument of Aemilius Paullus (see Fig. 1) shows Roman soldiers wearing belted, thigh-length cuirasses with shoulder doubling. This last feature is found on Celtic, as well as Roman, mail and reflects the fact that the shoulders are particularly vulnerable to the long Celtic slashing sword, and in need of reinforcement. In form, such doubling usually harked back to the shoulder pieces of Greek cuirasses. The 'Altar of Domitius Ahenobarbus' (see Fig. 19) shows soldiers in similar cuirasses, although this time the sculptors represented mail by surface-chiselling. In both sets of reliefs, Roman cavalrymen also wear thigh-length mail armour. An undated relief from Osuna in Spain, thought to be Republican, apparently shows legionaries with rectangular shields, helmets and mail.[38]

Scale armour (*lorica squamata*), was made up of small sections of metal sheet, wired to their neighbours and sewn to a fabric backing. Less flexible than mail, it was nevertheless popular throughout the Roman period, possibly because it was easier to manufacture (although presumably more difficult to maintain). A cuirass in the Royal Ontario Museum has been assembled from pieces of scale said to come from Lake Trasimene, but the association of military equipment with battlefield sites is very unusual and, in this case, perhaps a little suspicious. No examples of scale seem to have survived in the archaeological record from the Republican period, nor are there representations of Roman soldiers wearing it.[39]

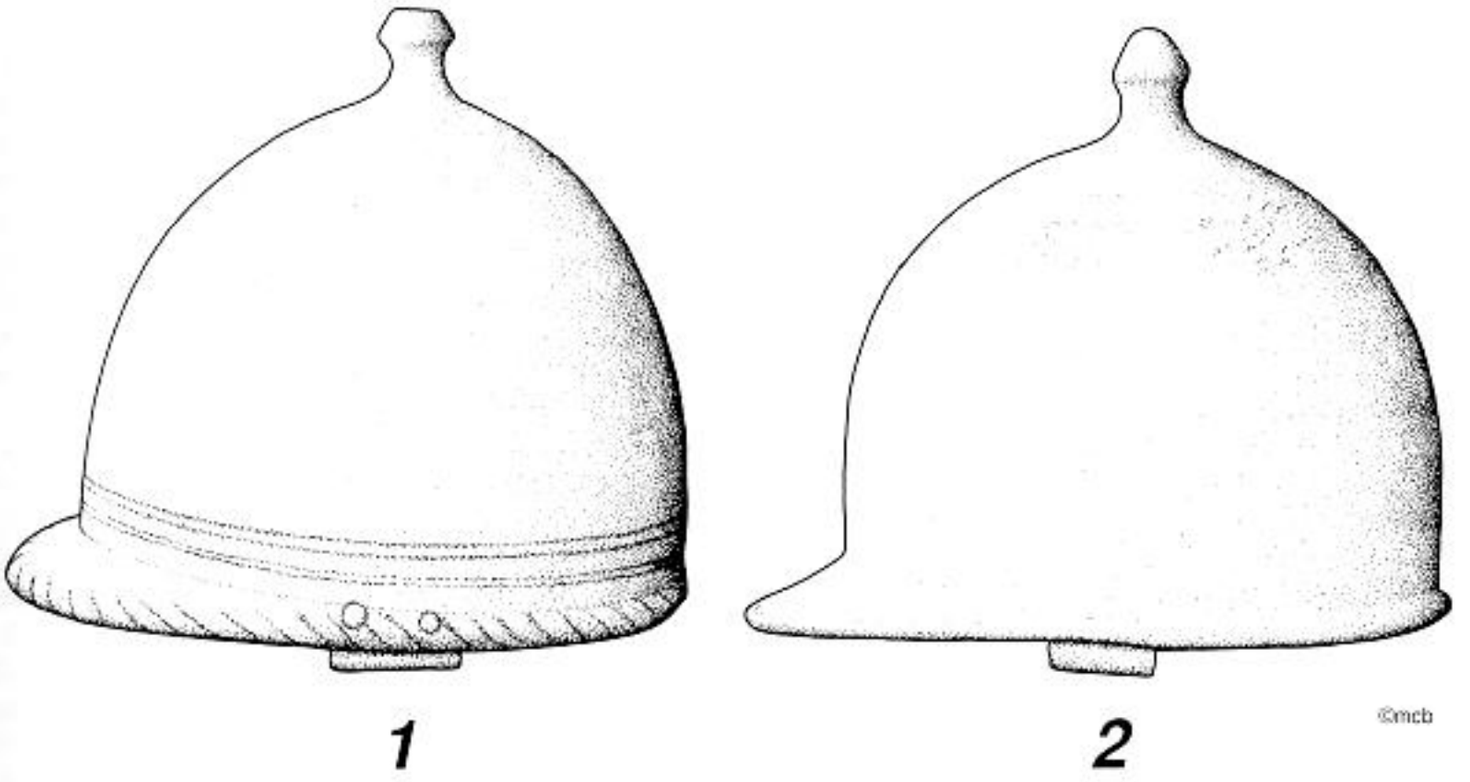
No examples of Republican greaves are known, but two intriguing devices found at Cáceres appear to have been presses for shaping them from copper alloy sheet. Polybios mentions greaves as in use in his time, although it has been suggested that each man only wore one, on his left leg, and this is illustrated by the Osuna relief. This practice finds a parallel in gladiatorial combat, where a greave was frequently worn on the left. The stance of the soldier (or gladiator) with a thrusting sword was with the left foot forward, so that weight could be put behind the blow as it was delivered. By wearing a greave, he presented a complete armour coverage to any enemy attacking his left side: his greave protected his lower leg, his shield the area up to his shoulders, with a helmet guarding his head.[40]

Helmets (Fig. 30)

Whilst many helmets survive from the Republican period, paradoxically none of those yet known can be directly connected with the Roman army. Most of the 'Montefortino' helmets (named after the type-find) are from funerary deposits. These are thought to have been the helmets commonly used by Roman infantry from the Punic Wars through to the end of the Republic, since they are the only examples from Italy dating to this period, and very similar helmets are later used by the Roman army. However, for much of this period, Rome had no standing army and, since equipment was the personal property of those in military service, it is scarcely surprising that helmets are found in 'non-military' contexts.[41]

The Montefortino helmet had its origins as early as the fourth century BC, amongst the same Celtic helmets that were to spawn the Coolus type. Consisting of a hemispherical copper alloy bowl beaten to shape, it was sometimes finished with a crest knob at the apex. Broadly speaking, the evolution of the Montefortino helmet saw the neck-guard increasing in size down to the early Principate, although the basic shape remained much the same. What did change was the method of manufacture, with much cruder workmanship first becoming apparent in the late second century BC, perhaps after the Marian army reforms, compounded by the appearance of spinning in the early Principate (see Chapter 9).[42]

As Rome expanded into Celtic areas she came into contact with more helmet types, such as the Coolus and the Agen/Port. It is true to say that many of the Imperial Roman helmet types owe their genesis to this turbulent period, for various native elements began to provide a large portion of the auxiliary infantry and cavalry. The origins of the Coolus and Montefortino helmets are much the same, the copper alloy Montefortino being taken into northern Italy by the Celts (the Senones in this region); the Agen and Port helmets exploited iron and dispensed with the hemispherical bowl of the other types, preferring instead an oval shape more suited to that of the human head. Also, whilst the earlier helmets generally had cheek-pieces that were triangular with three decorative bosses (recalling Italian-style breast-



30 Republican helmets. *1* Unknown (British Museum); *2* Castellani. (Not to scale.)

plates), the Agen/Port cheek-pieces provided better protection: projections at the front gave additional cover to the cheekbone and jaw without hindering the wearer's field of vision. It was this type of cheek-piece that became standard on subsequent Roman helmets.[43]

Polybios recalls that legionaries wore a plume of three purple or black feathers 1½ ft (0.45 m) high; although specifically referring to the *hastati* at the time, he implies that all three lines of heavy infantry (*hastati, principes, triarii*) were equipped in similar fashion. Some soldiers on the Ahenobarbus relief wear long (horse-hair?) crests that hang down the rear of the helmet to the shoulders. Caesar described an attack by the Nervii which was so rapid that his legionaries did not have enough time either to remove their shield covers or put on their *insignia*, a term which in this case may refer to helmet crests. At least one of Caesar's legions, the *legio V Alaudae*, appears to have had a distinctive cresting arrangement, giving rise to the *cognomen* ('Larks') of that unit.[44]

The depiction of helmets on sculpture is notoriously variable in quality, but the infantrymen on the altar of Domitius Ahenobarbus seem to be wearing the Montefortino type of helmet. This monument also depicts a cavalryman wearing what is clearly a Boeotian helmet, a broad-brimmed type dating back to Hellenistic times and recalling Polybios' comment about Roman cavalry being equipped in the Greek manner.[45]

Belts (Fig. 31)

Beyond the fact that soldiers wore belts (they are visible on both the Altar of Domitius Ahenobarbus and the Aemilius Paullus monument), we are unable to say much about Republican forms. Nevertheless, the very fact that belts were worn with mail armour is significant, because modern experiments demonstrate that belting a mail cuirass at the waist transfers some of its weight onto the hips, thus relieving the shoulders of some of their burden. With the thigh-length mail of the Republic, this would be particularly beneficial to the wearer.[46]

Although it is not known how widely belt-plates were used, some are known from the Spanish sites around Numantia and from Cáceres el Viejo. An openwork design was featured on a copper alloy example from Castillejo, with a metal backing and four dome-headed rivets, one in each corner. This plate was 40 mm (1½ in) wide and 45 mm (1¾ in) long. Of a similar width, but much longer, was another piece (45 mm by 148 mm (1¾ by 6 in)) from the same site which exhibits an interwoven design within rectangular borders. It was attached to the belt by three rivets at either end. Castillejo also

produced part of a similar width plate (49 mm (2 in)) with a triangular projection terminating in a large disc with a central rivet of uncertain purpose. Although the latter bore more than a passing resemblance to later dagger frogs, unlike them it in fact had a spike behind the disc, indicating that it was originally attached to leather.[47]

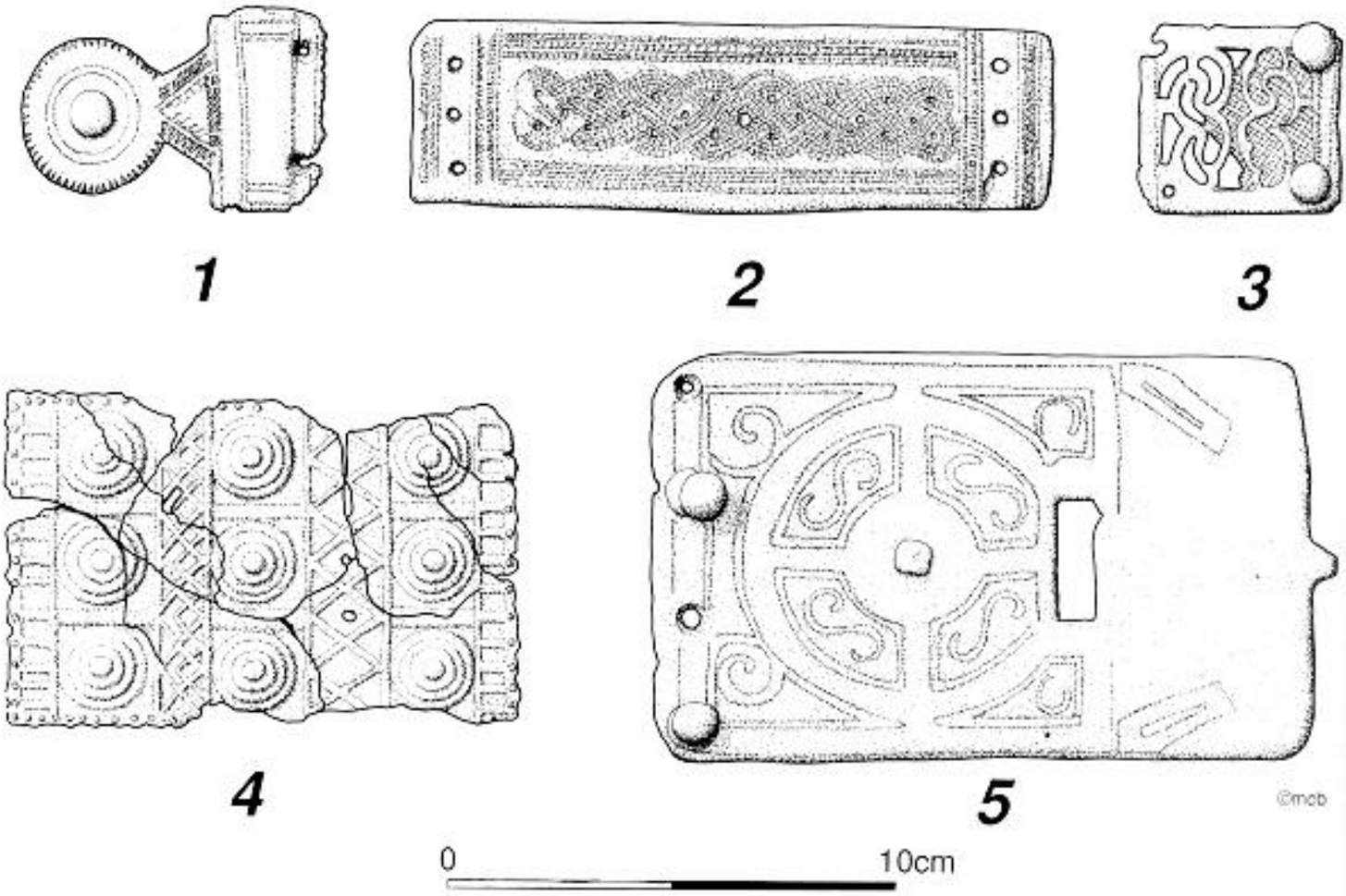
Whilst these items can quite reasonably be identified as belt-plates, two further pieces are open to question. A rectangular plate from Renieblas camp, embossed with three groups of three circular motifs, separated by decorative borders, and possessing no obvious means of attachment, must remain dubious. An intriguing plate from Cáceres el Viejo had four rivet holes on one of its narrow sides, a central hole, and then a rectangular slot. It was decorated with a circular design with S-motifs.[48]

Cloaks, capes and boots

Our ignorance of the equipment and garb of Republican soldiers is almost total: for not only is the archaeological evidence lacking, but also there is hardly any representational material to help fill in the gaps. The Padova centurion certainly seems to be wearing a *sagum* (see Fig. 20), the rectangular cloak draped around the neck and fastened at the front (on the right shoulder, as is usual) with a brooch, but his tunic is fairly formless and his boots not rendered in any great detail.[49]

On the altar of Domitius Ahenobarbus, the soldiers wear short-sleeved tunics that reach to just above the knee (see Fig. 19), but only the cavalryman seems to be wearing a cloak (perhaps a *sagum*). The officer figure has a *paludamentum* draped over his left shoulder and looped over the left arm. The *paludamentum* was the traditional sign of a high-ranking officer and, as such, is often shown on statues of emperors in later periods, but it was also worn by centurions during the first century AD.[50]

The *caligae* of later periods are nowhere shown on Republican military depictions, so we have no idea at what point this type of footwear was introduced into the Roman army: the soldiers on



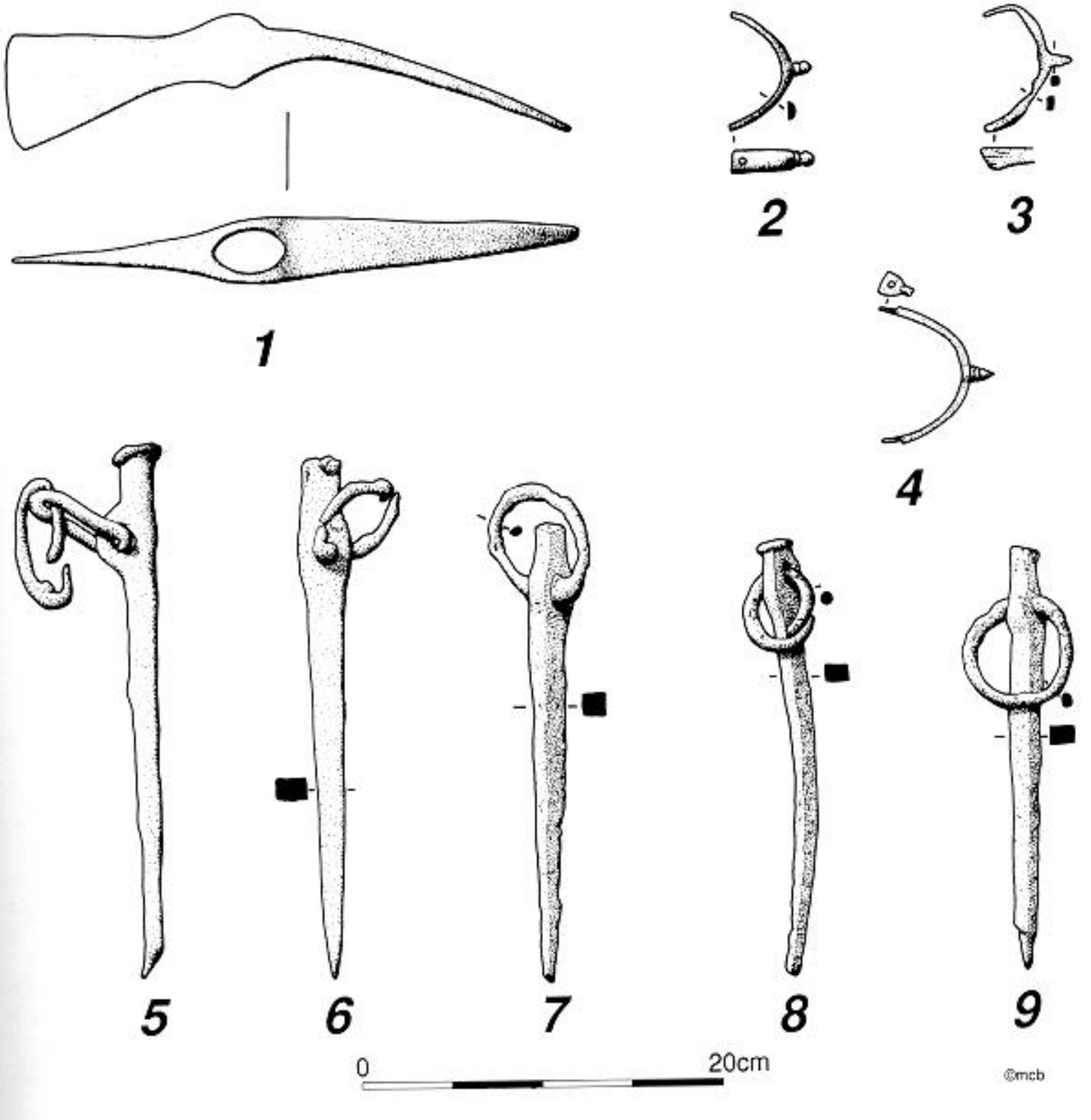
31 Republican belt-plates. *1–3* Castillejo; *4* Renieblas camp III; *5* Cáceres el Viejo.

the Ahenobarbus relief are depicted barefoot. The Padova centurion wears plain boots, although detail could obviously have been added in paint, as we know happened on later tombstones (see Chapter 1).[51]

Other equipment

Little is known about Republican cavalry equipment, and no examples of tentage from this period are known, so the adoption of the horned saddle from the Celts and the evolution of the tent can only be speculated on. Spurs were found at sites around Numantia and at Cáceres el Viejo, and snaffle bits came from Renieblas.[52]

Some tools and implements have been excavated (Fig. 32), and a pickaxe, which bears a very close resemblance to its much more numerous Imperial descendants, was found at Peña Redonda. One comparatively common find from Republican sites is a range of sturdy iron spikes



32 Republican tools, pegs, and spurs. *1* Pickaxe (Peña Redonda); *2–3* spurs (Cáceres); *4* spur (Numantia camps); *5–6* pegs (Numantia camps); *7–9* pegs (Cáceres).

with loops, through which a ring is passed. Weighing around 320 g (11 oz) each, these are fairly substantial, but their function is far from certain. Often identified as tent pegs, they are more plausible as tethering pegs for animals for, as Schulten pointed out, a legion would have needed 35 pack animals just to carry its tent pegs! Moreover, a fragment of Polybios records that the Celtiberians tethered their horses to just such an iron peg. Wooden tent pegs were used in the Principate and have the advantage of being both easy to manufacture and light to carry (see Chapter 2).[53]

Caesar describes various obstacles used by his army during the siege of Alesia, including *stimuli*, short double-ended spikes inserted into foot-long logs sunk into the ground. Examples of these were excavated by Stoffel.[54]

5

FROM AUGUSTUS TO HADRIAN

As Rome consolidated the territorial gains of the Republican period her army became more sedentary, although not to the exclusion of all strategic movement. When new areas such as Britain came into the Empire, the army was forced to reorganize its dispositions, shuffling both legions and *auxilia* as the need arose. Some areas, like the Voralpenland, were abandoned completely because the advance of the frontier region rendered them militarily irrelevant. All this military activity led to the frequent abandonment of sites when garrisons were changed and, inevitably, the deposition of surplus damaged equipment. The frontiers in Britain were especially active between the invasion of AD43 and the reign of Marcus Aurelius, with a correspondingly great amount of discarded equipment.[1]

Individual soldiers, one on the beach at Herculaneum and another down a well at Velsen, were unusual finds, but our study of this period is dominated by the Roman army's rubbish. The finest example of this is the *Schutthügel* (rubbish tip) at Vindonissa, additions to which were apparently made each time the garrison legion changed. The archaeological record for this period is also particularly rich in terms of deposition in water, with many fine examples of helmets, swords and daggers known from rivers. There are also a number of burials with equipment of the early Principate, notably the 'Thracian' series, which contained cavalry 'sports' helmets.

There is a very marked bias towards material from the north-western provinces, with the exception of some finds of cavalry equipment from North Africa. This might be due to the quality of information retrieval (and dissemination) practised by archaeologists in the various regions, but it could equally be due to differential depositional mechanisms in operation, a subject touched upon in Chapters 2 and 9.

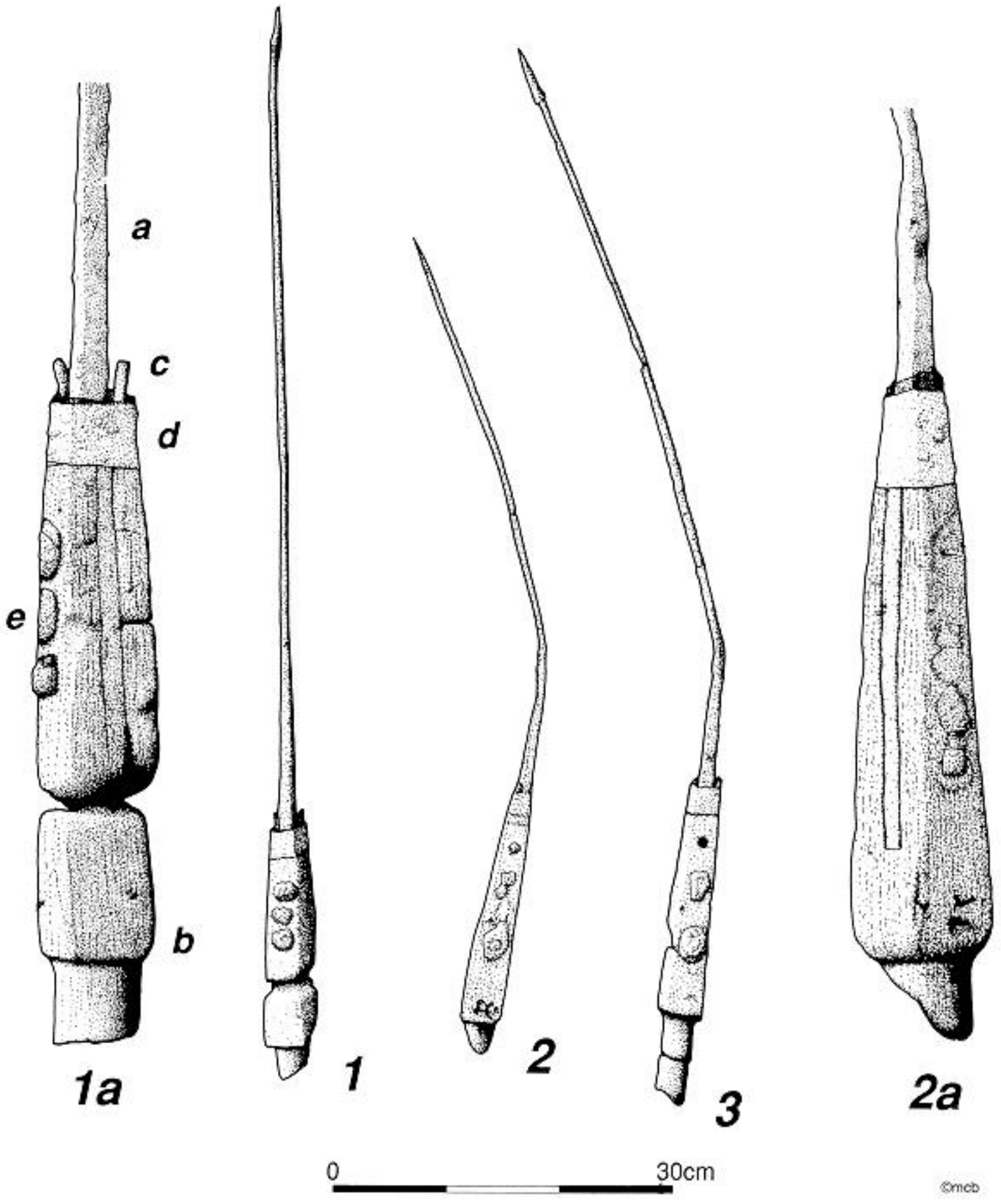
However, the period of the first century AD is probably best known for its representational evidence, for not only did it produce a magnificent tradition of funerary military depiction (see Figs. 4 and 143), but also the quality of state propaganda images peaked with Trajan's Column (Pl. 5), paralleled by the more provincial, but no less interesting, Adamklissi *tropaeum* sculptures (see Fig. 50).

Weapons

Pila (Figs. 33–34)

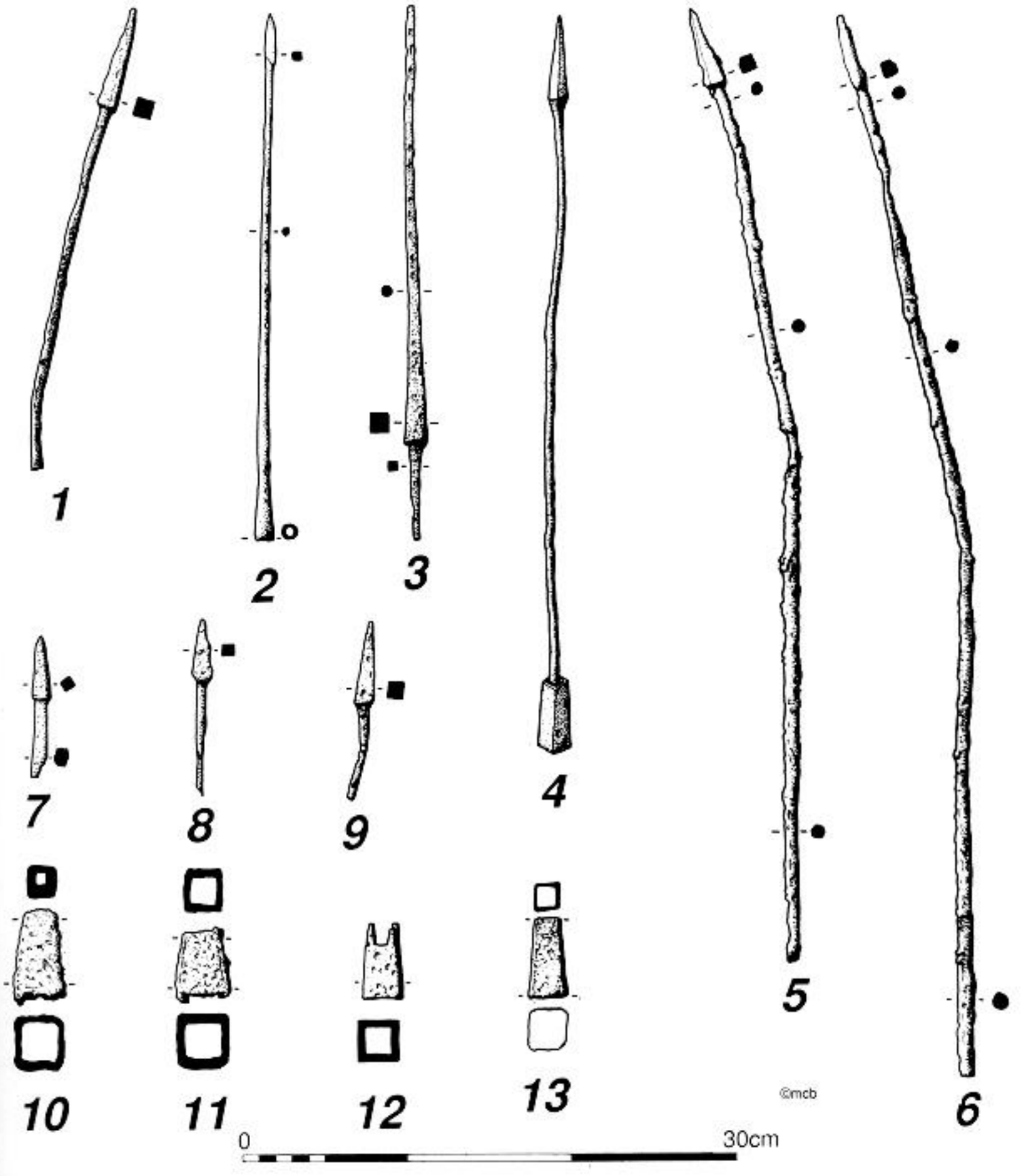
Some of the best surviving tanged *pila* date from the first century AD. Examples found at Oberaden before the Second World War not only had intact heads, shanks and collets, but even substantial portions of the wooden shafts survived. These showed how the tang was riveted through a pyramidal expansion of the shaft. Many other examples of the shanks have been found, often bent through use. *Pilum* heads are common finds on Roman military sites, although sometimes confused with drill bits and nails. The shafts must have been carved down from the maximum diameter of the pole (the broadest point of the expansion). Examples of early Imperial shanks are known from Augsburg-Oberhausen, Hod Hill and Dangstetten, whilst collets (which fitted on top of the pyramidal expansion) have been found at the last two. The fact that the *pilum* may normally have had a shoe (or butt) is demonstrated on Cancelleria Relief A (see Fig. 2), where one is clearly illustrated. Socketed *pila* also continued into the first century AD.[2]

Cancelleria Relief A has also led to the notion that a weighted *pilum* was introduced during the latter part of this period, since it depicts a bulbous addition to the weapon, just below the pyramidal expansion and above the handgrip, decorated with an eagle motif. A similar feature is apparent on *pila* on the Adamklissi monument (see Fig. 50) and possibly on the tombstone of C. Castricius Victor (see Fig. 3b). Such a weight would theoretically give additional penetrative power, whilst limiting the range. Weight was part of the key to the success of the *pilum*: once it had caused the weapon to penetrate a target, it helped to bend the shank so that the weapon was difficult to extract and could

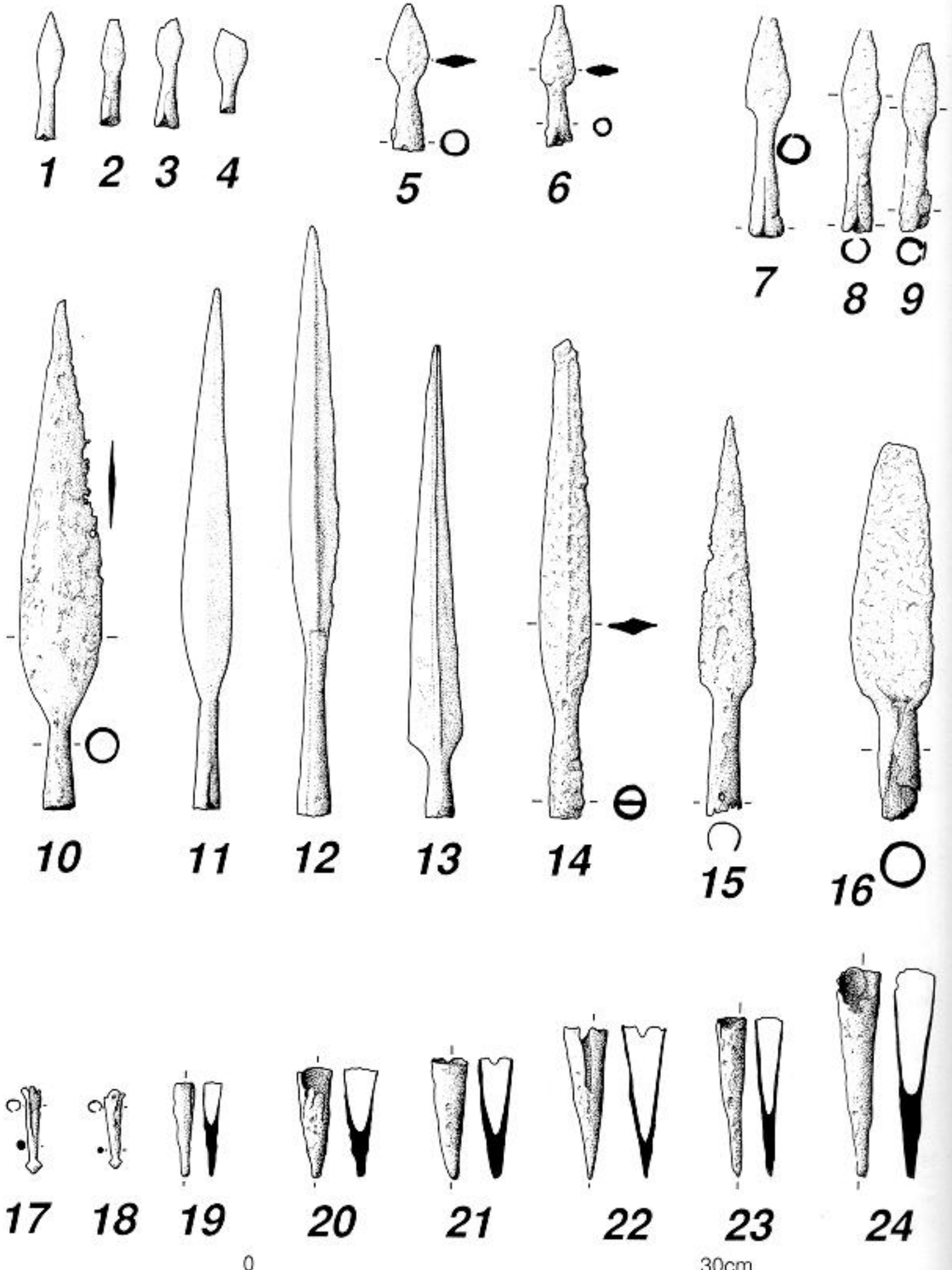


not be returned, although it could later be straightened out quite easily in a workshop. Performance of the *pilum* may have been further enhanced by the use of a throwing strap, apparently shown on the tombstone of Flavoleius Cordus (see Fig. 143,1).[3]

33 The Oberaden *pila* with (*1a*, 2a) details of the junction between the shank (a) and shaft (b), and showing wedges (c), collet (d), and rivets (e).



34 Early Principate *pila*. *1–9* Heads and shanks (*1* Dangstetten; *2* Waddon Hill; *3* Rottweil; *4* Carnuntum; *5–6* Hod Hill; *7* Longthorpe; *8–9* Oberstimm); *10–13* collets (*10–11* Hod Hill; *12* Dangstetten; *13* Rheingönheim).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Spears (Fig. 35)

The spear is ubiquitous in any period and notoriously difficult to classify. Some factors, such as the length of shaft, are not normally preserved in the archaeological record, so hypotheses tend to be dependent upon analysis of the head form and size, a process that is dubious to say the least. Depictional evidence is also unreliable in this field, both from the point of view of size (the weapon was, generally speaking, scaled to fit within the frame of the work) and shape of the head (usually nondescript). The spear can be categorized as having two extremes of function: first it can be a thrusting weapon, used in hand-to-hand combat; or it can be a missile, thrown at an enemy from a distance. However, there is a third category which covers all those spears that could be used for both purposes (*in extremis*, even the slenderest of javelins might be used as a thrusting spear and the longest of spears as a missile), so we can only hope to divine broad rules about the apparent perceived purpose of a weapon. One useful feature indicating function might be diameter of the shaft, rather than the shape of the head.[4]

The spear consisted of a forged iron head, nearly always socketed at this period, a wooden shaft (usually of ash or hazel, woods with the right qualities of strength and flexibility) and an iron butt. When considering spearheads, the term 'leaf-shaped' is commonly used, but there are obvious problems with this terminology: which leaf shape are we talking about, pinnate or lanceolate? Those detecting the onset of circularity in this search for a descriptive language may well be tempted to give up at this point! A more sensible solution lies in that offered by Barker, and followed by Densem, whereby the ratio between the length of the spear blade and its broadest point is taken as the significant attribute. The distance from the tip of the blade to this broadest point is termed the 'length of entry'. Thus a low-shouldered blade would be one where the broadest point was nearer the socket than the tip, mid-shouldered where it lay about half-way along, and so on. In the end, one has to accept that there is no one satisfactory way of categorizing Roman spearheads.[5]

Equally fraught is the question of terminology. The applicability of ancient terms like *hasta*, *lancea*, *verutum* and *spiculum*, let alone the more general *tela* or *missilis*, is virtually impossible to untangle, and Roman writers seem to use them interchangeably all too often. In fact, it is sometimes tempting to view all of these as synonymous, but this is perhaps taking too pessimistic a view of the matter. The *lancea*, for example, was a javelin, and in that context we may recall the ill-fated *lancea Lucullanea* (Lucullus, governor of Britannia, incurred the wrath of Domitian for naming his new *lancea* after himself). The Elder Pliny wrote a treatise on throwing javelins from horseback and this, together with Lucullus' *lancea*, may have been symptomatic of an aristocratic interest in hunting and mounted combat.[6]

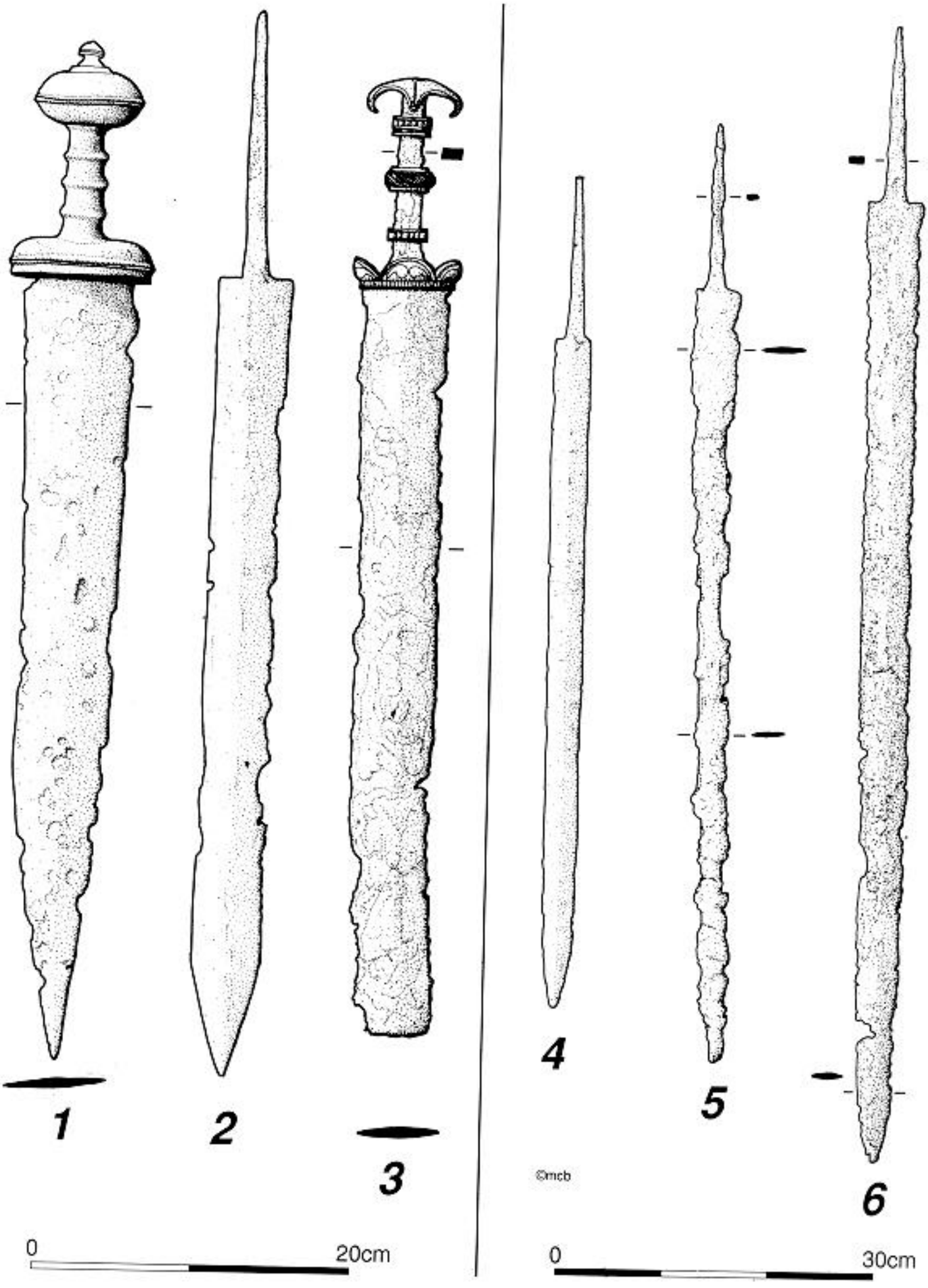
Auxiliary infantry are shown on first-century tombstones carrying more than one spear (see Fig. 143,3–4), which suggests that at least one of these was intended for use as a missile. The running auxiliary (if that is indeed what he is) on a Mainz column base (see Fig. 5a) is wielding one spear and carrying two more behind his shield. Josephus tells us that cavalrymen were equipped with a spear and had several lighter javelins in a quiver. The tombstones of cavalrymen often show their *calones* or servants holding spare missiles, and in at least one case a bundle or quiver is shown. The provision of more than one missile is clearly suggestive of the ability to skirmish, although this need not preclude either auxiliary infantry or cavalry from being used in more direct fighting.[7]

Swords (Figs. 36–38)

Contrary to popular belief, the term '*gladius*' can mean any sword and is certainly not specific to short weapons. The infantry sword underwent an important metamorphosis some time after the middle of the first century AD. The familiar long-pointed, taper-bladed weapon of the Republic, the so-called *gladius Hispaniensis* (known as the 'Mainz' type), was phased out in favour of a parallel-edged, short-pointed replacement (the 'Pompeii' type). These two swords are, it has been suggested, symptomatic of a change in the style of Roman fighting. Examples of the Mainz-type sword (so-called because so many examples come from the Rhine at Mainz) and its associated scabbard fittings are found throughout the first half of the century, and it was clearly still in use at the time of the invasion of Britain in AD43.

Plotting the distribution of such finds can give us some idea of how long it persisted in use in Britain and there does not appear to be much

35 Early Principate spearheads and butts. *1–4, 13* Waddon Hill; *5–6, 14–15* Hod Hill; *7–9* Longthorpe; *10, 17–24* Rheingönheim; *11–12* Newstead; *16* Corbridge.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indication of its continuation into the Flavian period. The blades (excluding tang) vary between 400 mm (16 in) and 550 mm (22 in) in length and blade widths taper from something like 54–75 mm to 48–60 mm (2–3 in to 2–2⅓ in), with the length of point varying between 96 and 200 mm (3¾ and 8 in). The handle assembly consisted of a handguard, an octagonal-sectioned handgrip, usually made from a cow longbone, and then a pommel of slightly flattened ovoid appearance. The pommel and handguard were often made of wood, as examples from Vindonissa show, but could also be of bone or ivory. These pieces were held onto the tang by a copper alloy rivet. The sword from Rheingönheim had a silver-plated wooden handle and the rivet originally possessed a 'small ring from a bronze chain', recalling a gladiator relief from Rome where the sword is suspended from the gladiator's wrist by a cord or chain.[8]

Scholars differ over the function of the two types of blade. Many of the Mainz-type swords had waisted blades and one wonders if they were deliberately made this way (and if so, why?) or whether they had been worn down by repeated sharpening. Vegetius' comment about the Romans scorning anybody who cut, rather than stabbed, with the sword is too vague to be of much use, and Polybios certainly indicates that the *gladius Hispaniensis* could be used for chopping as well as stabbing. So was the change to the Pompeii type made in order to provide a sword equally well adapted to stabbing or chopping?[9]

The parallel-edged Pompeii type (with blade lengths between 420 and 500 mm (16½ and 20 in) and widths between 42 and 55 mm (1¾ and 2¼)) was named after four examples found at Pompeii with the well-known *terminus ante quem* of AD79 (now supplemented by a fifth sword, carried by the Herculaneum soldier). Examples of the weapon and its scabbard-fittings give a rather different distribution by comparison with the Mainz-type sword and one piece of scabbard from Verulamium is dated to before the Boudican revolt, possibly the earliest archaeological manifestation of this weapon. Finds of Pompeii-type scabbard-fittings from Waddon Hill seem to belong to some time before AD64, although the earlier terminal date for Hod Hill (which has also produced Pompeii-type fittings) has been questioned. The handle assemblies differ markedly from those of the Mainz-type sword, with the handguard now more pronounced and the pommel resembling a flattened sphere.[10]

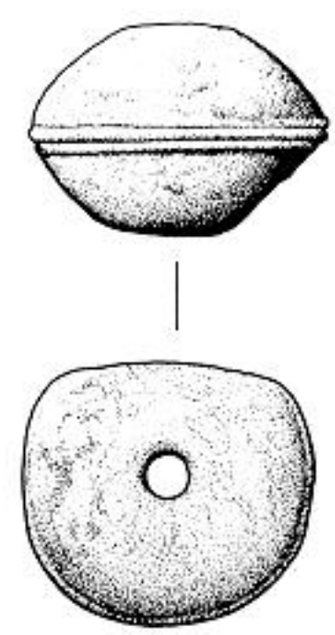
There was a variety of types of scabbard for these two swords and these seem to have had a broadly chronological development. The first Mainz-type sheath was notable for its use of elaborate openwork fittings at the mouth and chape. Complete examples have come from rivers (the Weser at Bremen and the Rhine at Mainz), but it is the fragments of sheaths which provide the dating evidence. A chape from Dangstetten must have been deposited around 15BC, but the form seems to have continued until the Claudian period, many pieces of this kind of sheath coming from the Magdalensburg (abandoned *c.*AD45). The second variant is best represented by the so-called Sword of Tiberius, where openwork decoration has been superseded by embossed motifs, in this case a propaganda scene. Fragments of the suspension bands, decorated with a laurel wreath motif, have come from Colchester and Chichester, indicating the continuation of use of this type into the 40s. The third type is almost totally decorated with embossed plates, examples coming from the Thames at Fulham, Strasbourg, Wiesbaden and Valkenburg. A fragment from Vindonissa belongs to a phase that finished before *c.*AD50.

Apart from the shape and forms of decoration employed, one of the distinctive characteristics of the Mainz-type sheath was the use of guttering, U-shaped copper alloy binding along the edges to prevent damage from the sword blade during sheathing or unsheathing. All three types appear to have incorporated a wooden lining, to judge from the organic remains sometimes found within them.[11]

Pompeii-type sheaths sometimes lacked guttering, having decorated locket plates and chapes attached to a leather-covered wood body. The locket is usually tinned or silvered and decorated with a combination of punched-out shapes and incised detail, the former presumably designed to contrast the colour of the underlying sheath with the white metal. An ornate palmette was fixed just above the chape, and the bottom of the locket and chape plates were similarly adorned with palmettes at the side. Some examples had studs on the face of the sheath. A Pompeii-type sword and sheath is shown on a relief from Pula.[12]

Of course, these were not the only types of sword in use by the Roman army in this period. A longer sword (often called the *spatha*) was used by the cavalry, presumably derived from Celtic

36 Early Principate swords. *1* Rheingönheim; *2* Newstead; *3* Hod Hill; *4* Newstead; *5* Camelon; *6* Rottweil.



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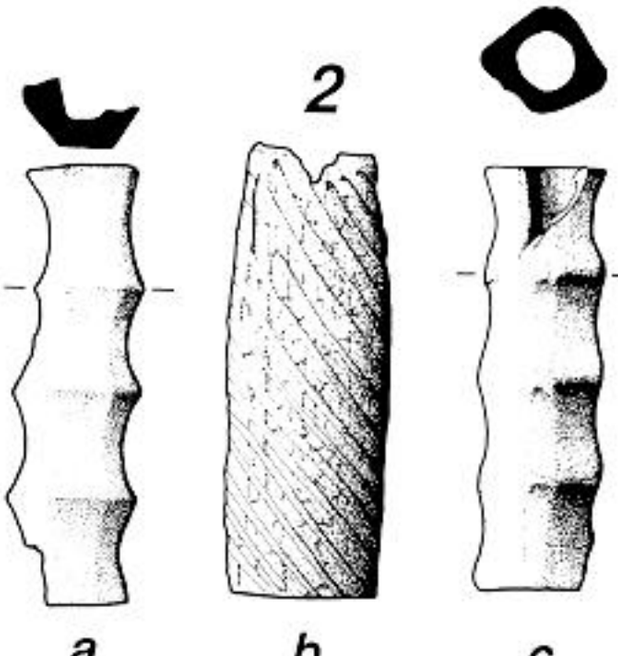

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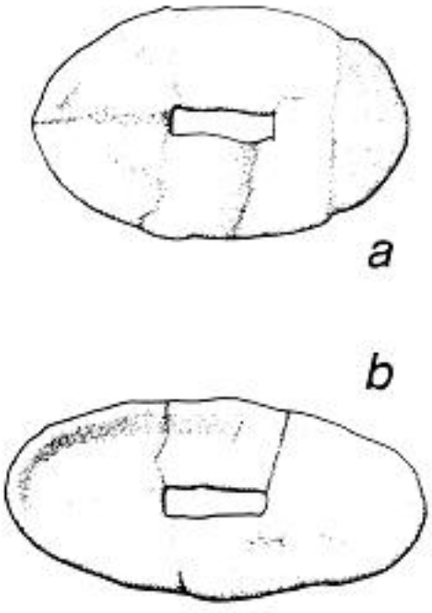

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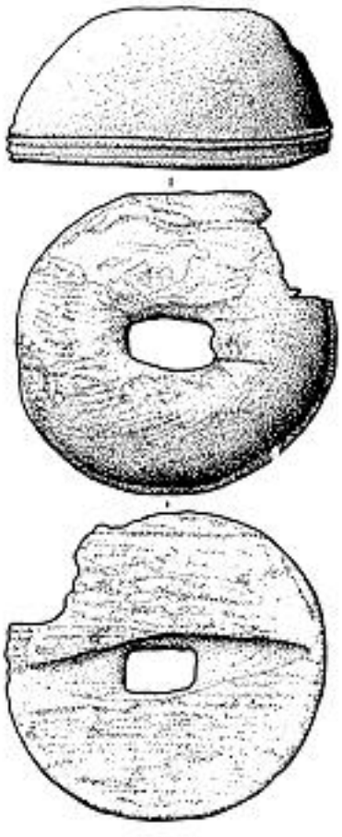

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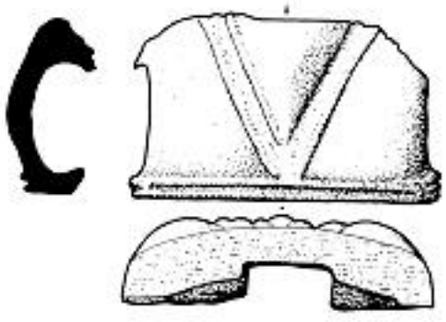

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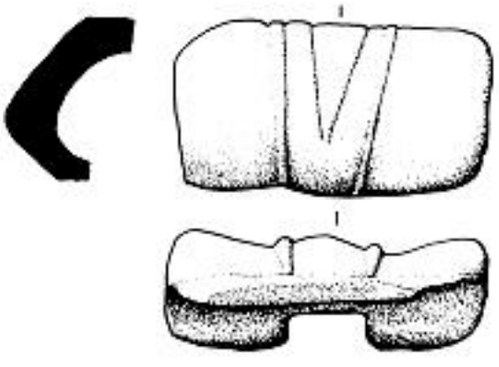

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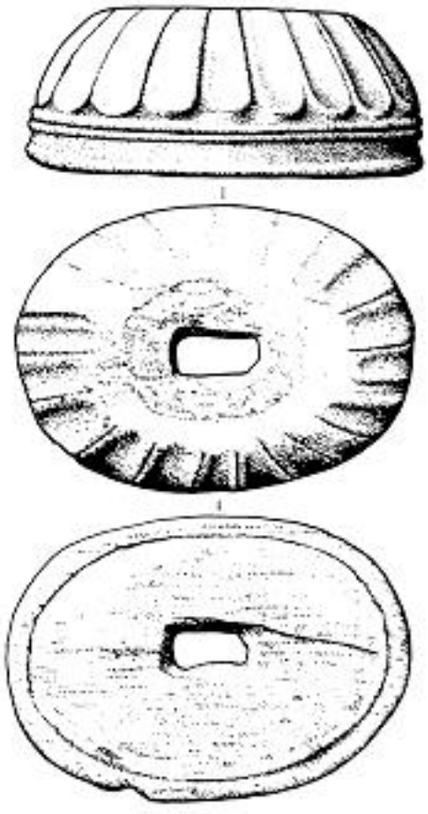

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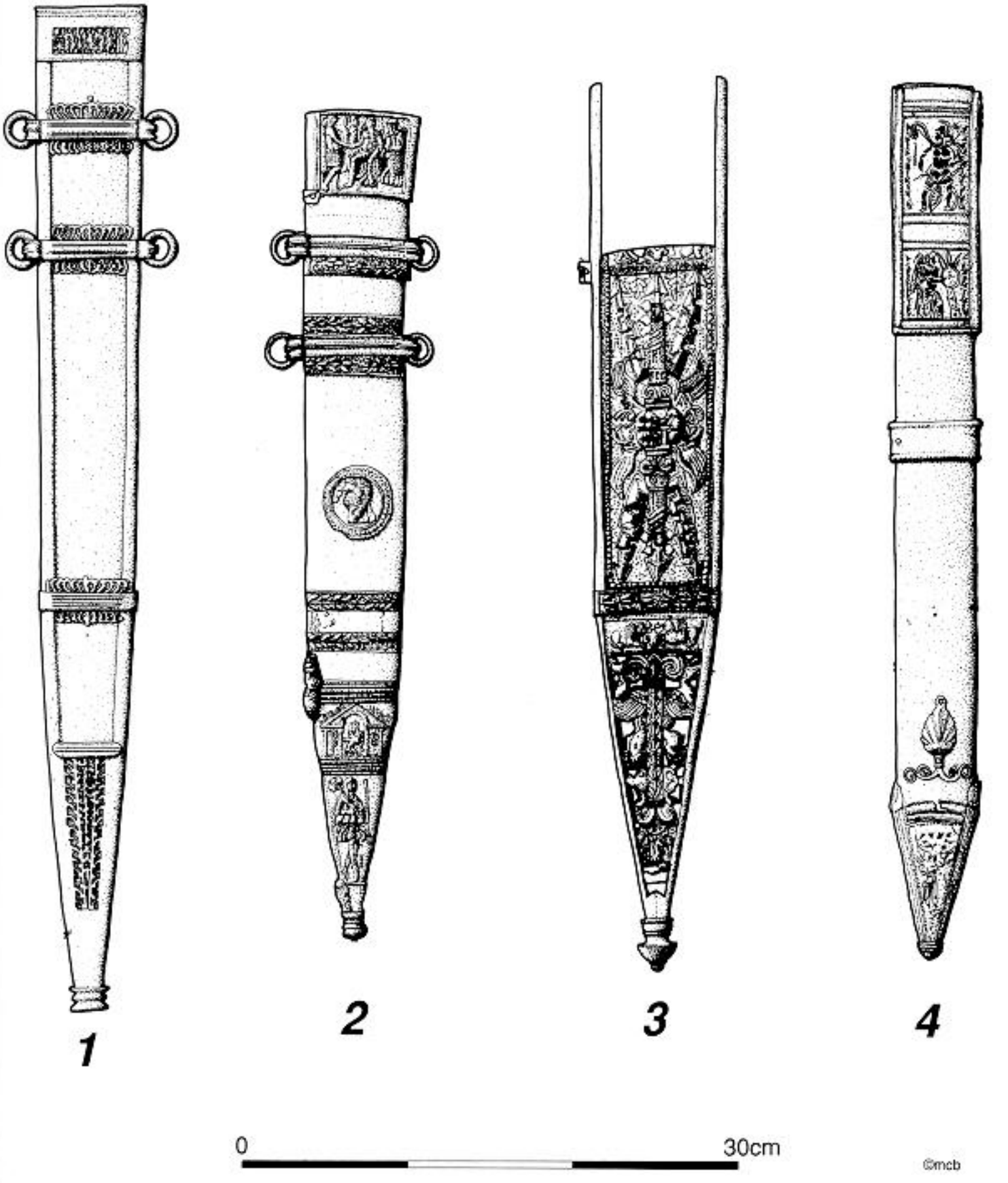


37 (*Left*) Early Principate swords – handle assemblages. *1* wooden pommel (Vindonissa); *2a–c* bone handgrips (*a* London; *b* Dangstetten; *c* Rheingönheim); *3a–b* handguard plates (*a* Dangstetten; *b* Baden); *4–7* handguards (*4* wood, Vindonissa; *5–6* bone, Rheingönheim; *7* wood, Vindonissa).

38 (*Above*) Early Principate swords – sheaths. *1* Rhine at Mainz; *2* Mainz ('Sword of Tiberius'); *3* Strasbourg; *4* Rhine at Mainz.

weapons. Fewer examples of these swords have survived, although a piece from Rottweil (L. 865 mm (34 in), W. 44 mm (1¾ in)) and at least two from Newstead (L. 622 and 635 mm (24 and 25 in), W. 30–35 mm (1–1⅓ in) each) seem to belong in this class. The longer sword was a prerequisite for a cavalryman to operate against infantry.[13]

In Britain, another form of sword that is represented amongst the archaeological finds is the 'native' type. Remains from these weapons have come from such sites as Hod and Waddon Hills, Newstead and Camelon. Whilst much about them reflects the influence of Roman short sword design, they still incorporate features that mark their La Tène ancestry. They certainly seem to show that some troops in Roman service were using their own weapons as late as the Flavian period.[14]

Centurions (see Fig. 49) and some standard-bearers wore their swords on their left-hand side, other troops on their right. The question of sword suspension is vexed, but it certainly seems that it started with the sword on one belt and the dagger on another (an arrangement still respected by the Herculaneum soldier, even though he was not wearing a dagger). Precisely how the sword was attached to the belt is unknown, although various suggestions have been made. The advent of the single belt may have necessitated the adoption of a baldric (no examples of double belts with a baldric are shown on the Rhineland tombstones), but we cannot be certain of whether only two suspension rings, three, or even all four were employed. The baldric did not require a fastener of any kind, since it could simply be slipped over the head and shoulder, but attempts to identify cavalry harness fasteners as baldric fittings persist, despite the obvious differences in decoration between infantry and cavalry equipment.[15]

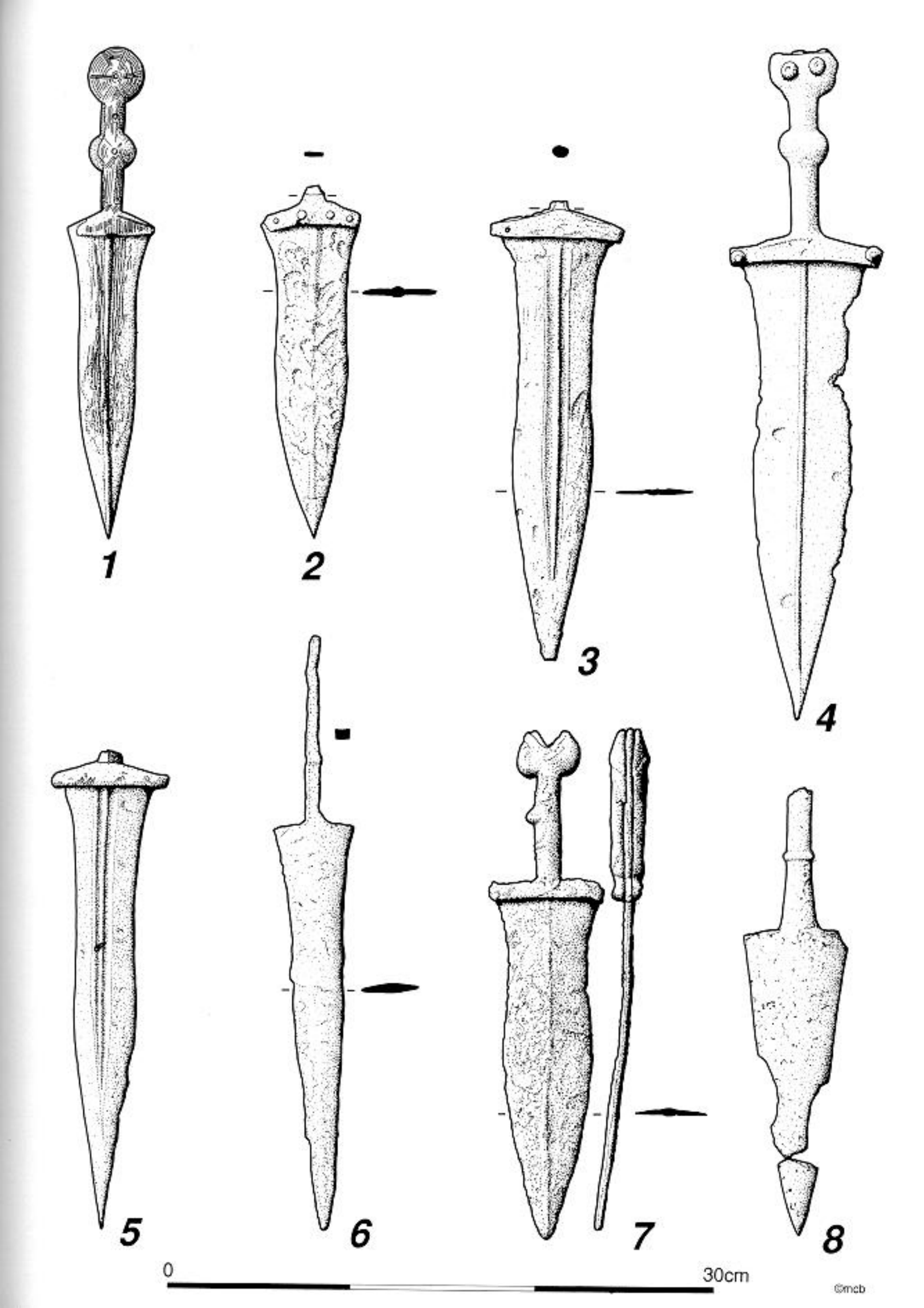
Daggers (Figs. 39–42)

Augustan daggers have been found at Dangstetten, Oberaden, the Titelberg and Augsburg-Oberhausen. Whilst some still have the round pommels of Republican daggers, others now have a flat-topped version with rivets, and inlaid decoration occurs for the first time amongst the handles from Oberaden. Flavoleius Cordus has a dagger sheath on his gravestone similar to the example from Titelberg, with guttering and cross binding, and similar guttering came from Haltern. By the Tiberio-Claudian period, the dagger had become the complementary side-arm to the sword and is shown on tombstones, often with a scabbard which has three fields of decoration. The blade and tang were forged in one piece and the two halves of the handle riveted in place, sandwiching an organic layer (horn or bone) on either side of the tang. The handle had an inverted 'T' shape, with a swelling half-way up its length and another as a pommel at the top.[16]

For the purposes of classification, two types of tang and three types of blade have so far been recognized. The first type of tang, with examples from Dangstetten, Oberaden, Hod Hill and Mainz, is flat and riveted to the blade, characteristically with two rivets through the pommel, one through the central expansion, and two or more through the handguard. With the second type, the rod tang (from Vindonissa, Gelligaer and Risstissen), the rivets do not actually pass through the blade or tang; many of these daggers are either found without handles or with replacement wooden ones fitted. The Type A blade (Alléríot, Mainz, Hod Hill) is broad with a simple midrib, whilst Type B (Vindonissa, Leeuwen) has deep grooves on either side of the midrib, a pronounced waist and a long tapering point. Type C dagger blades (Kingsholm, Gelligaer) are much narrower than either of the other two variants, and are also comparatively straight-edged. Type A blades have the flat tang, Type B either type, and Type C the rod tang. Scott has pointed out that there would seem to be a chronological progression, with Type B being a transitional type, but this is virtually impossible to demonstrate from the limited chronological information associated with these weapons.[17]

Dagger sheaths were frequently elaborately decorated with metal or enamel inlay, and a separate system of classification exists for these, although it should be stressed that this type of sheath was not the only kind in use (see below). There are two basic forms of the inlaid sheath, Types A and B. Type A (Alléríot, Hod Hill, Auerberg, Oberammergau) was made of two plates of iron joined at the edges and lined with wood, the front plate being inlaid with brass, silver, niello or enamel. The four suspension rings were usually free to move, attached to the sheath

39 Early Principate daggers. *1* Oberaden; *2* Dangstetten; *3* Risstissen; *4* Mainz-Weisenau; *5* Mainz; *6* Kingsholm; *7* Buciumi; *8* Mehrum.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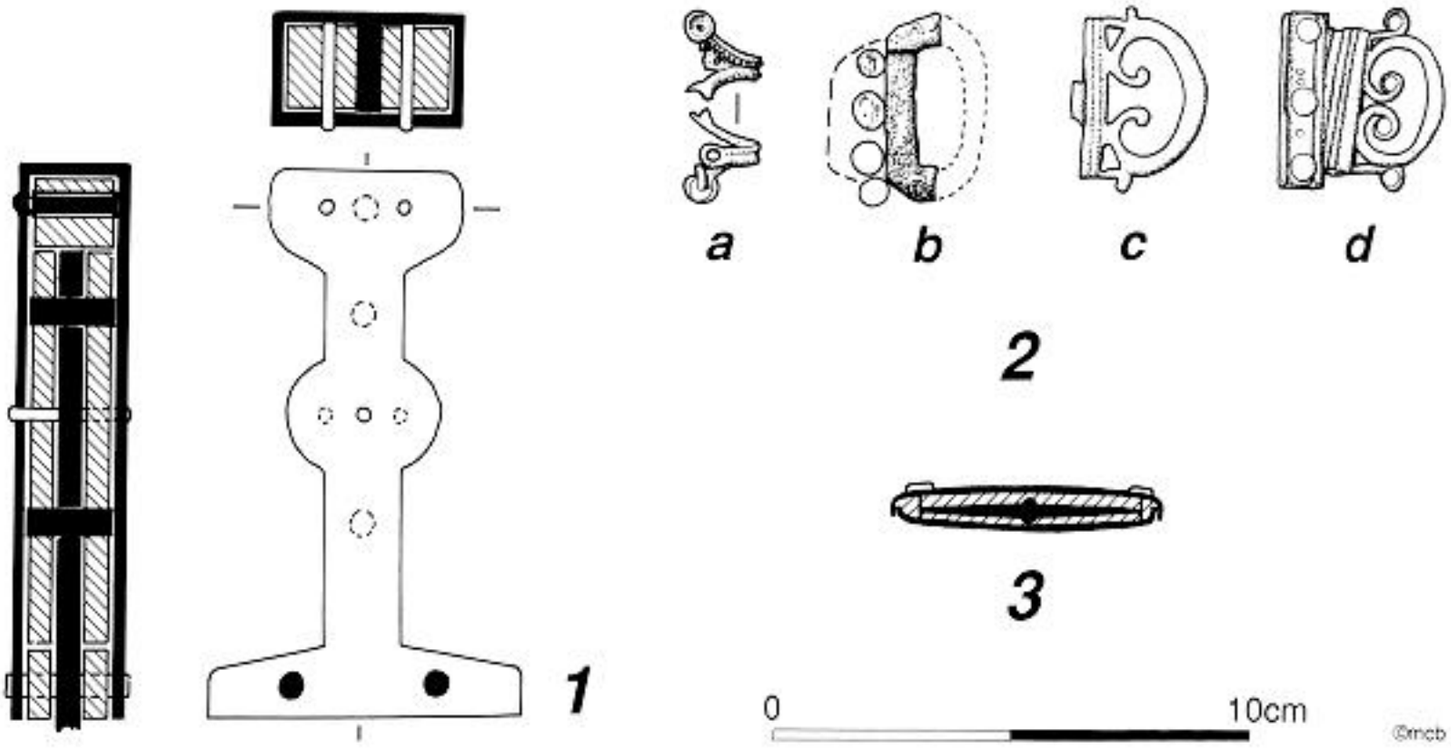


40 (*Above*) Early Principate daggers. *1* Diagrammatic section of handle; *2a–d* suspension loops (*a* Dangstetten; *b* Chester; *c* Kempten; *d* Velsen); *3* schematic cross-section of blade and sheath (Basel).

41 (*Right*) Early Principate daggers – sheaths. *1* Titelberg; *2* Rhine at Mainz; *3* Dunaföldvar; *4* Allériot; *5* Hod Hill; *6* Risstissen; *7* Vindonissa; *8* Leeuwen.

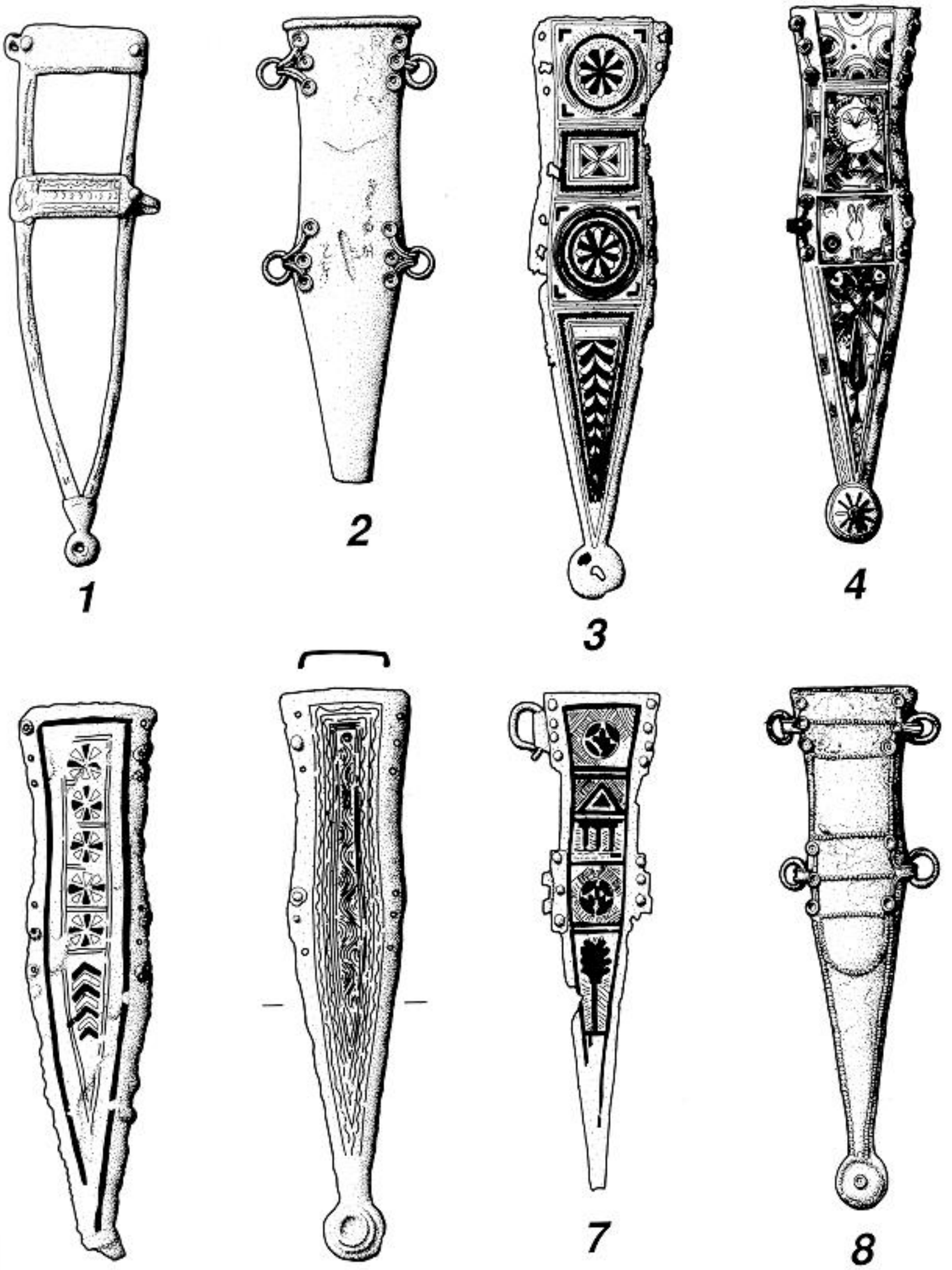
by fine copper alloy loops. Type B sheaths (Vindonissa, Loughor, Risstissen) were made of organic materials (probably leather and wood) with a near-flat decorated iron plate attached to the front, with two lugs on either side through which the rivets securing the suspension loops passed.

These suspension loops were hinged to the sheath and were elaborately formed by bending the metal components. An example from Velsen had iron loops as the upper pair and silver as the lower, all of which were constructed in the same way, although from different metals. Type B sheaths were inlaid with silver and not brass.[18] The decorative designs employed were, with only a few exceptions, usually placed within four zones and motifs included rosettes, temples, palmettes and various geometric elements.[19] Apart from the inlaid sheaths, there were embossed examples, such as the piece from Leeuwen, and completely undecorated sheaths from Mainz, Basel, Oberaden, Dangstetten and Carnuntum.

The study of daggers and their scabbards is complex, but no aspect of it is particularly helpful in telling us what the weapon was used for. With blade lengths of between 250 and 350 mm (9 and 14 in), it was clearly a formidable weapon to have as a back-up should the sword be lost or damaged and we need not view it solely as a 'boy-scout' knife used for eating meals or whittling wood. Daggers, like the short sword, were used by both legionary and auxiliary infantry, a fact that is evident from the tombstone evidence. However, they also seem to have been owned by some cavalrymen. A papyrus records that L. Caecilius Secundus, an *eques* of the *ala Paullini*, borrowed money from an auxiliary infantryman, and one of the objects he used as security for the loan was 'a silver dagger sheath with ivory inlay', the document being dated 25 August, AD27.[20]

It is commonly supposed that decorated sheaths were personal purchases replacing 'standard issue' items, but the rarity of such plain pieces from the archaeological record, together with the Roman soldiers' evident taste for decorated equipment, suggest that this view may be groundless. The undecorated sheaths are of Type A and dated ones come from early Principate contexts, so it is feasible that most dagger scabbards of the mid-first century should not have been decorated.[21]

A thoroughly heterodox form of dagger was found in the Mehrum burial, and is assumed to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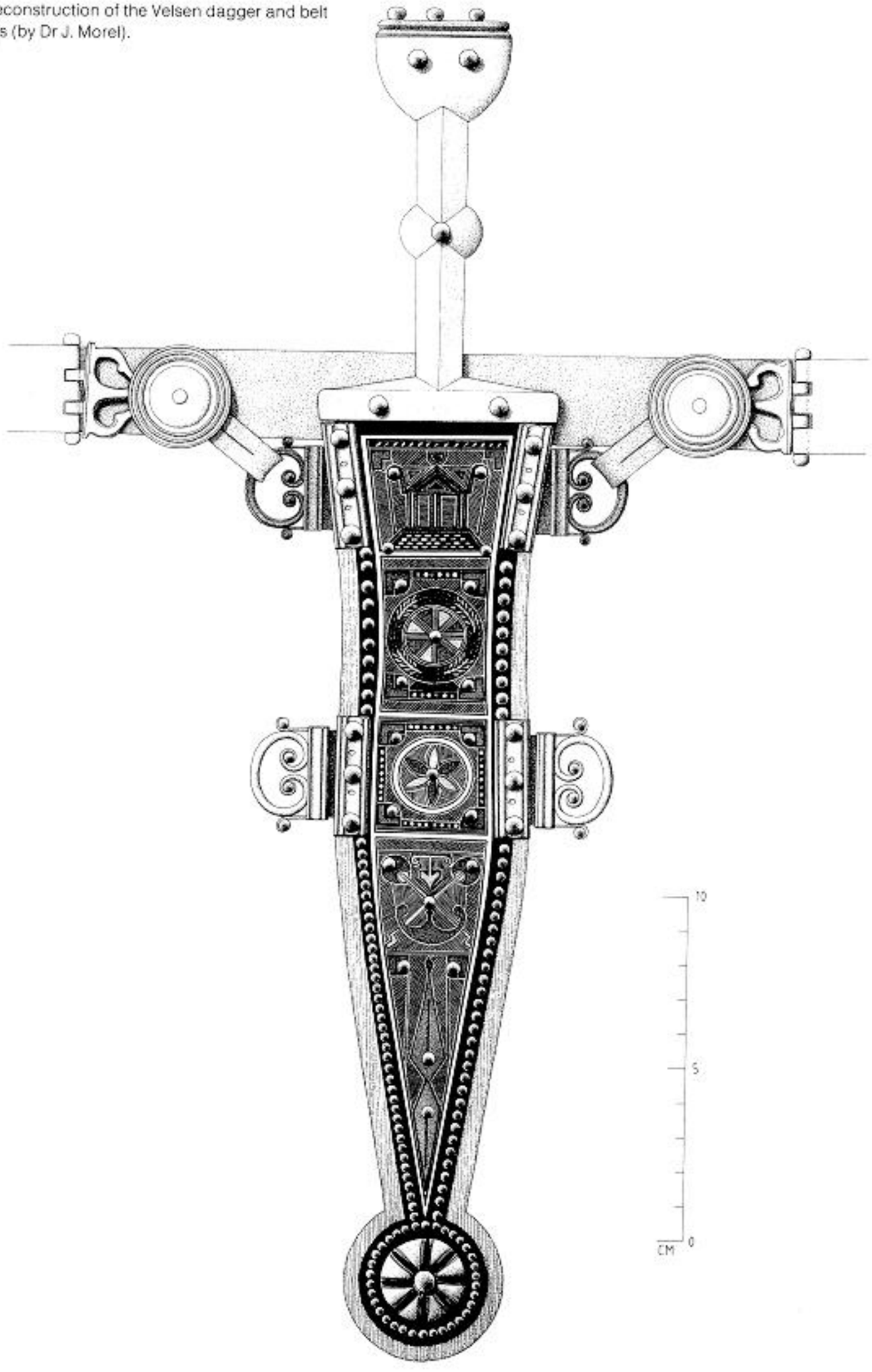
42 Reconstruction of the Velsen dagger and belt fittings (by Dr J. Morel).



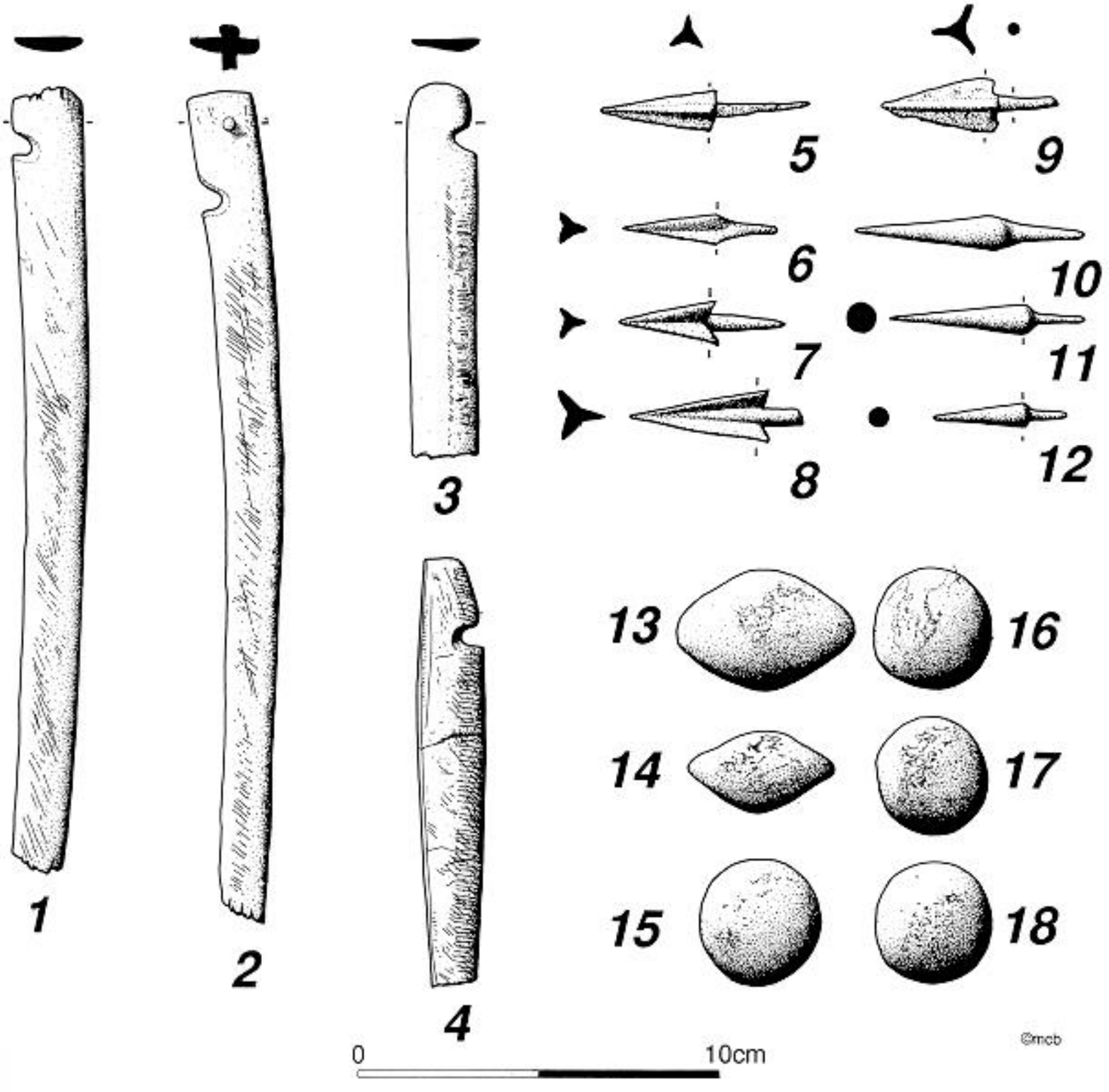
have belonged to a Germanic auxiliary in Roman service.[22]

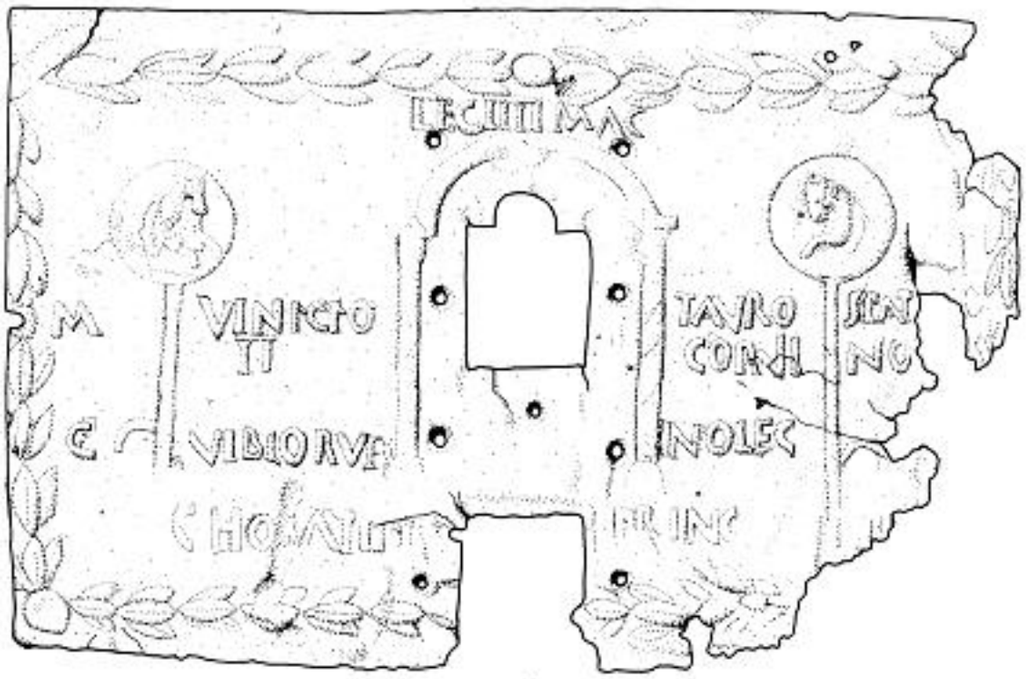
Contrary to accepted belief, the dagger continued in use into the second century, an example coming from Buciumi, and one is shown on the tombstone of Castricius Victor at Aquincum. Decorated sheaths continued in use into the Flavian period, with an example from Corbridge probably dating to after AD85.[23]

Bows and slings (Fig. 43)

Finds of arrows, particularly the trilobate tanged variety, illustrate the use of archery by the Romans in this period. Fragmentary bone or antler laths designed to stiffen the ends (ears) of composite bows are known from Oberaden and Dangstetten (Augustan), Velsen (Claudian), Waddon Hill (Neronian), Risstissen (late Neronian/early Flavian) and Vindolanda (late Flavian).[24]

43 Early Principate archery equipment and slinging missiles. *1–3* bone (Carnuntum); *4* bone (Waddon Hill); *5* iron (Dangstetten); *6–8* iron (Carnuntum); *9* iron (Hod Hill); *10–12* iron (Carnuntum); *13–18* clay shot (Pförring, Germany).





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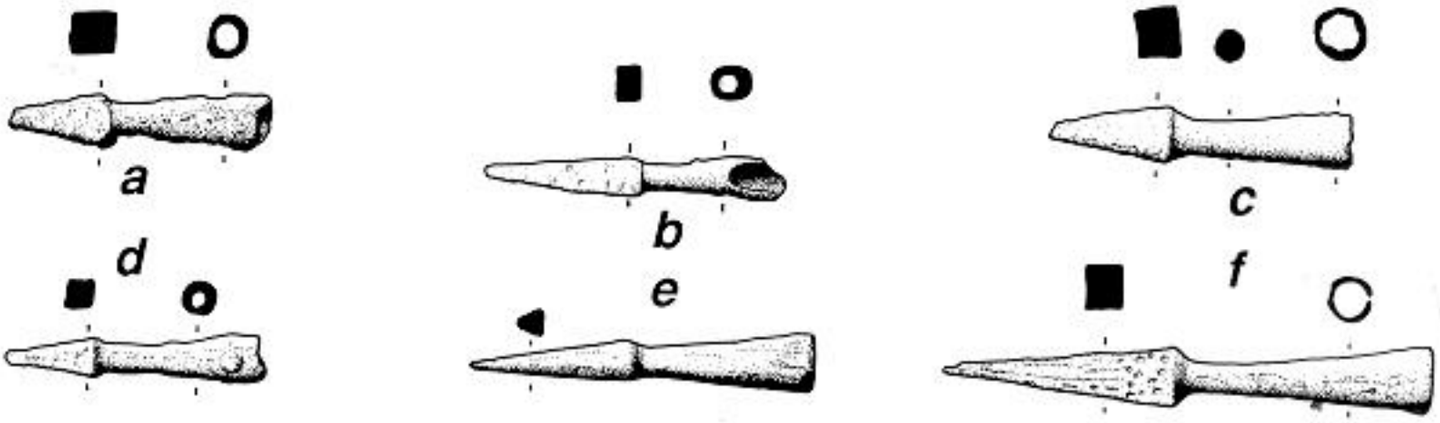

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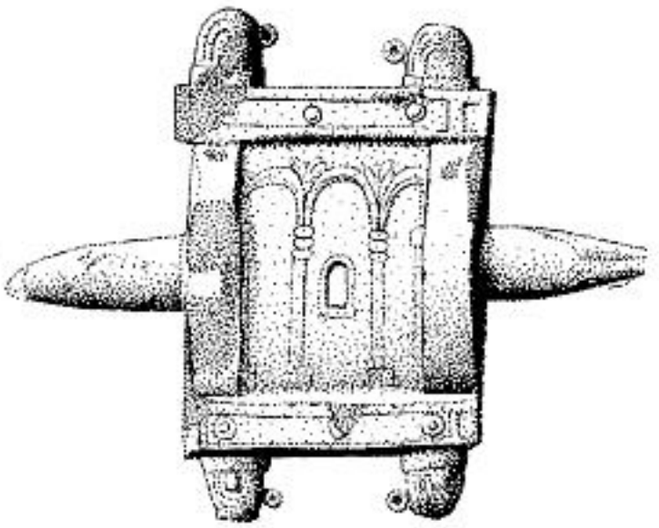
Slingshot are also sometimes found, made of clay and lead. Soldiers were taught both archery and slinging as a matter of course during their training, presumably as a useful skill to keep in reserve, but specialists in these weapons (particularly the bow) seem to have been spread amongst the army when in garrison, rather than kept together in one place.[25]

Artillery (Figs. 44–45)

The two main types of artillery in use by the Roman army in the first century AD were still the stone-thrower (*ballista*) and bolt-shooter (*catapulta*). Vegetius states that each legion had ten stone-throwers and 55 bolt-shooters. Some stone-throwers could be very large, as is shown by an incident from the civil war of AD69, reported by Tacitus. The components of torsion artillery are occasionally found on sites of this period, such as a washer from Elginhaugh or the moulds for casting washers from the Auerberg. A shield from the front of the frame of a bolt-shooter, complete with a consular date of AD45, was found near the site of the battle of Cremona, along with a less-complete second example, and washers probably belonging to both weapons.[26]

We know from Josephus that stone shot were used by Roman artillery in the siege of Jerusalem, and examples of these have been found around the city. However, the most common find associated with artillery is the so-called catapult (or *ballista*) bolt-head. These were square-sectioned and socketed, and one found at Dura-Europos, on a wooden shaft with flights, confirms the identification. Other types of weapon head are occasionally suggested as artillery bolts (for example, that which struck down one man at Maiden Castle), but there is no real clue that allows us to distinguish these from, say, light javelin heads. As we have already seen (Chapter 4), bladed artillery missiles are unlikely to have been used.[27] By comparison with their Republican predecessors, bolt-heads of the early Principate had much longer heads.



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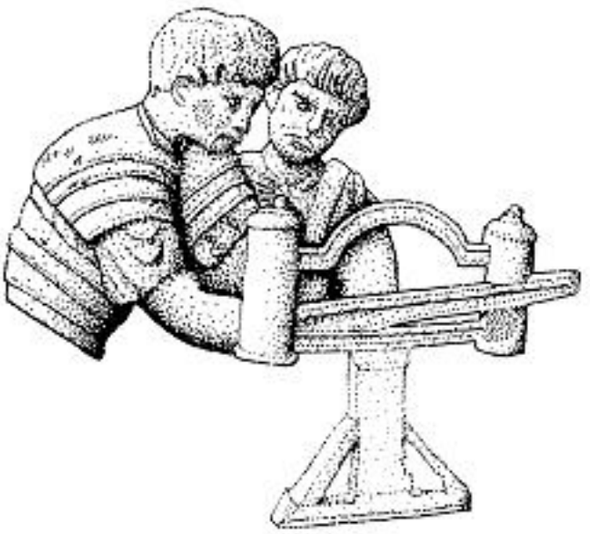

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44 (*Left*) Early Principate artillery. *1* Catapult frame shield (Cremona); *2a–c* washers (Cremona); *3a–f* catapult bolts (*a* Hod Hill; *b* Kingsholm; *c* Corbridge; *d* Hod Hill; *e* Waddon Hill; *f* Augsburg-Oberhausen).

45 (*Above right*) Early Principate reliefs depicting artillery. *1* Tombstone of Vedennius Moderatus (Rome); *2* Trajan's Column Scene LXVI.

Armour

Shields (Figs. 46–47)

A relief on the mausoleum of Munatius Plancus at Gaeta shows that the curved rectangular shield was already in use by *c.*10BC An *adlocutio* coin of the emperor Gaius shows soldiers of the Praetorian Guard equipped with it (see Fig. 8,1), so it was obviously widespread well before the invasion of Britain in AD43. However, this form, so familiar from Trajan's Column, was by no means the only type of legionary shield. Oval shields are shown on the tombstones of Flavoleius Cordus of *legio XIIII Gemina* (see Fig. 143,1) from Mainz (probably before AD 43) and C. Castricius Victor of *legio II Adiutrix* (see Fig. 3,2). There are problems in

identifying intermediate shapes due to the Romans' difficulty in portraying perspective, but a Praetorian(?) carrying a shield with curved sides and a straight top is depicted on a Trajanic relief from Pozzuoli. The curved rectangular shield seems to have been exclusive to Praetorians and legionaries; no representation accompanied by a diagnostic inscription shows an auxiliary equipped with one.[28]

Auxiliaries, both foot and mounted, used flat shields that might be rectangular, oval or hexagonal. The relief of Annaius Daverzus from Bingen (see Fig. 143,4) has a large, flat, rectangular shield sculpted in low relief. Oval shields are often associated with auxiliaries (as at Adamklissi, or on the Mainz column base) and leather covers of this shape have been found. The cavalryman Vonatorix from Bonn has a hexagonal shield, as do several other riders.[29]

Standard bearers and some other specialists had small round shields that could be tucked under the arm, depicted on Trajan's Column, Cancelleria Relief A, and the Pozzuoli monument, whilst a leather cover for such a shield has been identified at Castleford from a Flavian context.[30]

No complete examples of first-century AD shields have survived, although the similarities between the Kasr el-Harit and Dura-Europos curved shields suggest that the curved 'legionary' shield of this period would be made of three layers of plywood, thicker at the centre than at the edges, with a horizontal handgrip. Indeed a (flat) shield from Doncaster was almost certainly made of plywood. Size probably varied, but something approximating to the distance from knee to shoulder may have been usual. Shields were edged with U-sectioned brass binding, normally fastened to the wood with brass nails inserted through lobate expansions on either side of the binding. When recovered from Roman military sites, this binding often shows signs of damage, although it is not really possible to tell whether this results from combat or just careless handling. In addition, the rear face was usually strengthened with iron bars, fastened through the shield-board with disc-headed iron nails, and such a bar would frequently reinforce the handgrip.[31]

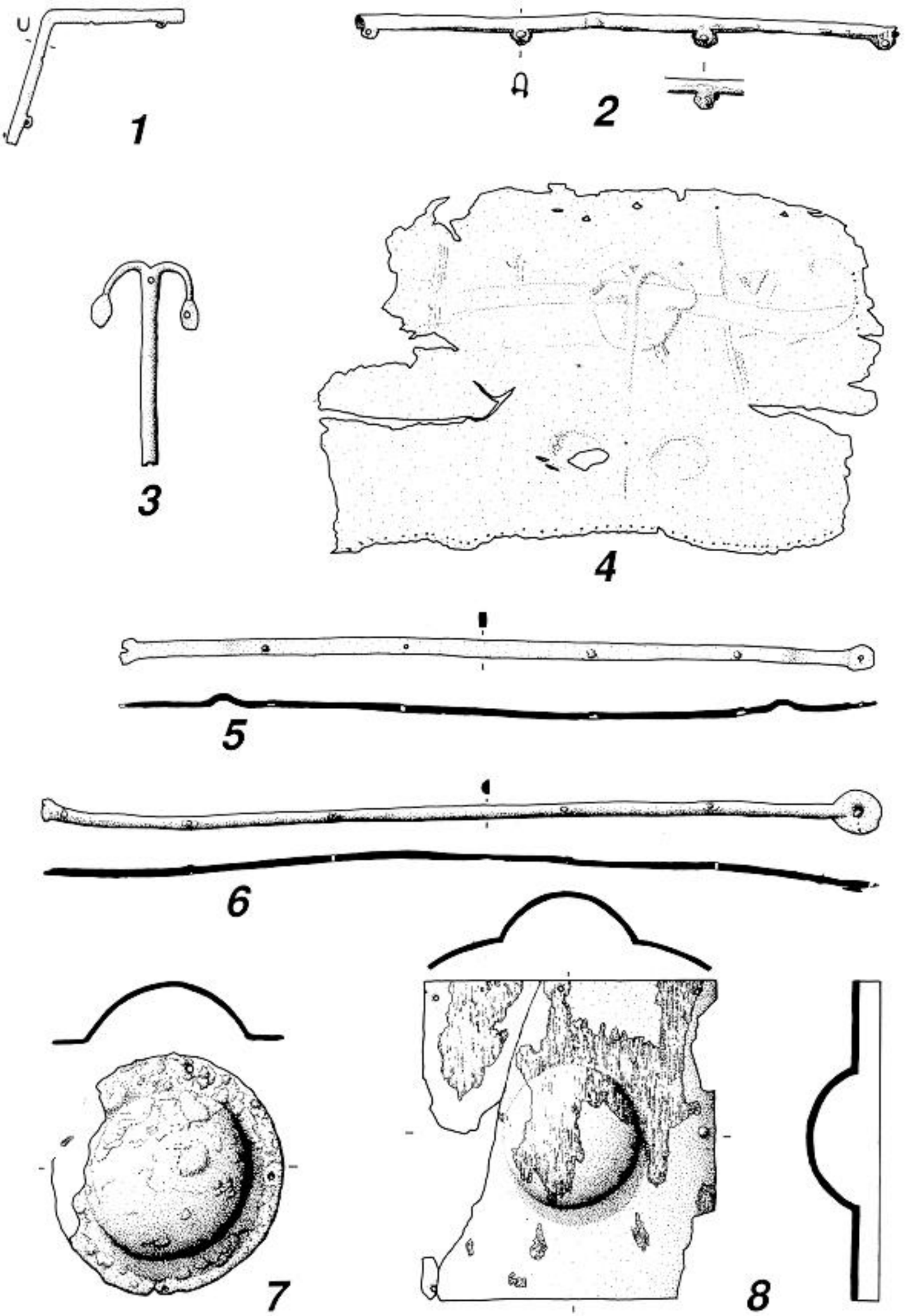
Bosses for the legionary shield frequently reflected its shape, being rectangular and curved around the central hemispherical boss, although they are comparatively rare as archaeological finds (the two well-known copper alloy pieces of *legio VIII Augusta* being second century – Pl. 3a – and the three iron examples from the weapons store at Carnuntum of uncertain date). A curved circular boss was found in a grave at Nijmegen, along with a Roman helmet (see below, p. 93). Circular bosses from flat auxiliary shields are more common, a particularly fine piece with a punched ownership inscription coming from Zwammerdam, closely comparable with the example depicted on a Mainz column base. Bosses could be of iron or copper alloy, the advantage of the latter being that they could be spun, a much easier and quicker process than beating.[32]

The shield was protected when not in use by a goatskin cover with a drawstring around its periphery. These had specially shaped patches that fitted over the boss, and were decorated with appliqué panels containing the legionary name or motif – at Vindonissa the name of the unit in openwork, at the Bonner Berg site a rather crude representation of Minerva, tutelary deity of *legio I Minervia* (whose name is also included in the design). Caesar implies that it was normal to take the cover off before battle. Some commentators have suggested that the shield board itself was covered with leather which was glued to it, even covering the boss, but this fails to account for the fact that some bosses at least were clearly designed to be seen.[33]

Indeed, the study of shield covers has revealed an otherwise unattested type of shield, with curved ends and straight sides, known from sites like Valkenburg, Caerleon and Bonner Berg. In the case of the last, the shield was legionary (a fact recorded by the stitching marks on the vanished appliqué panel). Unfortunately, what the leather evidence cannot tell us is whether the shield board was originally flat or curved.[34]

Representational evidence suggests that legionary shield-blazons comprised a thunderbolt (*fulmen*) and wings, as well as stars and crescents, and these were probably painted on the shield-board. Praetorian designs often included a scorpion, but nothing is known about auxiliary blazons. Attempts to identify individual units on Trajan's Column by their supposed badges are misguided.[35]

46 Early Principate shields. *1* Binding (Aislingen); *2* binding (Spettisbury); *3* reinforcing strip (Newstead); *4* shield cover with impression of reinforcing strip (Vindonissa); *5–6* handgrips (Newstead); *7* flat boss (Doncaster); *8* curved boss (Carnuntum).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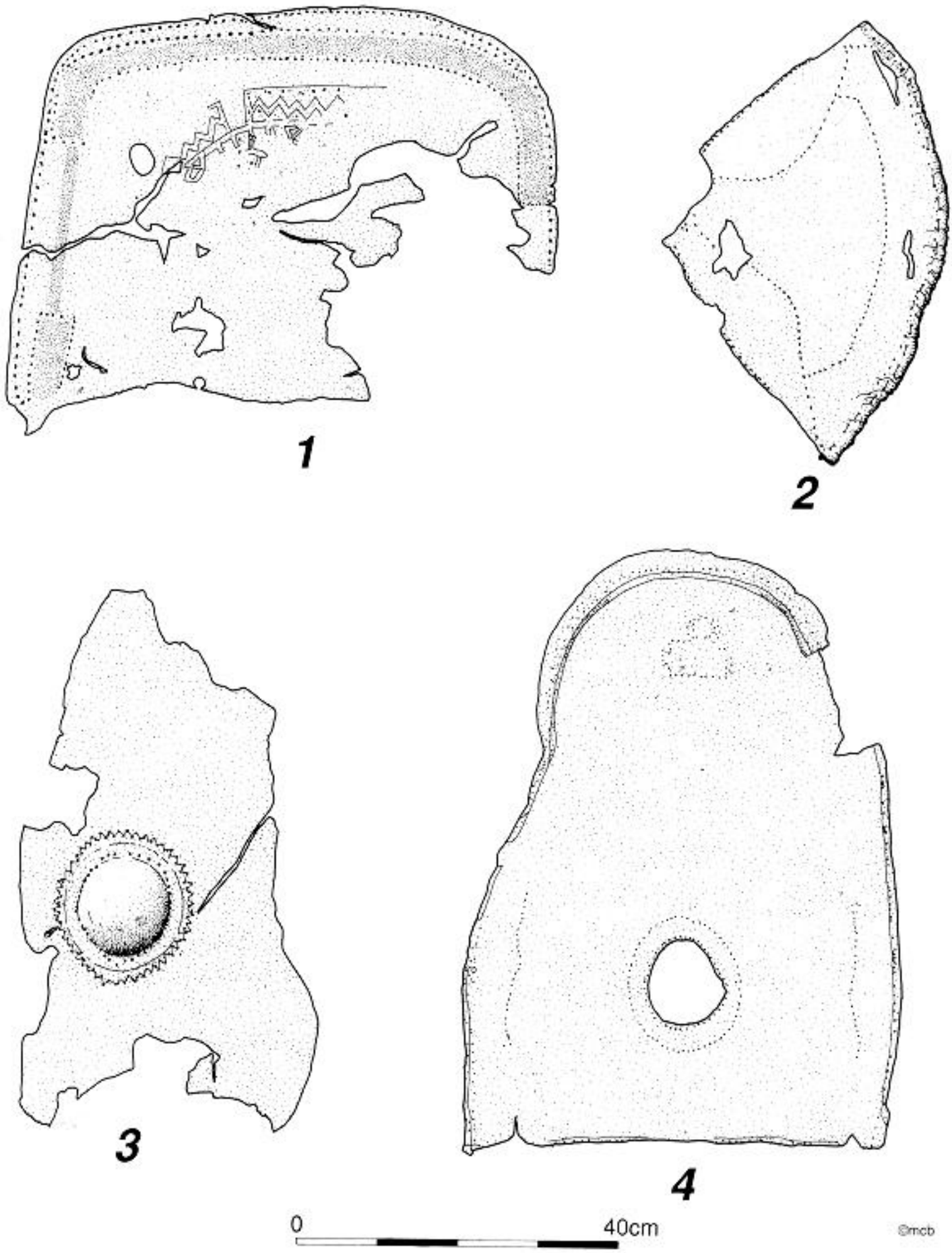


47 Early Principate leather shield covers. *1* Rectangular (Vindonissa); *2* circular (Castleford); *3* shield boss (Vindonissa); *4* oval (Valkenburg).

Body armour (Figs. 48–55)

Mail continued to be used by both legionaries and auxiliaries during the first century AD, a fact that is demonstrated by finds of small clumps of the rings. Robinson showed quite convincingly that what had often been thought to be leather armour on sculpture was in fact supposed to be mail, and the tombstone of C. Valerius Crispus of *legio VIII Augusta* from Wiesbaden (see Fig. 3,1) shows mail in use by a legionary in the Flavian period, and the Adamklissi metopes confirm its continuation amongst some Trajanic legionaries.[36]

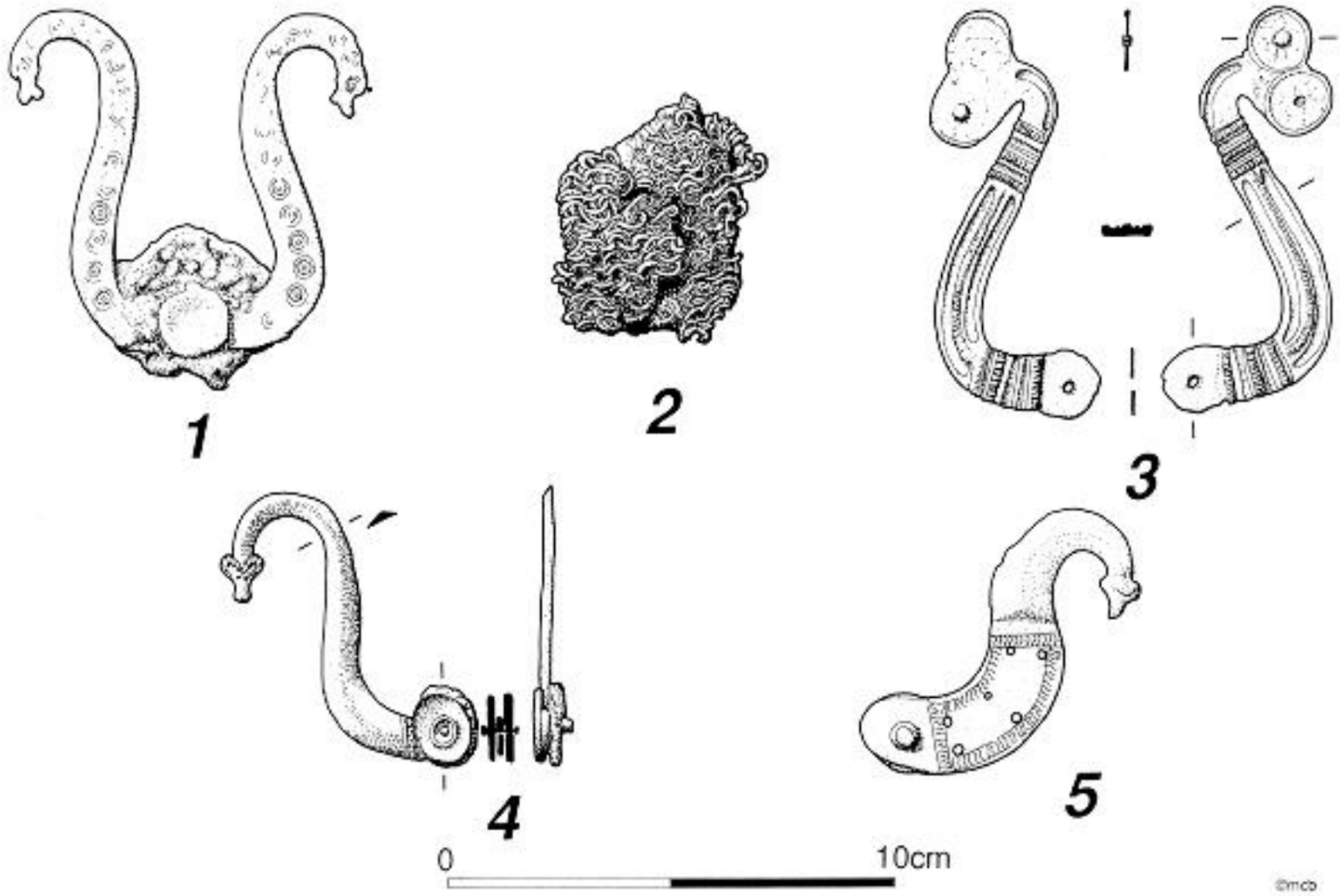
Its use was of course also widespread amongst the *auxilia* (arguably more so than scale armour, but this could just be due to a quirk in the representational evidence), and is found worn by both cavalry and infantry. Mail fasteners are known from a number of sites and frequently echo their Iron Age antecedents. These hinged fittings, attached to the centre of the chest, served to fasten the shoulder-doubling. Hip-length mail shirts were now common, those of cavalrymen having a short slit on either side to make it easier to sit on a horse (this feature is also shown on mail worn by a legionary on a Mainz column base).[37]

Scale armour was also used by both legionaries and auxiliary infantry and cavalry. The tombstones of the Sertorii from Verona, one a *centurio* (Fig. 49,1) and the other an *aquilifer* with *legio XI Claudia*, both depict scale, as does the tombstone of a centurion from Carnuntum and, of course, the Adamklissi metopes (Fig. 50,2). Amongst auxiliaries, the cavalrymen Vonatorix from Bonn and Longinus Sdapeze of *ala I Thracum* from Colchester (both Claudian or earlier) wear scale. Finds of scales in the archaeological record appear to show this type of armour was used much more widely than the tombstones suggest. Scales were frequently tinned, as were alternate ones on a cuirass from Ham Hill (the intervening scales were left their natural brass colour). A hybrid form of body defence, the so-called *lorica plumata*, consisted of mail with very small scales attached to its surface. Presumably very time-consuming to produce, it is not a common find. No examples of the metallic muscled cuirass, presumed to have been used by officers (see Fig. 49,2), have survived.[38]

The form of armour for which the first century AD is best known, however, is that termed '*lorica segmentata*' – a cuirass made of strips of iron sheet articulated on leather straps, with copper alloy fittings. This is a recent coinage, the Roman name is unknown. Although the Corbridge find that led to our full understanding of this type of armour belongs firmly in the second century AD, pieces are found on military sites from the Claudian period onwards and it does not seem to have changed much over a century. Its origins are uncertain, but may lie with gladiatorial equipment, since the articulated armguard or vambrace (*manica*) was certainly in use in this sphere. In fact, the first time the Romans came directly into contact with this armour may have been during the revolt of Florus and Sacrovir in AD21, when heavily armoured gladiators, called *crupellarii*, fought against legionaries. Tacitus describes how these men were encased in plate armour which the legionaries had to hack through with pickaxes. Armoured gladiators were quite unusual and a small figurine found at Versigny, which has been identified as a *crupellarius*, shows a gladiator wearing segmental armour covering torso, arms and legs (Fig. 54). It is not difficult to imagine the men of the Upper German army, impressed by the efficacy of this type of armour, adopting a version of it. This is, of course, pure speculation, but perhaps more credible than some writers' suggestions that Roman defeats, such as that at Carrhae, were the spurs that led to the 'invention' of segmental plate armour.[39]

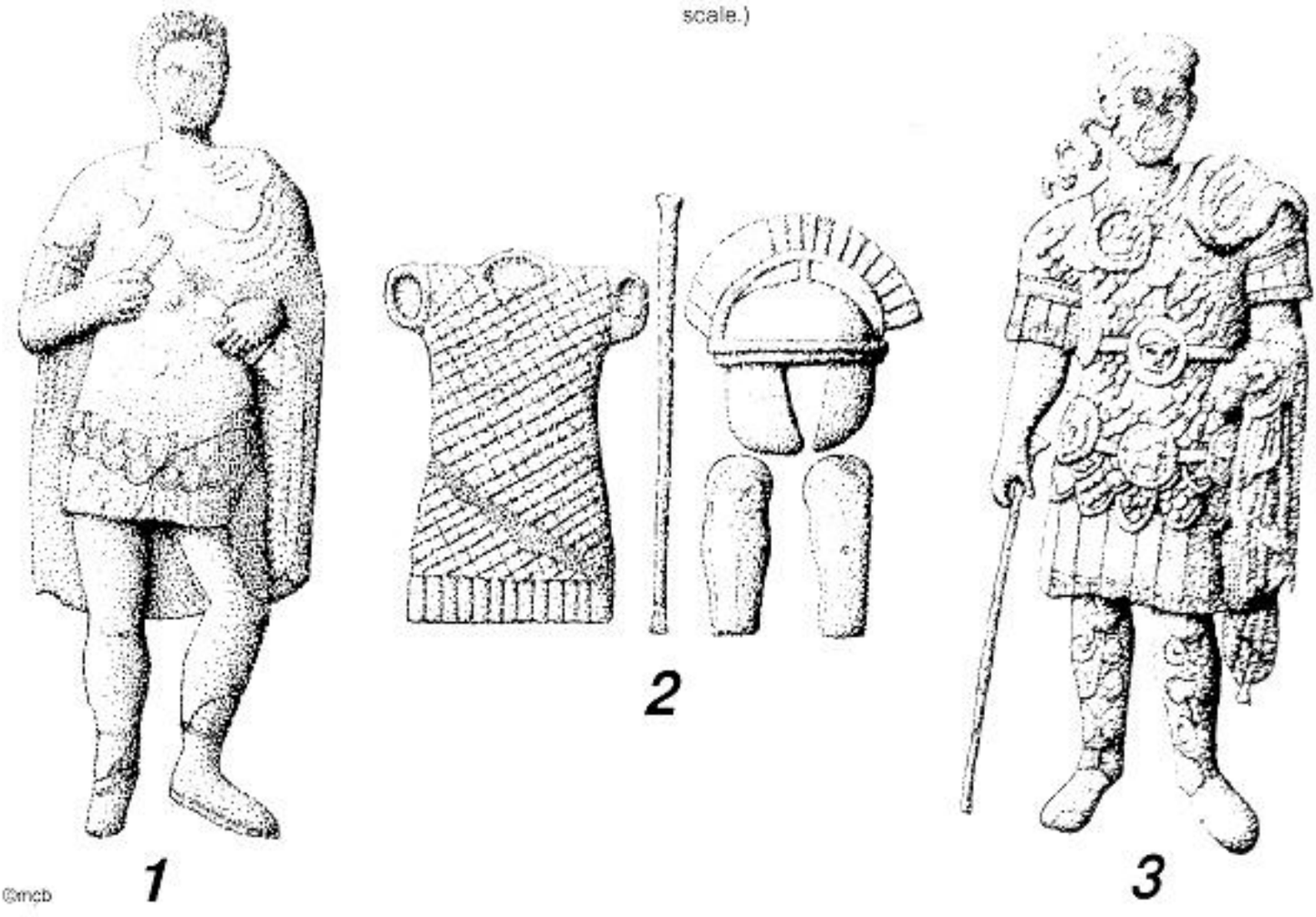
The earliest datable artefacts seem to be copper alloy fittings from the Magdalensburg, abandoned around AD45, and these are closely matched by pieces from Chichester (deposited by AD47?) and Colchester (deposited in AD49 when *legio XX* moved on?). The fittings are often found on British sites of the first century AD and are one of the pivotal points in discussions over whether there were distinctions between legionary and auxiliary equipment (see Appendix). Usually made of very thin sheet copper alloy, these fittings were commensurately fragile and seem often to have broken. Moreover, the electrolytic reaction between the copper alloy and the iron of the plates would have led to these being the first place that corrosion would start.[40]

The '*lorica segmentata*' was especially strong in shoulder-defence, probably for the same reasons that mail shirts had shoulder-doubling. Indeed, most of the damage on the Corbridge cuirasses was in the shoulder area. However, it has been pointed out that plate armour has one major advantage over mail, that is when hit it would absorb the force of a blow (a so-called 'soft' armour), whereas mail, unless extremely well padded, would be driven into the flesh of the wearer. The added use of a padded undergarment



48 (*Above*) Early Principate armour – mail. *1* Chassenard; *2* Carnuntum; *3* Longthorpe; *4* Dangstetten; *5* Sheepen.

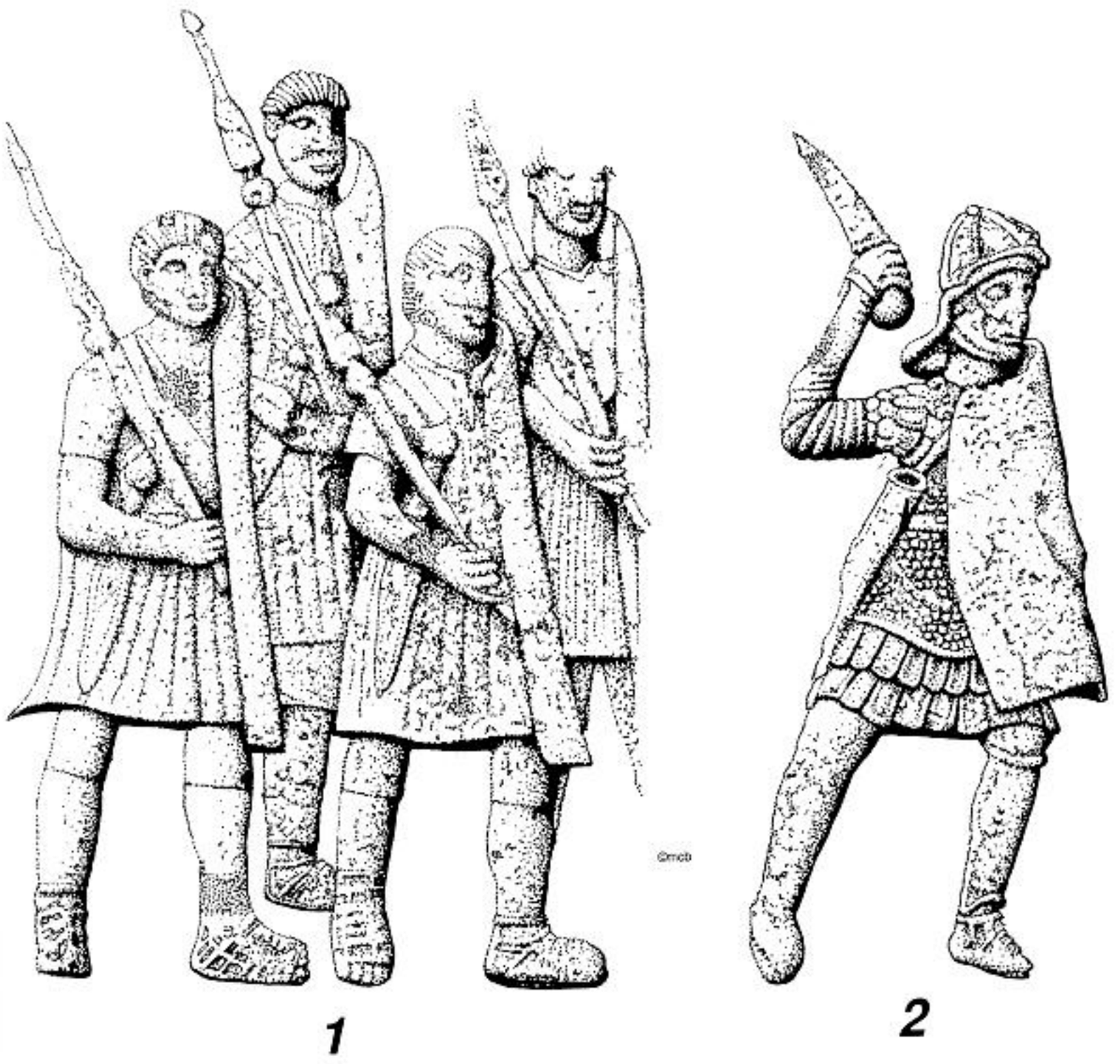
49 (*Below*) Early Principate tombstones of a prefect and two centurions. *1* T. Exomnius Mansuetus (Sitten); *2* T. Calidius Severus (Carnuntum); *3* Q. Sertorius Festus (Verona). (Not to scale.)

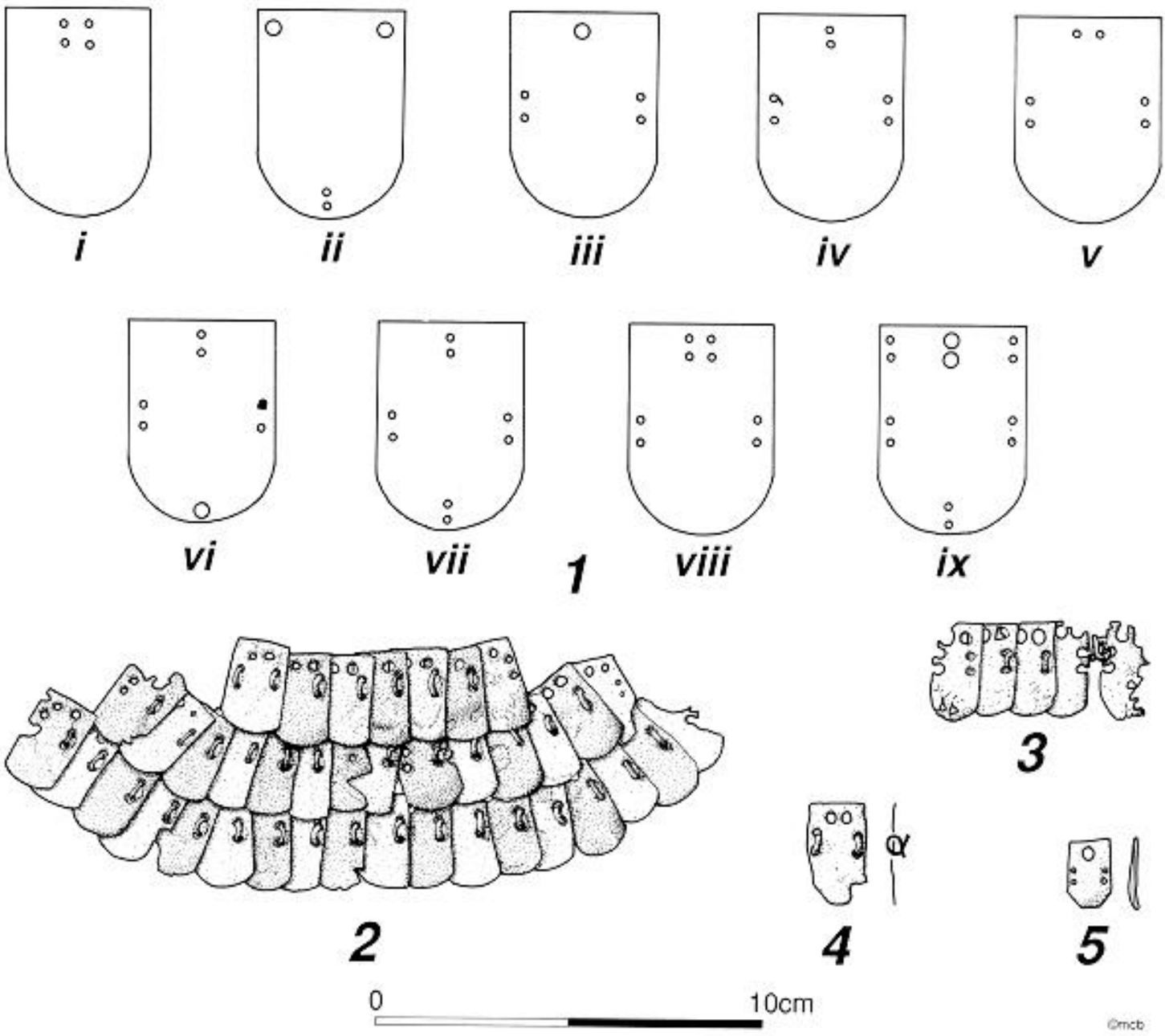


(*thoracomachus*) with '*lorica segmentata*' would have further protected the shoulders from bruising, and this would also solve some of the supposed problems with the chest-plates on modern reconstructions. Some writers have stressed that plate armour was easier to manufacture than mail. Whilst the processes involved in making mail would be tedious to the lone craftsman, an increase in manpower would greatly facilitate production.[41]

Limb armour was used by some legionaries in the first century AD. A segmental armguard is shown on the tombstone of Sex. Valerius Severus of *legio XXII Primigenia* from Mainz. The Adamklissi reliefs show such armguards being worn by legionaries, leading some scholars to suggest that they were adopted purely to counter the menace of Dacian scythe-weapons (*falces*), but Valerius Severus' tombstone denotes wider use. Fragmentary *manicae* were also found in the *Waffenmagazin* at Carnuntum and at Newstead (although wrongly identified as thigh defences by Robinson). Likewise, it is often said that greaves, both decorated and undecorated, were the exclusive preserve of centurions, but they are also shown being worn by ordinary infantry on the Adamklissi metopes; a sculpture from Alba Iulia may also depict one. The leather lining from a greave was found in the *Schutthügel* at Vindonissa.[42]

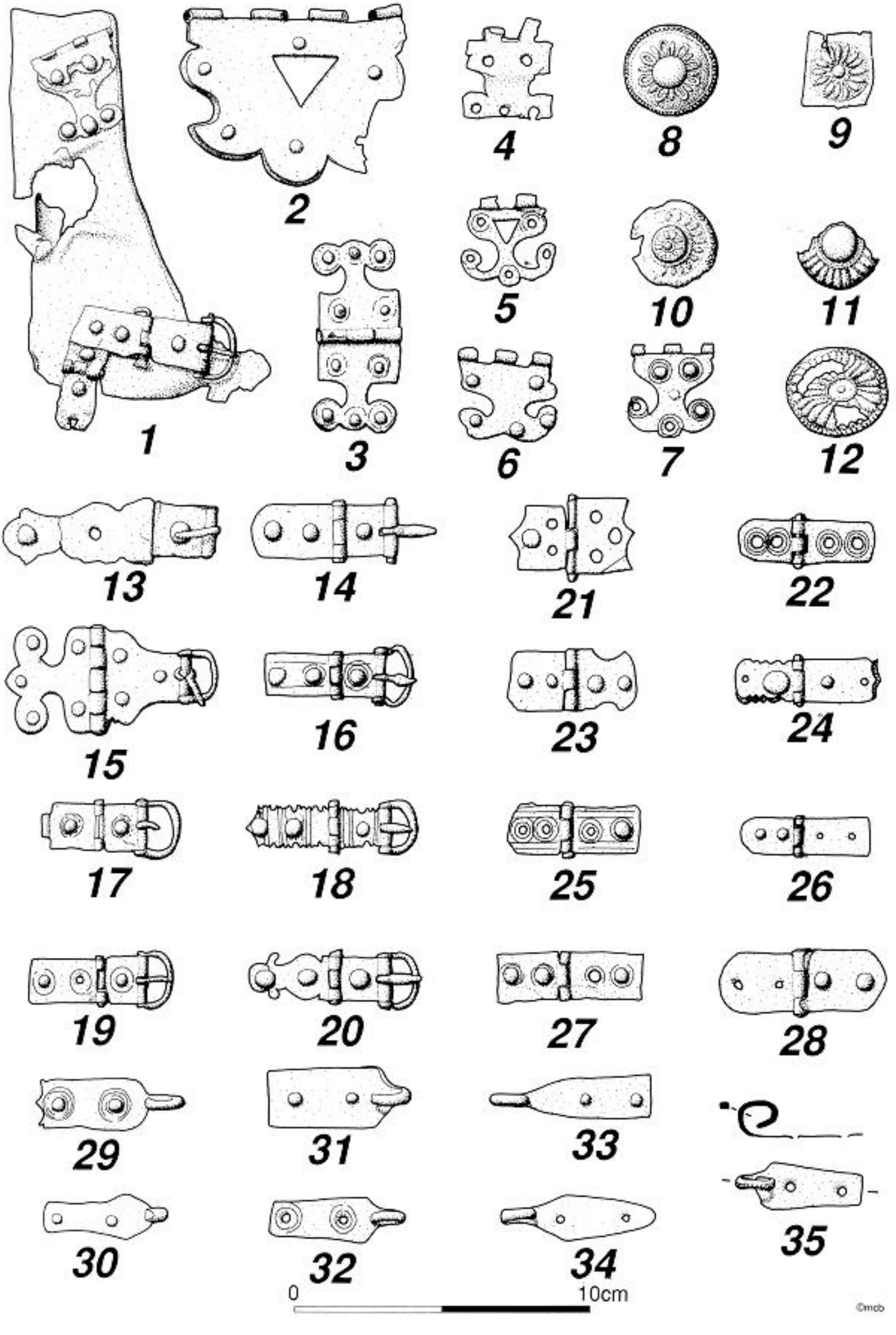
50 Adamklissi monument. *1* Marching legionaries; *2* fighting legionary. (Not to scale.)





51 (*Above*) Early Principate armour – scale. *1i–ix* Von Groller's classification of Carnuntum scales; *2* Ham Hill; *3* Kempten; *4* Longthorpe; *5* Chichester.

52 (*Right*) Early Principate armour – '*lorica segmentata*' fittings. *1* Breastplate (London); *2–7* lobate hinges (*2* Carnuntum; *3* Chester; *4* Rheingönheim; *5* Hofheim; *6* Oberstimm; *7* Sheepen); *8–12* decorated washers (*8* Silchester; *9* Rheingönheim; *10* Chichester; *11* Chester; *12* Longthorpe); *13–20* hinged buckles (*13* Sheepen; *14* Chichester; *15* The Lunt; *16* Rheingönheim; *17* Aislingen; *18* Vindonissa; *19–20* Risstissen); 21–28 hinged strap fittings (*21* Strasbourg; *22* Oberstimm; *23* Carnuntum; *24* Hod Hill; *25* Oberstimm; *26* Broxtowe; *27* Rheingönheim; *28* Risstissen); *29–35* tie loops (*29* Hod Hill; *30* Risstissen; *31* Hod Hill; *32* Rheingönheim; *33* Carnuntum; *34* The Lunt; *35* Corbridge).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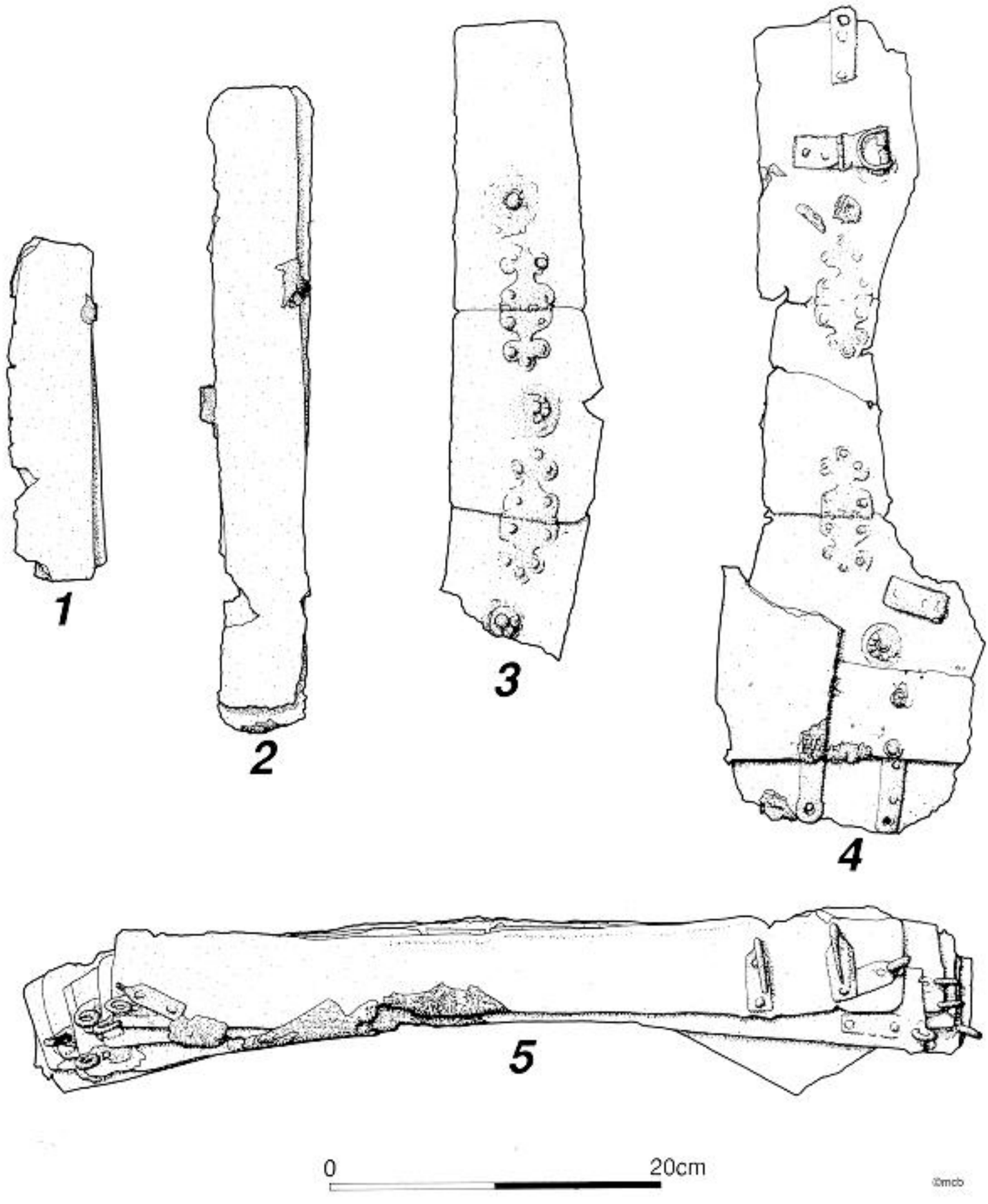
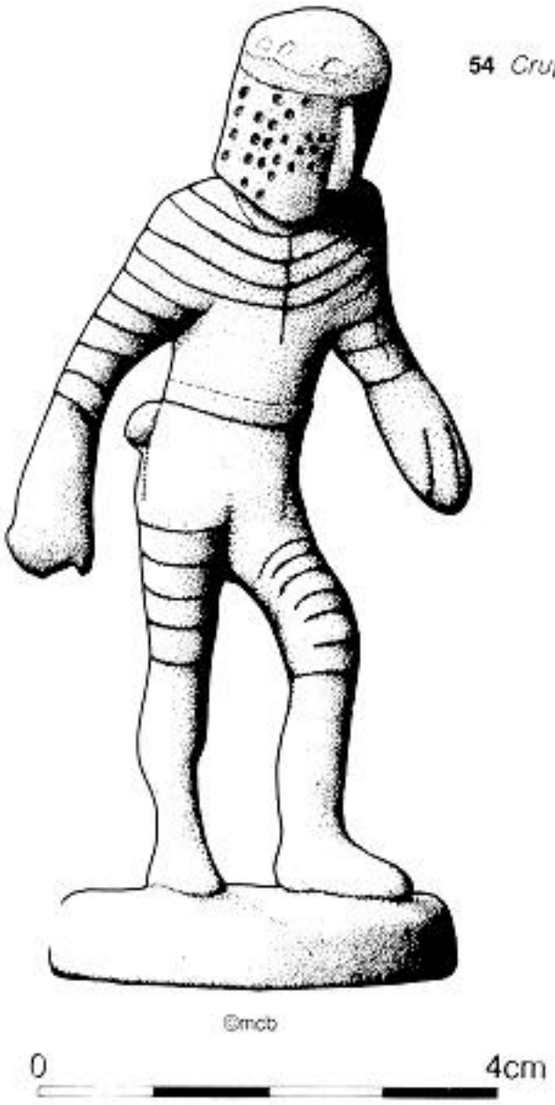
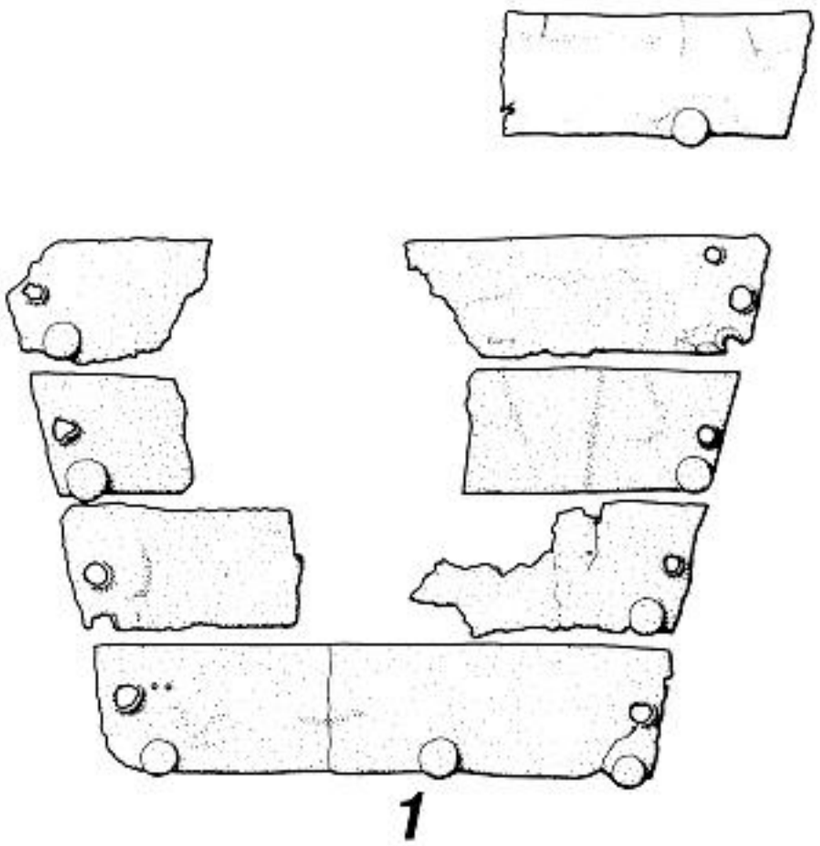


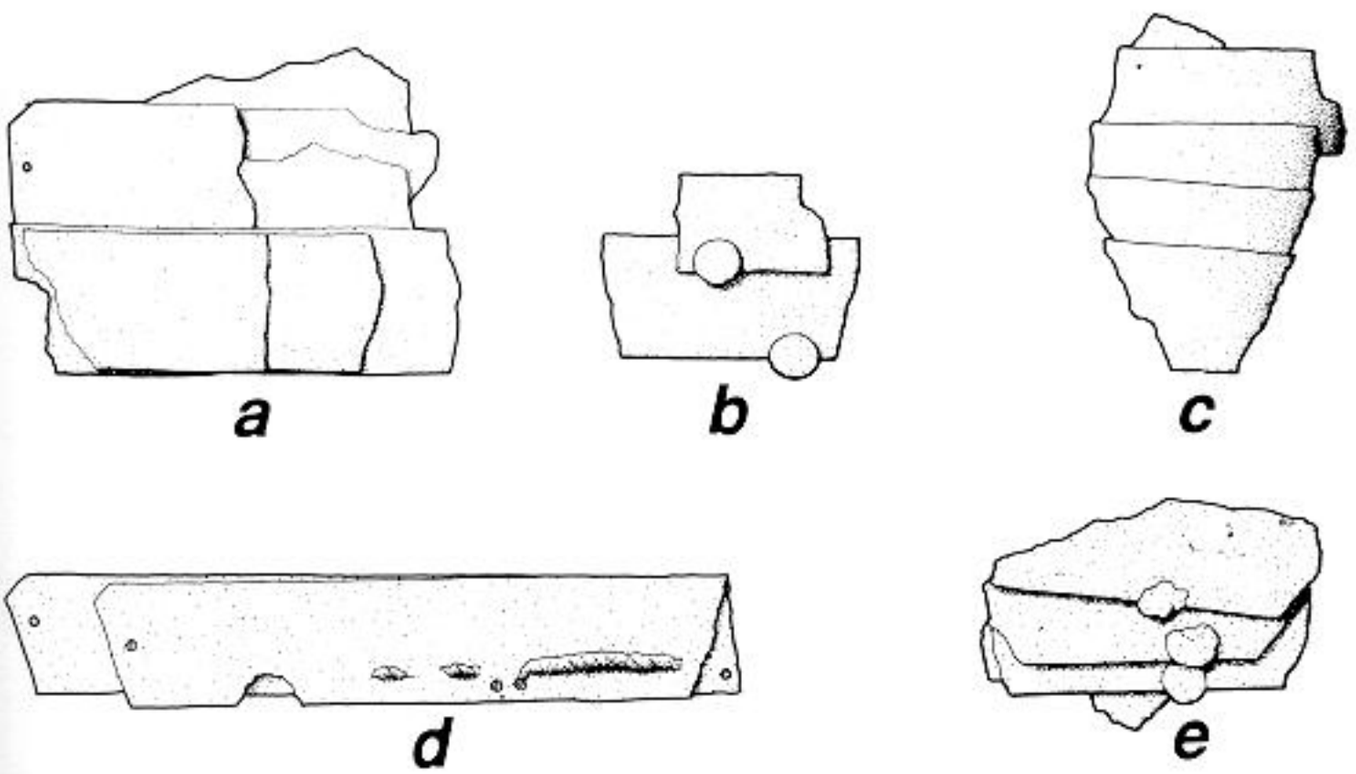
53 The Corbridge armour, cuirass 5. *1–2* Lesser shoulder-guards; *3* upper shoulder-guard; *4* collar plates; *5* girth plates.

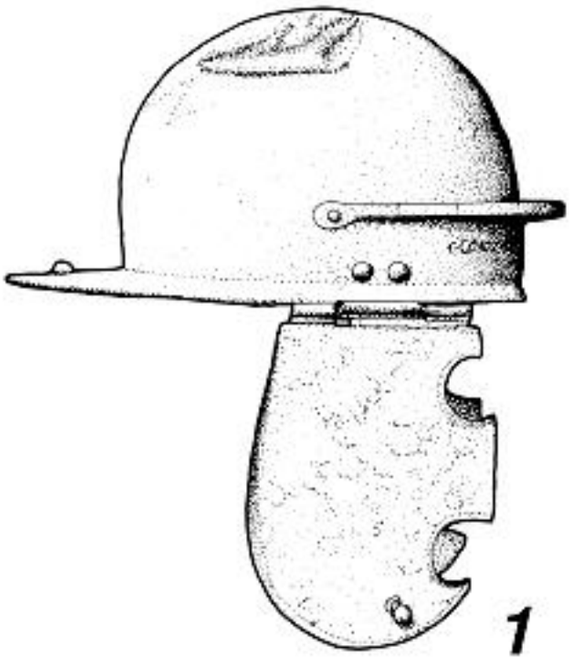


54 *Crupellarius* figurine from Versigny.

55 Early Principate armour – armguards. *1* Newstead; *2a–e* Carnuntum.







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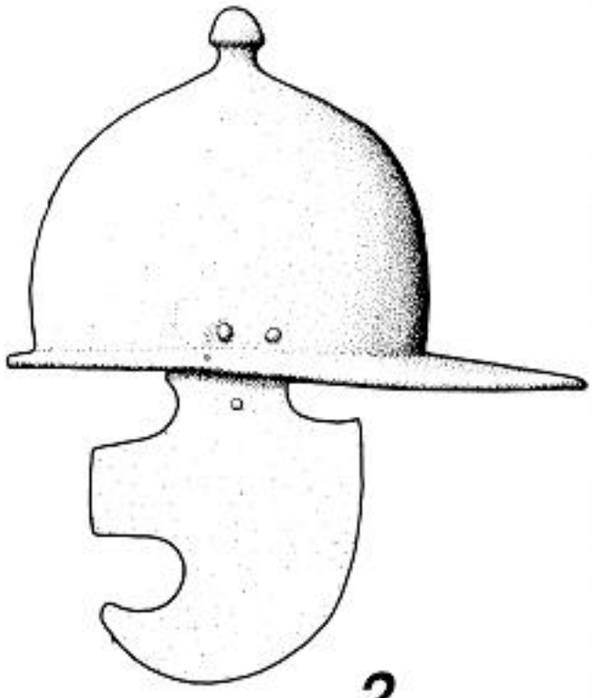

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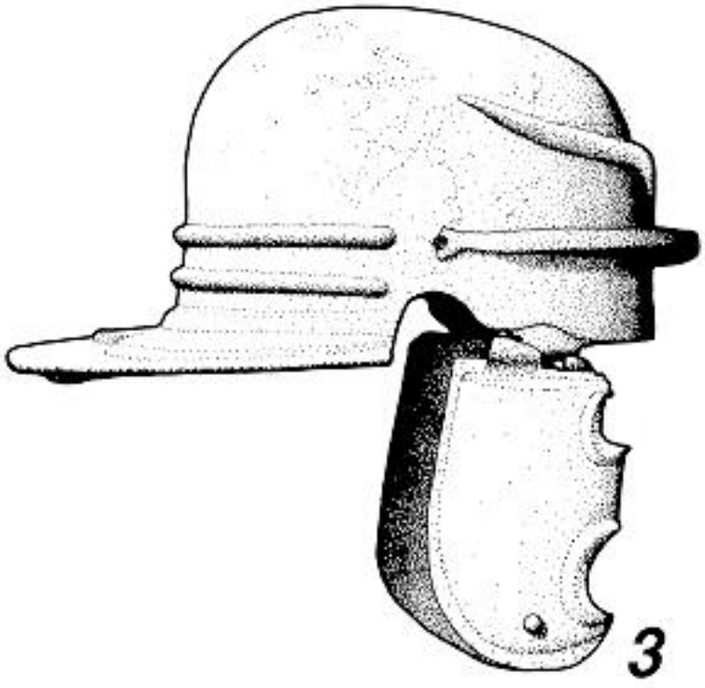

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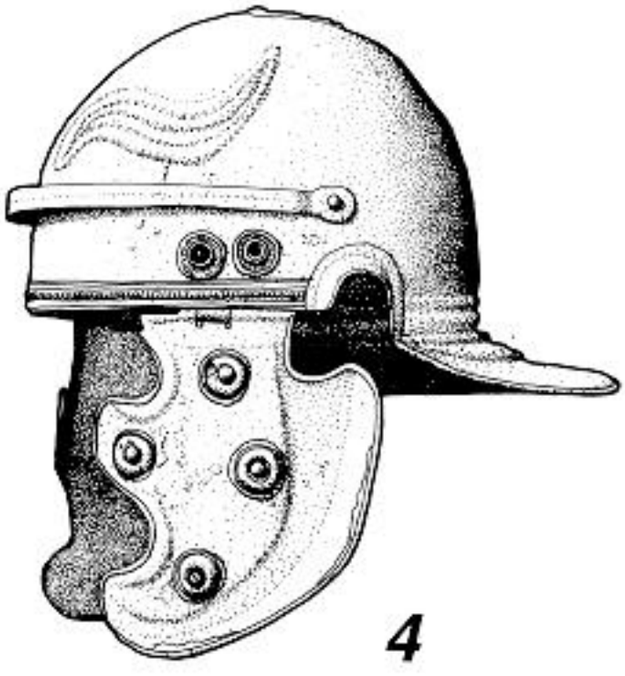

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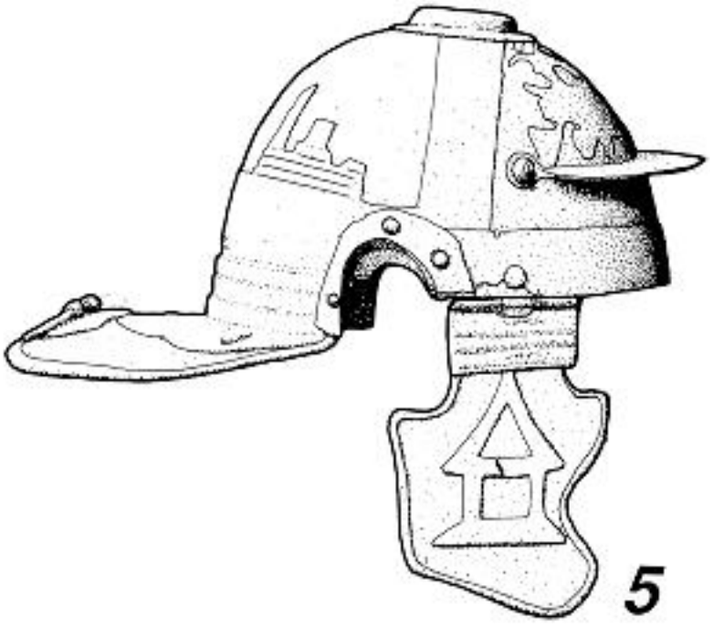

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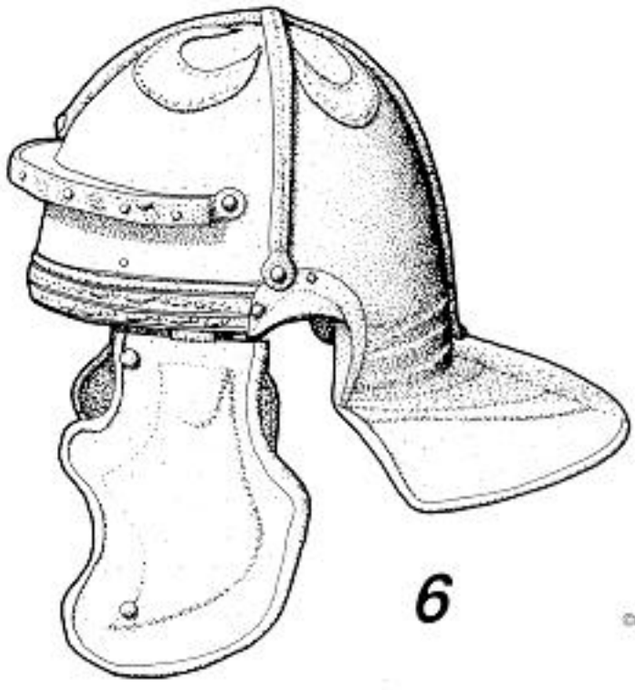

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Helmets (Figs. 56–58)

Perhaps one of the best attested forms of Roman equipment from this period, the helmet, can be seen to display a number of different traditions which gradually began to blend. However, helmet studies are hindered, rather than furthered, by the various systems of classification in use: continental scholars preferring a clumsy type-site nomenclature, and the British using Robinson's inflexible scheme (with its implied linearity of development). The essential characteristics of the helmets introduced in the first century AD were a bowl and broad, ribbed neck-guard manufactured in one piece, a brow-guard, and large hinged cheek-pieces. Helmets now also began to feature cut-outs on the side of the bowl for the ears, some even having added ear-protectors. The brow-guard and ribbing on the neck were probably designed to counter (or at least hinder) slashing blows travelling downwards, whilst the neck-guard quite clearly protected the back of the head and shoulders.[43]

The Coolus and Montefortino types continued from the Republic, whilst the Imperial-Gallic (also known as 'Weisenau') and Imperial-Italic types soon came to the fore, so that a trend towards a deeper neck and broader neck-guard is detectable amongst the better-dated pieces. The earliest piece that is recognizably Roman was found in an Augustan grave at Nijmegen (along with the above-mentioned curved, circular shield boss), but there are a number of similar helmets from undated contexts which appear to belong to the same stage of development. However, examples of the Agen-Port type of helmets, although technically pre-Roman, may well have been used by Celtic auxiliaries in the service of the Romans, and this would provide a likely mechanism for the introduction of this helmet to the regular soldiers of the legions.[44]

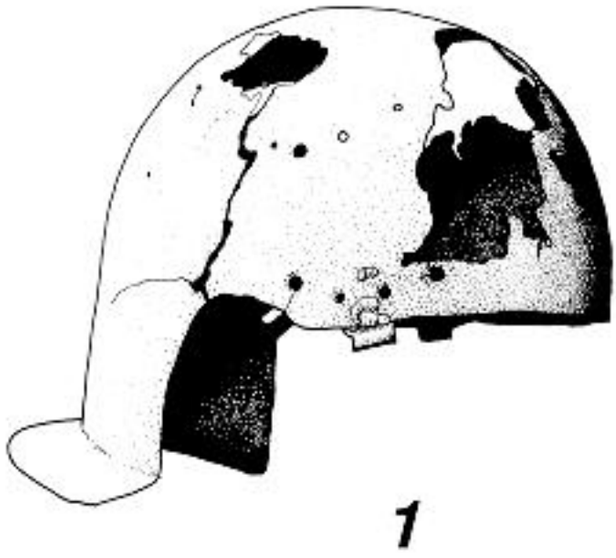
The Imperial-Gallic helmet was usually (but not exclusively) manufactured of iron, the bowl having to be beaten out over a former. It was characterized by a pair of stylized eyebrows on the front of the helmet bowl. Trimmed with brass piping and decorated with brass bosses (sometimes enamelled), these are amongst the finest helmets produced by the Romans. Imperial-Italic helmets, on the other hand, lacked the quality of finish displayed by their Imperial-Gallic counterparts, although they had many of the same design tendencies. Crests could be fitted to helmets, for which purpose a forked crest-box holder could be slid or twisted into a plate on top of the bowl, and plume-tubes on the side of the bowl could receive decorative plumes. No example of a crest-box has survived from this period, but we know how wide they must have been from the crest-box holders. Nor, curiously enough, have any fittings been identified that might have belonged to the transverse crest worn by centurions.[45]

It was also in the first century AD that carrying-handles began to appear on helmet neck-guards. This interpretation of isolated handles is sometimes doubted, but they are always of the same internal width, just big enough to place the three middle fingers through the loop whilst steadying the neck-guard with the thumb and little finger. Helmets have to be lined and, more often than not, padded so that they fit comfortably; the remains of lining are sometimes found, as on the inside of the bowl of an Imperial-Gallic example from Brigetio.[46]

In truth, the distinction between the two traditions may be more illusory than real and the implication of Robinson's terminology – that they were manufactured in two different areas – may be misleading. Their origins may have been disparate, but the reasons for their evolution were probably the same. It has also been suggested that some helmets, because of the poor quality of their manufacture, might have been specifically designed for auxiliaries, but this is difficult to prove without a larger body of data and more specific inscriptions.[47]

Cavalry helmets enjoyed a quite separate development from their infantry counterparts during the first century AD. Tombstones, such as those of T. Flavius Bassus from Köln (see Fig. 4,1) and C. Romanius Capito from Mainz, both of *ala Noricorum*, show helmets with what appears to be hair depicted on the helmet bowl itself, that of Romanius also showing a decorated cheek-piece. Helmets resembling these are seen on the arch at Orange. A few actual examples are now known, and fragments (especially cheek-pieces) of this type of helmet are fairly common finds. The helmets were made of iron and then covered with a copper alloy sheathing, embossed to look like hair on the bowl itself. Cheek-pieces completely covered the wearer's ears and were likewise of iron

56 Early Principate helmets. *1* Coolus C (Schaan); *2* Montefortino F (Cremona); *3* Imperial-Gallic A (Nijmegen); *4* Imperial-Gallic D (Mainz); *5* Imperial-Italic D (Mainz); *6* Imperial-Italic G (Hebron?). (Not to scale.)



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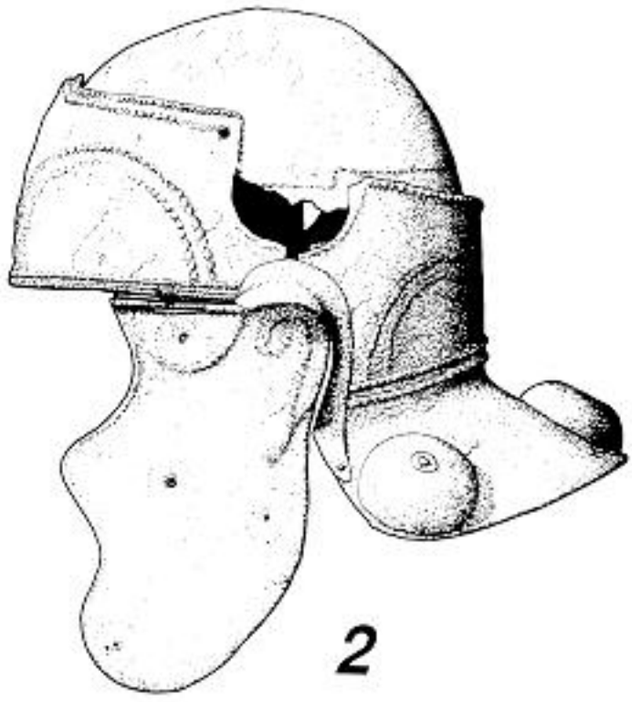

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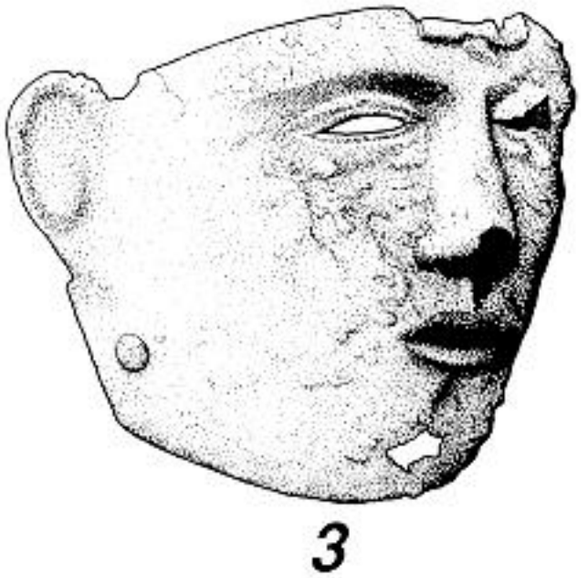

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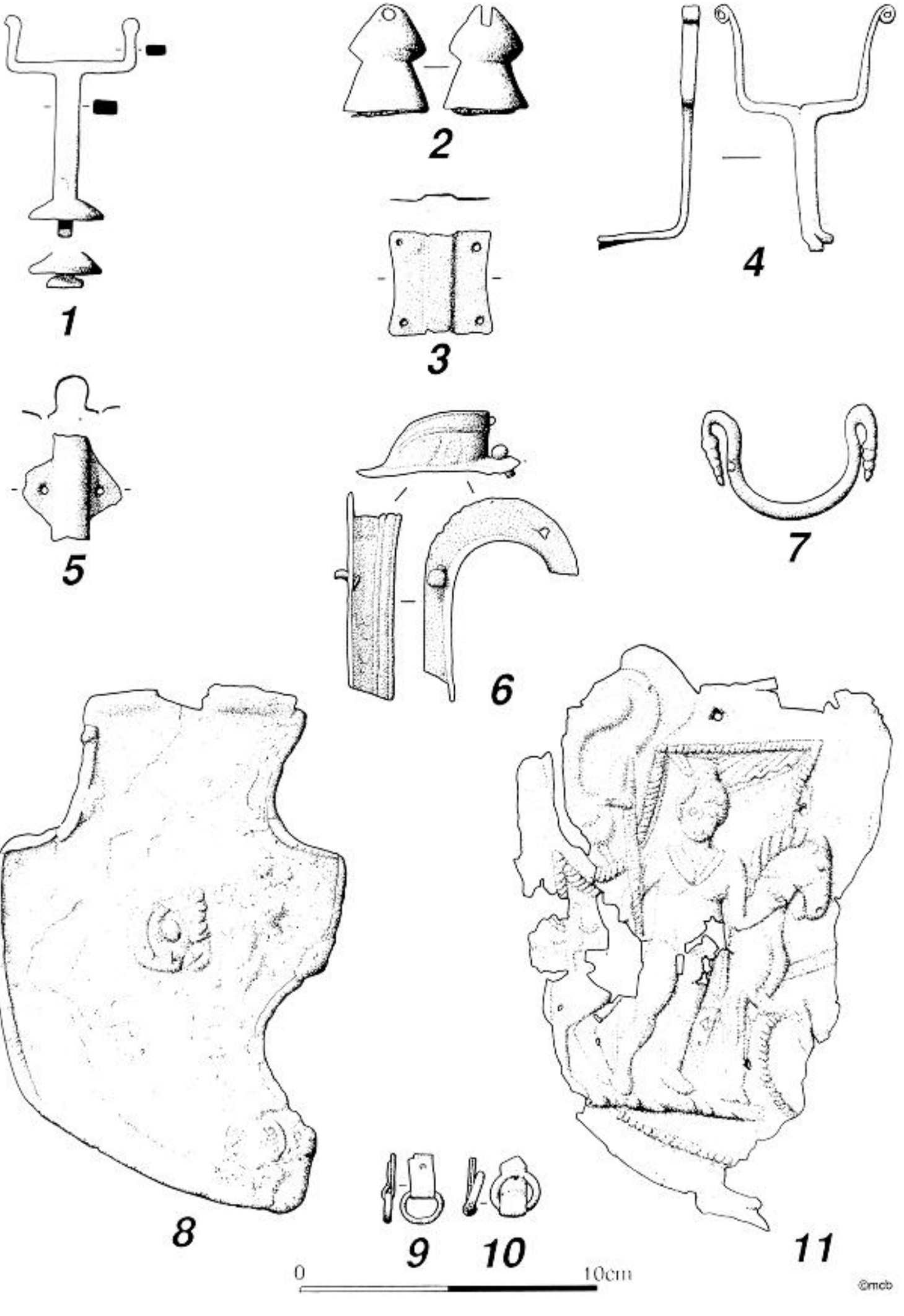
57 (*Above*) Early Principate battle and 'sports' cavalry helmets. *1, 4* Newstead; *2* Ely (England); *3* Chassenard. (Not to scale.)

58 (*Right*) Early Principate helmet fittings. *1* Twist-on crest-holder (Aislingen); *2* crest knob (Chichester); *3* slide-on crest-holder attachment (Rheingönheim); *4* slide-on crest-holder (Rheingönheim); *5* plume tube (Rheingönheim); *6* ear-guard (Rheingönheim); *7* carrying handle (Eich); *8* iron infantry helmet cheek-piece (Chester); *9–10* tie loops (Waddon Hill); *11* copper alloy cavalry helmet cheek-piece (Brough by Newark).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with a thin covering of copper alloy sheet (an example from Kingsholm was actually of copper), usually highly decorated with embossed mythological scenes. Virtually complete examples are known from Koblenz-Bubenheim, Weiler and Xanten (Pl. 2a), but iron bowls have also been found at Newstead and Northwich.[48]

It is during the first century AD that we encounter the first evidence of what is usually called sports or parade armour, thought to be used by Roman auxiliary cavalry in the exercise called the *Hippika Gymnasia*. The helmets associated with this activity were made in two parts, a helmet bowl and a face mask, and these were usually hinged together. A well-dated grave find from Chassenard (AD37–41) included a mail shirt folded up inside such a helmet. This is certainly not the earliest known example: a mask from one of these helmets was found in the legionary base of Haltern, which must date to the years *c.*7BC–AD9. The Newstead examples presumably belong to the abandonment of the fort in *c.*AD105, but a sports helmet with mask came from a particularly exciting first century grave at Čatalka, along with mail, scale and lamellar armour, and various other pieces of military equipment indicating a blending of steppe and Roman influences. Burials like those at Čatalka and Chassenard may involve native, perhaps especially Thracian, commanders of auxiliary units serving with the Roman army.[49]

It has been suggested that these 'sports' helmets can be identified on sculpture, but even the best Roman tombstones cannot be relied upon to support this interpretation. Some writers have taken three tombstones from Mainz to indicate that infantry standard bearers could also wear this type of helmet, but the sculptures are all too crudely executed to provide reliable evidence for this.[50]

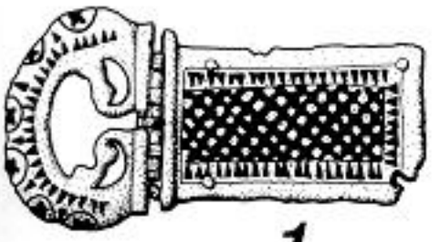
Belts (Fig. 59)

Although traditionally known as the *cingulum militare* (or *militiae*), there is good reason to believe that the Roman military waist-belt of the first century AD was actually simply called a *balteus*. The term *cingulum* is hardly ever found before the third century AD; Varro says that *cinctus* was a belt worn by men, *cingillum* that worn by women. Papyri and literary sources suggest that *balteus* is the more correct term, for in a letter of AD99, Terentianus' sister Apollonous wrote to him in Greek that 'I understood from Thermouthas that you obtained for yourself a pair of belts [using the Greek *baltion*, equivalent to the Latin *balteum*], and I was much gratified'. Another fragmentary letter of the early second century AD, written by Claudius Terentianus to his father Claudius Tiberianus, includes the phrase *balteum militare*. The Tiberianus archive also has a letter from one Tabatheus to Tiberianus which refers to the fact that a relative 'sent your son Isidorus to you so that [he might take to you] your belts (*baltea*)'. Pliny the Elder sheds more light on this terminological problem when he discusses the soldiers' habit of silvering military equipment, saying 'their scabbards ring with silver links and their belts (*baltea*) with silver plates'. Tacitus records that when Vitellius needed to raise money for his attempted usurpation in AD69, soldiers handed over their belts (the word '*baltei*' is used) in lieu of cash. Isidore of Seville simply says 'the *balteus* is the military belt'.[51]

Tombstones show that there was a gradual change during the first century AD from two belts (often worn 'cowboy' fashion, that is crossed) to just one (see Fig. 143). Originally, each belt served to support one sidearm, but later both dagger and sword were hung on one belt (or the dagger was worn on the belt and the sword on a baldric over the shoulder). It has been suggested that the introduction of the single belt coincided with the appearance of '*lorica segmentata*', since crossed belts were impractical with this type of cuirass. However, single belts are also presented worn with mail shirts, so we must be careful not to oversimplify this matter. The Herculaneum soldier had two belts and the Trajan's Column sculptors depicted up to four belts with segmental armour. In fact, there was a general change from narrow belt-plates to broader ones and it might be argued that this coincides with the change from two (narrow) to one (broad) belt. Reconstruction work has shown that the belt (or belts) served to relieve the weight of a mail shirt upon the wearer's shoulders.[52]

The elements common to all belts were ordinary belt-plates, plates with a hinged buckle, and plates with dagger or sword frogs (sometimes, but not always, hinged). A set from Velsen comprised four plain plates, one buckle plate, and two frog plates whilst one from Rheingönheim (found together

59 Early Principate belts. *1–3* Hod Hill; *4* Rheingönheim; *5* Hod Hill; *6* Risstissen; *7* Oberstimm; *8–9* Rheingönheim; *10* Colchester; *11* Tekije; *12* Mehrum; *13* Naples; *14* Oberstimm; *15* Hod Hill; *16* Verulamium; *17* Oberstimm; *18* Rheingönheim; *19–21* Velsen.



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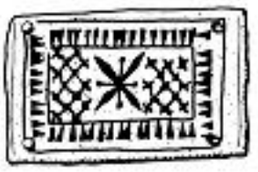

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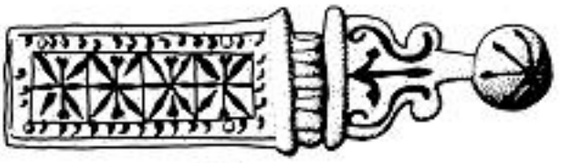

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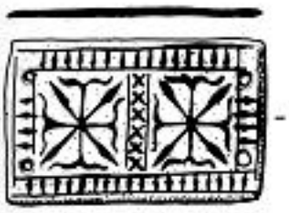

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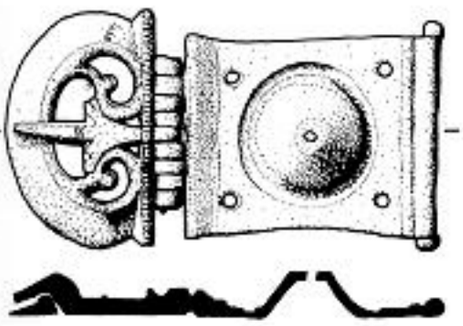

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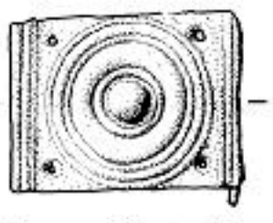

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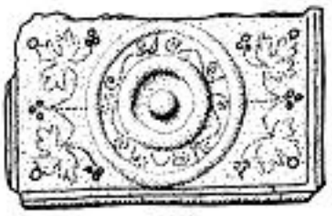

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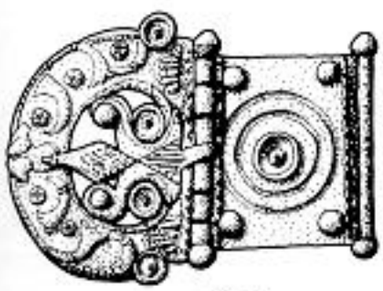

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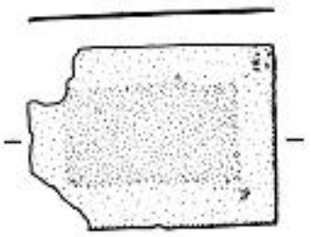

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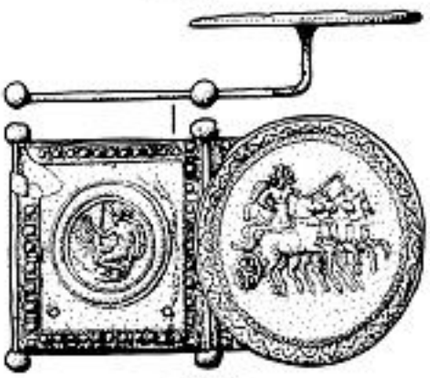

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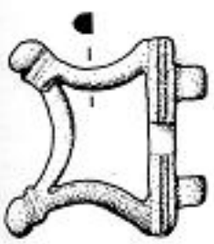

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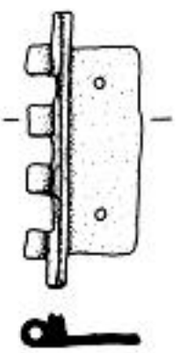

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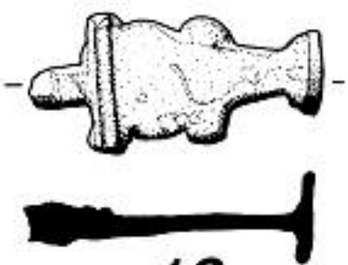

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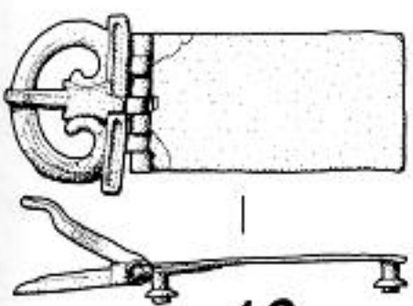

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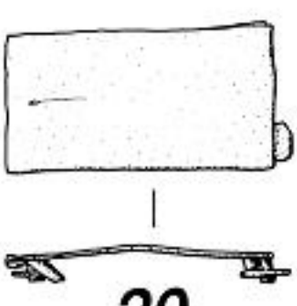

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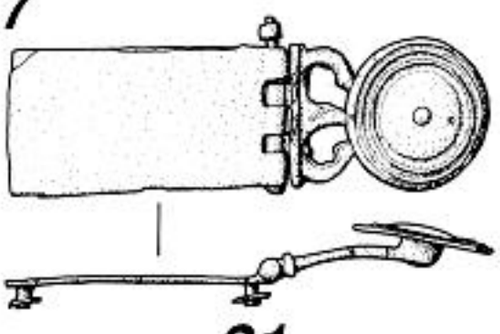

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with the sword) had five plain plates and one with a buckle. There is no guarantee of the integrity of the Rheingönheim set, but the Velsen fittings are almost certainly complete and would seem to indicate that some belts did not have plates to the wearer's rear. This is suggested by a relief from Casacco, but the Herculaneum soldier (who was wearing one belt and had another wrapped around the sword he was carrying) had at least 16, and possibly as many as 21 plates on his two belts (five were attached to the sword handle and the marks of five more were evident on the sword sheath). Thus it is possible that the Herculaneum belts were completely covered by plates.[53]

In Britain and the Rhineland, the narrow belt-plates were either left plain and then part or wholly tinned or silvered on the front face (as was the case with the belt fittings from the well at Velsen), or quite often decorated with niello inlay. Even when inlaid with niello, the belts usually seem to have been tinned or silvered, providing a contrast between the white metal surface and the black of the niello. The decorative motifs largely consisted of geometrical and vegetal designs, frequently incorporating one or more 'St Andrew's Cross' patterns, reflected on some of the finer tombstone representations of belts. The plates were usually cast and fastened to the leather of the belt itself using four rivets.[54]

Another type of plate was that embossed with designs such as the wolf-and-twins (*lupercal*), a hunt scene or a bust (often thought to be the emperor Tiberius) with *cornucopiae*. In Britain, these are generally found only in the south and west of England where the *legio II Augusta* was campaigning after the capture of Camulodunum. On the continent, they are mainly found in Upper Germany, Raetia and Noricum. Plates from the Magdalensburg (abandoned *c.*AD45) confirm the use of this type in the Claudian period, and might further indicate that they are contemporary with the niello-inlaid plates.[55]

At the same time, another type of embossed belt-plate was to be found, bearing a simple boss and concentric rings. This pattern, dominating the latter half of the first century AD, was accurately depicted on the Casacco gravestone. Finds from Tekije are of this kind, as were those worn by the Herculaneum soldier. Both ends of the plate were rolled over to form a tube and a spindle with bulbous terminals passed through it as a sort of 'pseudo-hinge'.[56]

Buckles were normally hinged to one of the plates, although occasionally they were integral with it. Tombstone evidence shows the buckle both on the wearer's left-hand end of the belt and on the right, but with the latter a more common method. Buckles of this period were normally D-shaped and frequently had internal volutes, although one type had a quadrilateral form that can be seen in both earlier and later periods. Buckle tongues were almost exclusively of the 'fleur-de-lys' type, less elaborate examples usually being repairs.[57]

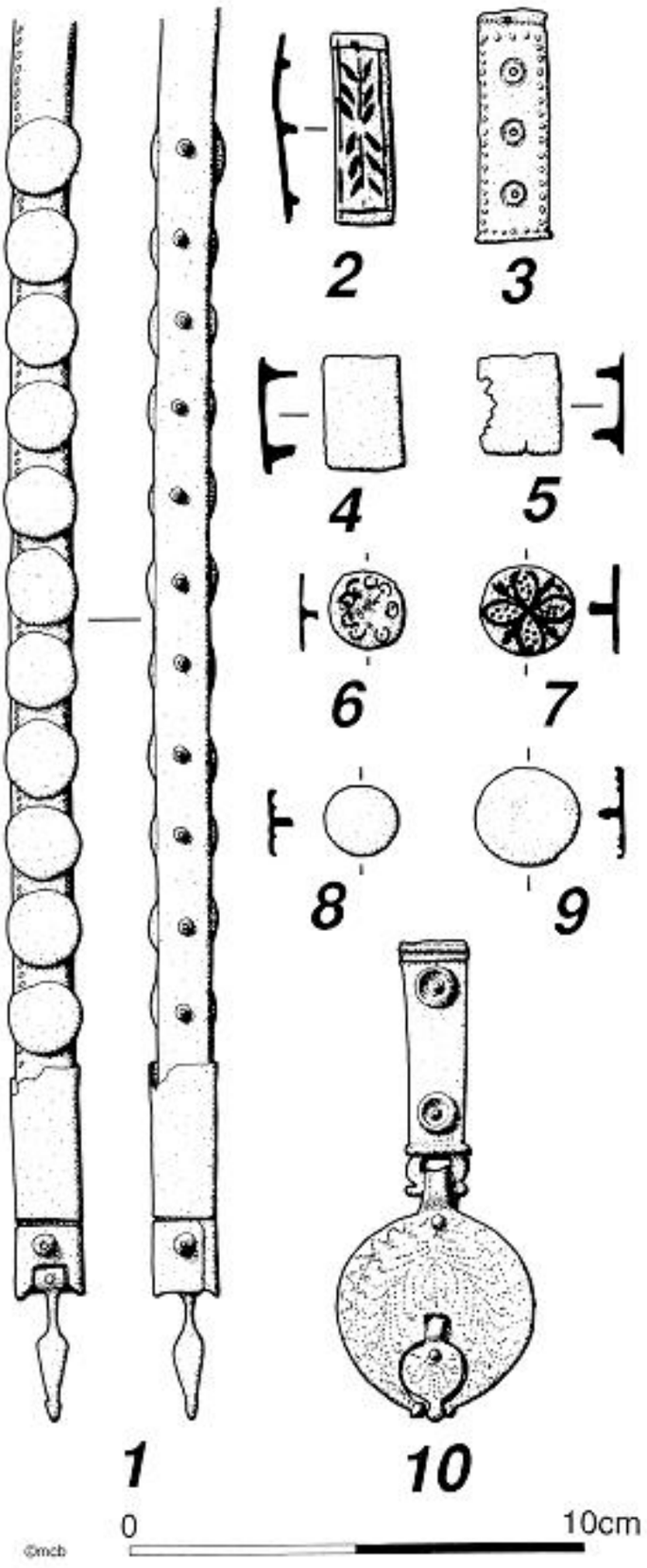
Dagger frogs were also normally hinged to a belt-plate, and would either be made by casting in one piece and then bending up the knob, or the button would be riveted on after the frog had been cast.[58] A different kind of belt seems to have been worn by at least some cavalrymen. This 'Celtic belt' was a normal (but apparently unadorned) waist belt with an additional strap which appears to have fastened to the lower suspension rings on the scabbard. It is clearly shown on a statue from Vachères.[59]

'Aprons' (Fig. 60)

It is commonly held that the 'apron' (also sometimes erroneously called the 'sporran' – a Gaelic word for purse), as it has become known, originated in the elaboration of belt terminals with studs and pendants, and developed into as many as eight straps with 16 studs each. This process, it is said, can be seen in the sculptural evidence. The tombstone of the *aquilifer* Cn. Musius from Mainz shows the end of his belt divided into four straps, each with a terminal pendant, three of these hanging freely, the fourth passing through the buckle and thus appearing shorter. Two reliefs from Pula are also pertinent here. One shows a Pompeii-type sword and belt, complete with belt-plates, to which it is evidently attached. At the opposite end to the buckle, the belt is divided into two straps, each of which is studded, with a lunate terminal. The other sculpture shows a dagger attached to a belt (again with belt-plates) which ends in four straps with crude representations of terminals. The arch at Orange represents plated belts with terminals. Finally, the fragmentary tombstone relief from Casacco shows two crossed belts, the ends of which hang freely as an apron.[60]

Care must be exercised, however, because the bulk of the representational evidence can be dated only very approximately. In fact, it could equally well be argued that different 'apron' traditions developed in different areas, or that a range of forms were in use at the same time.

For the more elaborate 'aprons', our evidence is surprisingly good. Not only did an actual example survive from the Rhine in Germany, but a set of fittings were found with the Herculaneum soldier, closely paralleling some from Tekije. These correspond with the 'aprons' shown on first-century AD infantry tombstones (see Figs. 3 and 143), but they do not help in interpreting function. It is thought that it offered protection to the area of the lower abdomen and groin, although practical experiments with reconstructions have shown that weighted straps swinging between the legs of running soldiers are more likely to pose an additional, unwanted, hazard in combat. A more attractive theory is that which sees the 'apron' as a mark of status, reinforcing the soldier's ego with its jingling components (stealth wearing an apron would have been virtually impossible, but it is not difficult to imagine the effect of thousands of men marching past).[61]



60 Early Principate aprons. *1* Rhine at Mainz; *2* Rheingönheim; *3* Tekije; *4–5* Rheingönheim; *6* Caerleon; *7* Hofheim; *8–9* Rheingönheim; *10* Tekije.

Studs are found in vast numbers on most Roman sites and it is usually impossible to tell what they were used for. Plain disc-headed studs abound, many of them tinned or silvered, but the fact that those on the Rhine strap and many in the Tekije hoard were of this form suggests that at least some such studs from military sites must come from aprons. Some disc-headed studs were inlaid with niello, a sure sign that they were in military use as studs of this type are only found in military contexts. Apron straps were terminated with a hinged pendant, as the material from Tekije, Herculaneum and the Rhine demonstrates (it is even clear on some tombstones), although pieces of what are obviously cavalry equipment are quite commonly misidentified as 'apron terminals'. Examples of lunate terminal pendants can be found both in sculpture and amongst archaeological finds, but the form attached to the Rhine strap, and a more general teardrop type seem to have been equally common.[62]

Tunics and leggings

The Roman military tunic was very distinctive, for it instantly marked its wearer as a soldier simply by the way it was worn: shorter than the everyday tunics of ordinary citizens. Its lower edge hung just above the knee, but it could also be worn off-the-shoulder, as a number of early-second-century AD reliefs attest. Unfortunately, these garments are unlikely to survive in a recognizable form in the archaeological record, although some tunics (almost certainly not military and probably not Roman) were found in the Cave of Letters at Nahal Hever.[63]

In form, it may have been a simple 'bag' formed from two rectangles joined, with a central neck opening and holes for the arms. Length could be regulated by gathering the material over the waist

belt. The length was clearly important, for one of Augustus' punishments for wayward soldiers recorded in Suetonius was that they should be made to stand outside the headquarters building of a legionary base without a belt, simultaneously depriving them of their two key indicators of status (weapons' belt and short tunic).[64]

One recent attempt at reconstruction has suggested that the garment was fairly loose and could be knotted at the shoulder to gather up surplus material (these knots are shown on reliefs such as that in Chatsworth House). There is little modern agreement about the colour of military tunics (or even whether there was one set colour).[65]

Cavalrymen are depicted on sculpture as wearing leggings that reach to the knee and some of the Adamklissi metopes show infantrymen wearing similar garments (see Fig. 50,1). Some cavalrymen, such as Flavius Bassus (see Fig. 4,1), also wear a long-sleeved tunic with the cuff turned back, like that of the Vachères warrior.[66]

Cloaks and capes

There were two types of overgarment habitually worn by soldiers under the early Principate and these were the *sagum* and *paenula*. The *sagum* was a draped cloak, fastened at the wearer's right shoulder by a brooch, whilst the *paenula* was a cape which the soldier put on over his head. Tombstones of the first century AD show rather more men wearing the *paenula* than the *sagum*, although the latter lasted well into the third century AD.[67]

There seems to be little doubt about the form of the *sagum*. It appears to have been a rectangular piece of material, usually depicted as having one or more fringed edges (see Fig. 5d). These might be applied fringes, but it seems more likely that the edge of the material had been deliberately picked out to avoid hemming or unsightly fraying of a cut edge. If specially woven, two of the edges could have been selvedge. The fastening of the *sagum* must have been one of the major uses of brooches in the Roman army.

The *paenula* may have been oval in shape, to judge from the representations (see Fig. 143,2–3), with a central hole for the head. As worn, it was knee-length, and split up the front as far as the neck opening, being fastened on the breast with buttons and toggles (but not brooches, apparently), a fact revealed by the detailed sculpture on a funerary *stela* from London. The split up the front meant that the two 'tails' of material could be thrown back over the shoulders of the soldier to give easy access to his sidearms (or, one suspects in the case of tombstones, to show off his military status).[68]

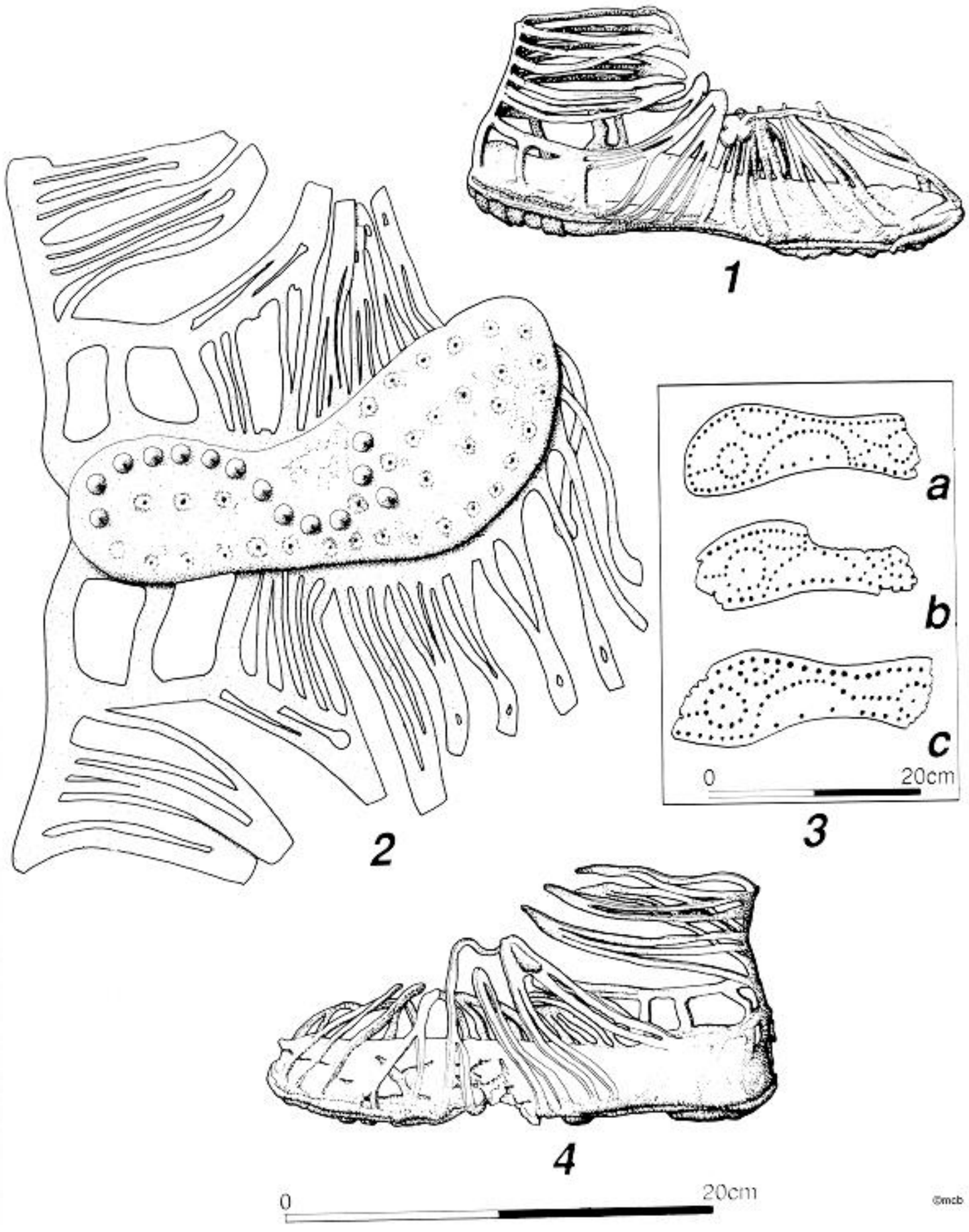
Centurions such as Caelius, Sertorius (see Fig. 49) and Favonius Facilis are depicted on tombstones wearing the *paludamentum*, draped over the left shoulder and wrapped around the left arm, more as a symbolic than a practical garment.[69]

Footwear (Fig. 61)

Roman military footwear of this period was very distinctive and is well known from both the representational and archaeological evidence. Usually known as *caligae*, each boot was made from three main pieces of vegetable-tanned ox or cow leather – the upper, the sole and an insole. All three layers were 'clenched' with hobnails, frequently arranged in patterns, at least some of which were designed to facilitate comfortable walking and anticipated twentieth-century research into the optimum design of training-shoe soles. The uppers were pierced with openwork designs, so that the boots looked more like the modern idea of a sandal, but it was, as van Driel-Murray has pointed out, an extremely functional piece of footwear. The openwork upper gave good ventilation, the many straps allowed adjustment to fit the peculiarities of an individual's foot, whilst parts of the boot that might rub (on toe joints, ankle and big toe nail) were cut away. *Caligae* found on Roman military sites seldom show signs of repair, usually being thrown away once the nails started to wear through the insole, thus becoming uncomfortable. Complete boots have been found at Mainz and Valkenburg, but their remains are known from several first-century sites where waterlogged conditions have preserved leather.[70]

Caligae were laced up through the end of the openwork straps, and were frequently depicted on first-century Rhineland tombstones in paint, only the ridge caused by this lacing being represented in relief (leading many earlier scholars to think the soldiers went barefoot). We know that socks were worn (they are mentioned in the writing tablets from Vindolanda) and one type is even shown on the Cancelleria relief, lacking heel and toes (see Fig. 2).[71]

61 Early Principate footwear. *1* Complete *caliga* (Mainz); *2* underside of a *caliga* (Mainz); *3 caliga* nailing patterns from *a* Valkenburg, *b* Xanten, *c* Velsen; *4* complete *caliga* (Mainz).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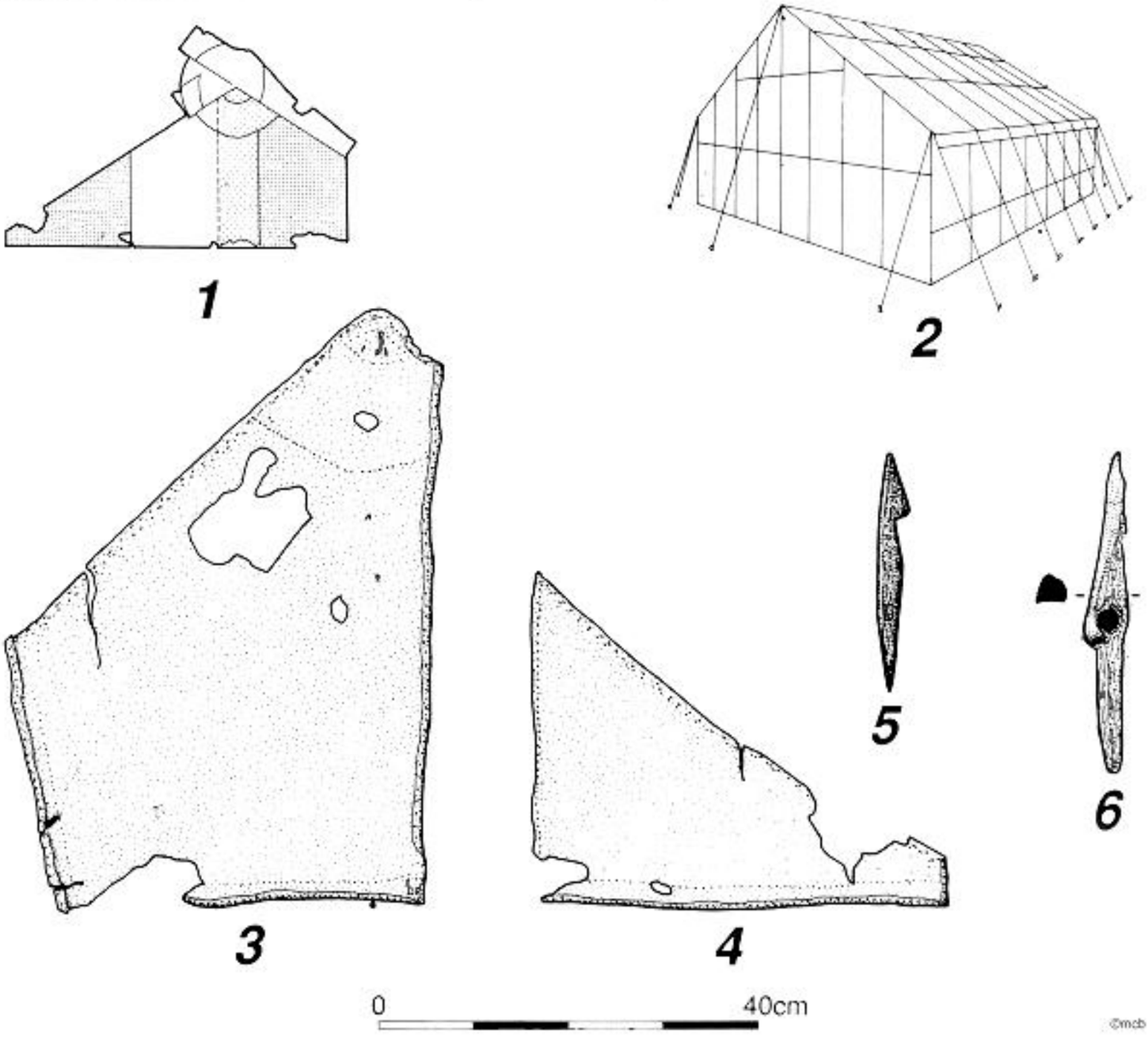
Other equipment

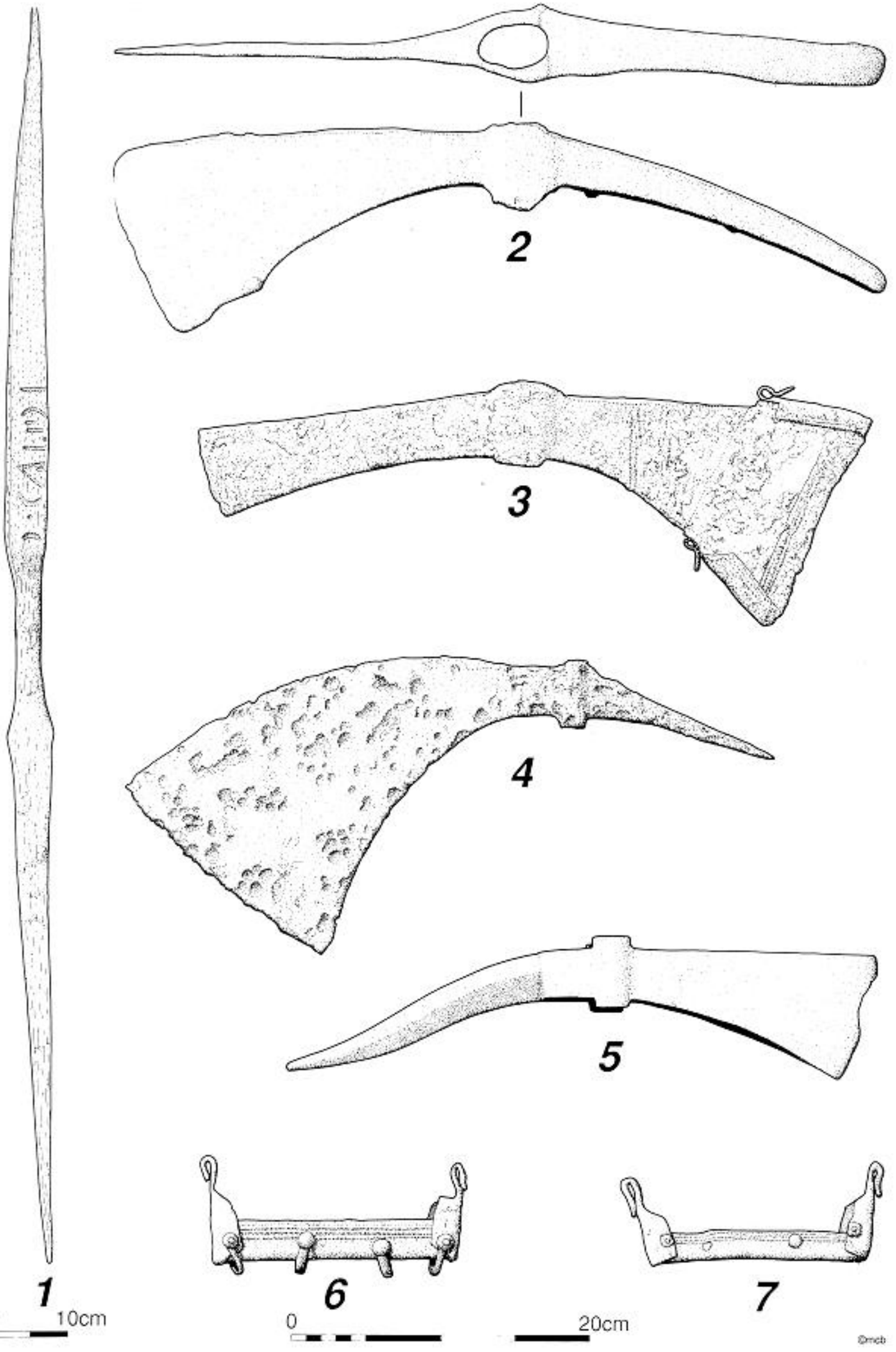
Tents (Fig. 62)

Tents were constructed of leather panels stitched together so that water would run off. Leather panels from tents were first positively identified by McIntyre and Richmond in 1934. The reconstruction they offered, based on a compromise between the depictions on Trajan's Column and the space allowed for each tent in Hyginus' description of a Roman camp, has had to change as more finds of leatherwork have been made. During the 1960s, Groenman-van Waateringe produced the best reconstruction possible that utilized the newly available evidence from the Netherlands, but it was not until the 1980s that large portions of tent began to be found at Vindolanda, enabling a more accurate understanding of this difficult subject. It is now thought that at least one variety of the Roman tent was much bigger than Richmond and McIntyre had envisaged and may in fact have had a wooden frame inside. Tent pegs were of wood, examples of oak (L. 250–500 mm (9–20 in)), triangular in section and pointed at both ends, being recovered from the fort ditches at Newstead.[72]

62 (*Below*) Early Principate tents. *1* Gable assembly (Vindolanda); *2* reconstruction of a *contubernium* tent; *3–4* gable panels (Vindolanda); *5–6* tent pegs (*5* Newstead; *6* Mollins).



63 (*Right*) Other equipment of the early Principate. *1* Double-ended *chevaux-de-frise* stake with centurial inscription (Oberaden); *2–5* pickaxes (*2* Brandon Camp, England; *3* Rhine at Mainz, with (?)leather cover for blade under sheath; *4* Risstissen; *5* Newstead, with damaged blade); *6–7* pickaxe sheaths (Vindonissa).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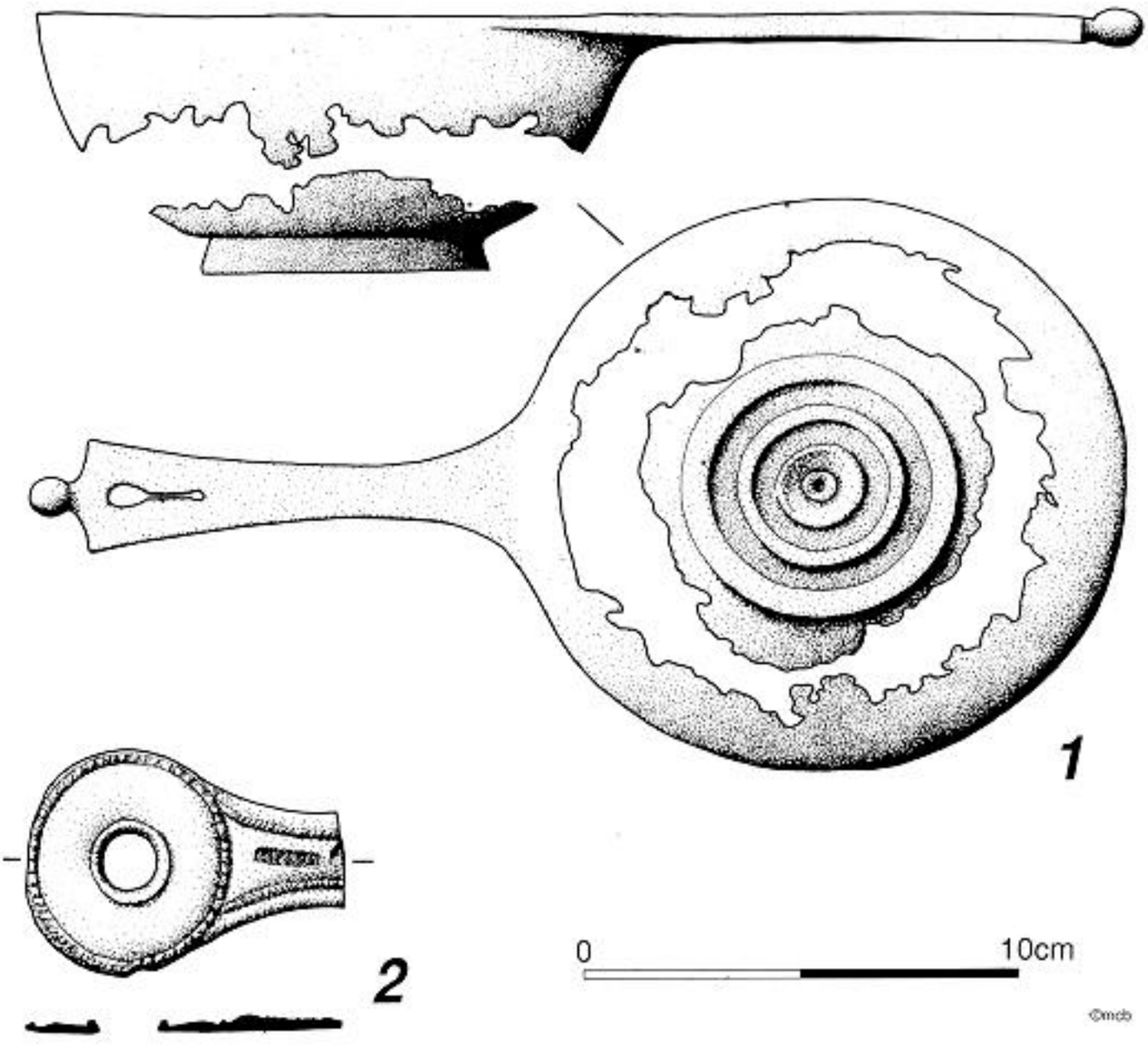
Obstacles (Fig. 63)

One wooden object, pointed at both ends with a medial 'handgrip', was for a long time interpreted as a palisade stake and, curiously, at the same time named '*pilum muralis*' (although to Roman writers this was clearly a weapon thrown from the ramparts and not a rampart stake). The alternative suggestion is that these were components of some sort of portable obstacle, either bound to a common bar as *chevaux-de-frise* (known to the Romans as *ericus*, a hedgehog), or protruding from ramparts above ditches (thorn bushes were used for a similar purpose).[73]

Tools (Fig. 63)

The classic military tool was the pickaxe or *dolabra*, with an axe blade and an opposing tine. It was used for breaking up ground when ditch digging, clearing scrub or sometimes even fighting (as happened in the revolt of Florus and Sacrovir). When not in use, the axe blade was fitted with a copper alloy sheath, probably as much to protect the blade as the careless soldier, and this was occasionally decorated with small pendants.[74]

Military sites naturally produce a wide range of tool finds that would be equally at home in a civilian context, such as those associated with metalworking, carpentry and numerous other handicrafts, but military pieces were often marked for unit identification, as was the case with a wooden mallet and a bread stamp, both from Mainz.[75]



64 Early Principate metal vessels. *1* Skillet (The Lunt, England); *2* handle (Chester).

Metal vessels (Fig. 64)

All soldiers seem to have had access to a wide range of metal vessels, presumably for campaign use when pottery would be too cumbersome and fragile. One familiar piece of military equipment from the first century AD is the cooking pan (variously known as the *patera* or *trulleus*). These came in a range of sizes and had a base with pronounced moulded concentric rings (a feature that aided rapid and even heating of the contents), and were probably the everyday cooking and eating vessel for Roman soldiers of the first century. The flat handle, which was cast in one with the rim of the bowl, usually had a hole at the end (convenient for suspending them from a kit pole). In military equipment terms, these objects were unusual not only for being manufactured in Italy, as indicated by the makers' name-stamps, but also for being made from true bronze, not brass (see Chapter 9). One of these pans found at Caerleon not only bore the manufacturer's stamp, but also the countermark of an *ala* to which it presumably belonged. Soldiers also used a range of other copper alloy cooking vessels and grid-irons.[76]

Funerary reliefs show that the centurion's vine-wood staff (*vitis*) was waist-high, straight, and with a knobbed end. *Optiones*, however, bore a shoulder-high knobbed staff.[77]

Equine equipment (Figs. 65–67)

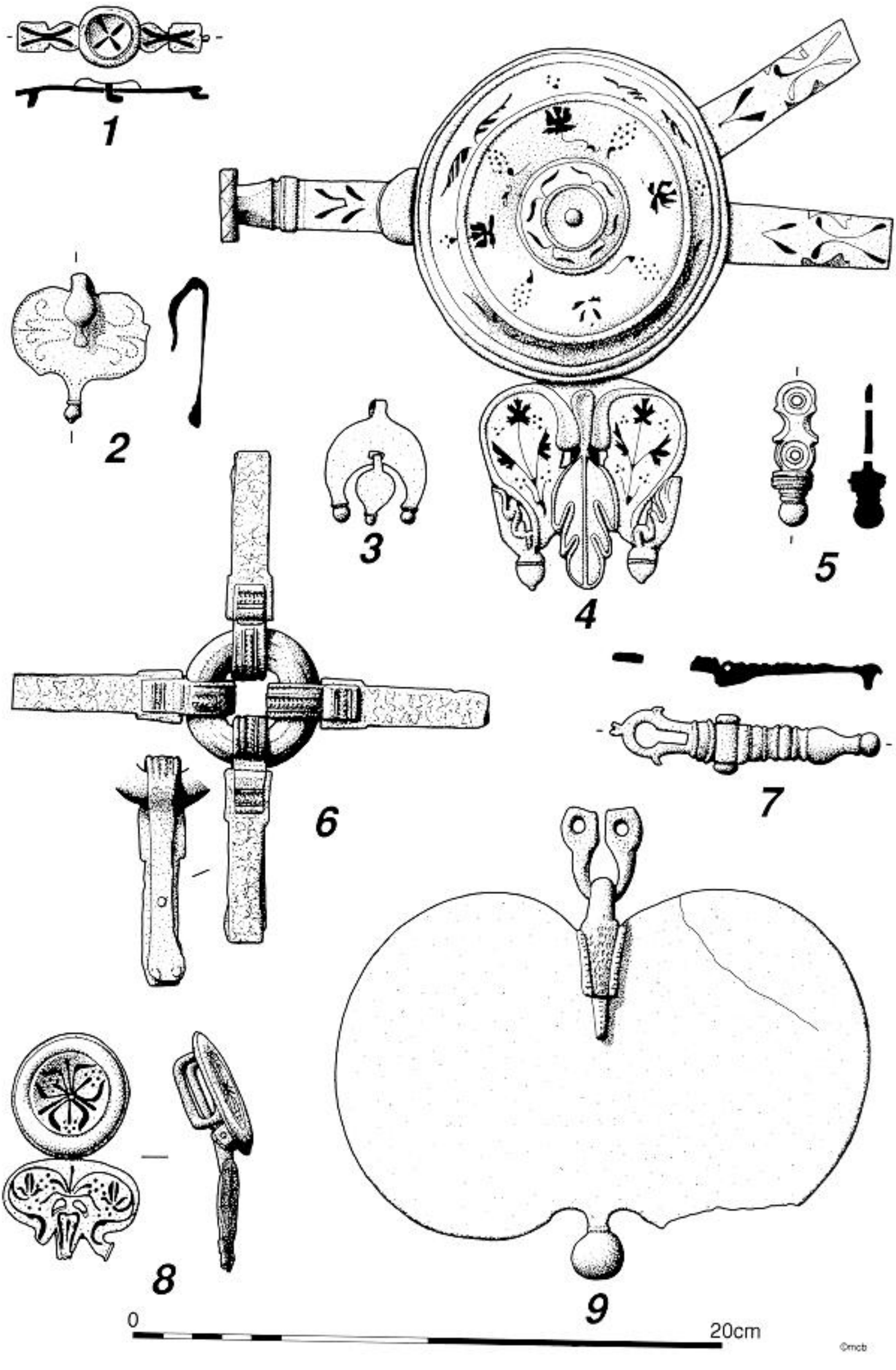
The harness fittings of the auxiliary and legionary cavalry of the early Principate are probably directly descended from Celtic equipment. The main harness consisted of five junctions which, along with the girth, served to hold the saddle firmly in place. It combined both functional and purely decorative components.[78]

The first type of junction consisted of a cast ring, to which three or four leather straps would be attached by means of free-moving junction loops. Strap-fittings of the pre-Flavian period were frequently decorated with moulded relief which would sometimes incorporate into the design the rivets necessary for attaching the fittings to the leather. The junction loops were boldly adorned with hollow-cast loops, since they were visible. Pendants hung from the harness, and characteristically were in stylized bird-designs.[79]

However, some time probably during the reign of Claudius, a new type of junction came into favour utilizing concealed loops behind discs (*phalerae*), although some Augustan examples had loops mounted around the periphery of a disc. The fittings were covered with silver foil and inlaid with niello using designs drawn from Bacchic imagery (vine tendrils, leaves and bunches of grapes, presumably relating to Bacchus' association with horses) and junction loops were now very simple affairs with little or no moulded decoration. Pendants were suspended from the *phalerae* and these employed imagery derived from the oak tree (oak leaves and acorns in low moulded relief), mixed with the Bacchic designs. A set of fittings from the Rhine near Xanten includes a *phalera* inscribed PLINIO PRAEFECTO (Fig. 16,8) and it has been suggested that this refers to Pliny the Elder, whom we know commanded a cavalry *ala* in Lower Germany during the reign of Claudius. The Xanten hoard, together with the collection of items from Doorwerth, forms a very important source of information for the study of cavalry harness during this period. In particular, both sets clearly demonstrate the identification of so-called 'baldric fasteners' (see above, p. 74) as cavalry harness.[80]

Leather straps from horse-harness do not normally survive, except in corrosion products, as they were probably made of oiled, rather than vegetable tanned, leather. Saddle-covers, on the other hand, have survived and a considerable number of goatskin fragments have now been recognized, together with copper alloy stiffeners for the horns. The most plausible reconstruction of such Celto-Roman saddles has been made by Connolly, which fully accommodates the surviving evidence (shape of the leather, type of stitching, stretch and wear marks), unlike alternative interpretations.[81]

Tanned leather was also used for chamfrons, serving (together with eye-guards) to protect the horse's head during the practice manoeuvres known as the *Hippika Gymnasia*. Cavalry 'sports' armour, of the kind found in the third century, was generally rarer in the first century, although a copper alloy peytral of Claudian date was found at Neuss (a legionary base with a cavalry contingent present); some eye-guard finds could also be strapped onto the head without a chamfron.[82]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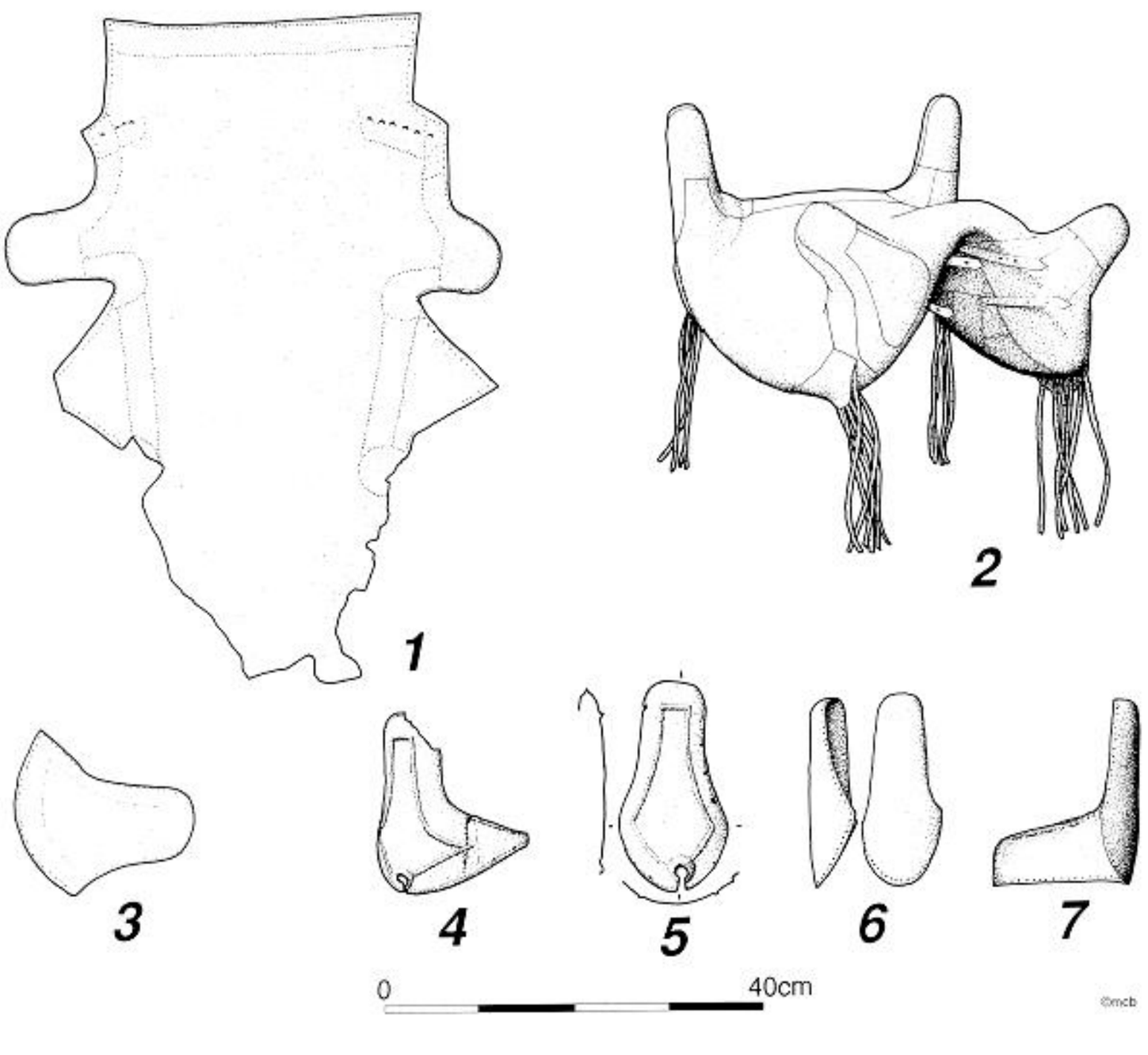
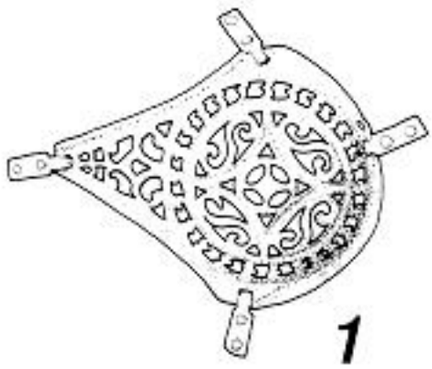
65 (*Left*) Early Principate equine equipment. *1* Risstissen; *2* Rheingönheim; *3* Magdalensburg; *4* Doorwerth; *5* Krefeld; *6* Kempten; *7* Rheingönheim; *8* Wroxeter; *9* Cirencester.

66 (*Below*) Early Principate saddle fittings. *1* Valkenburg; *2* reconstruction (after Connolly); *3* Valkenburg; *4–5* saddle horns from Mainz-Weisenau; *6–7* Newstead.



67 Early Principate horse and 'sports' armour. *1* Copper alloy eye-guard (Mainz); *2* chamfron (Neuss); *3* leather chamfron with silvered copper alloy studs (Vindolanda).



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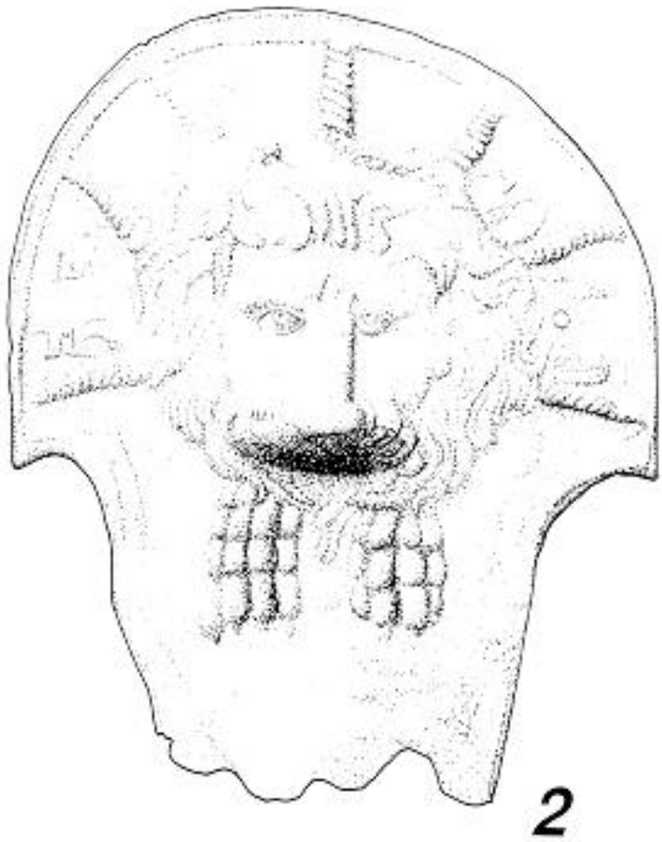

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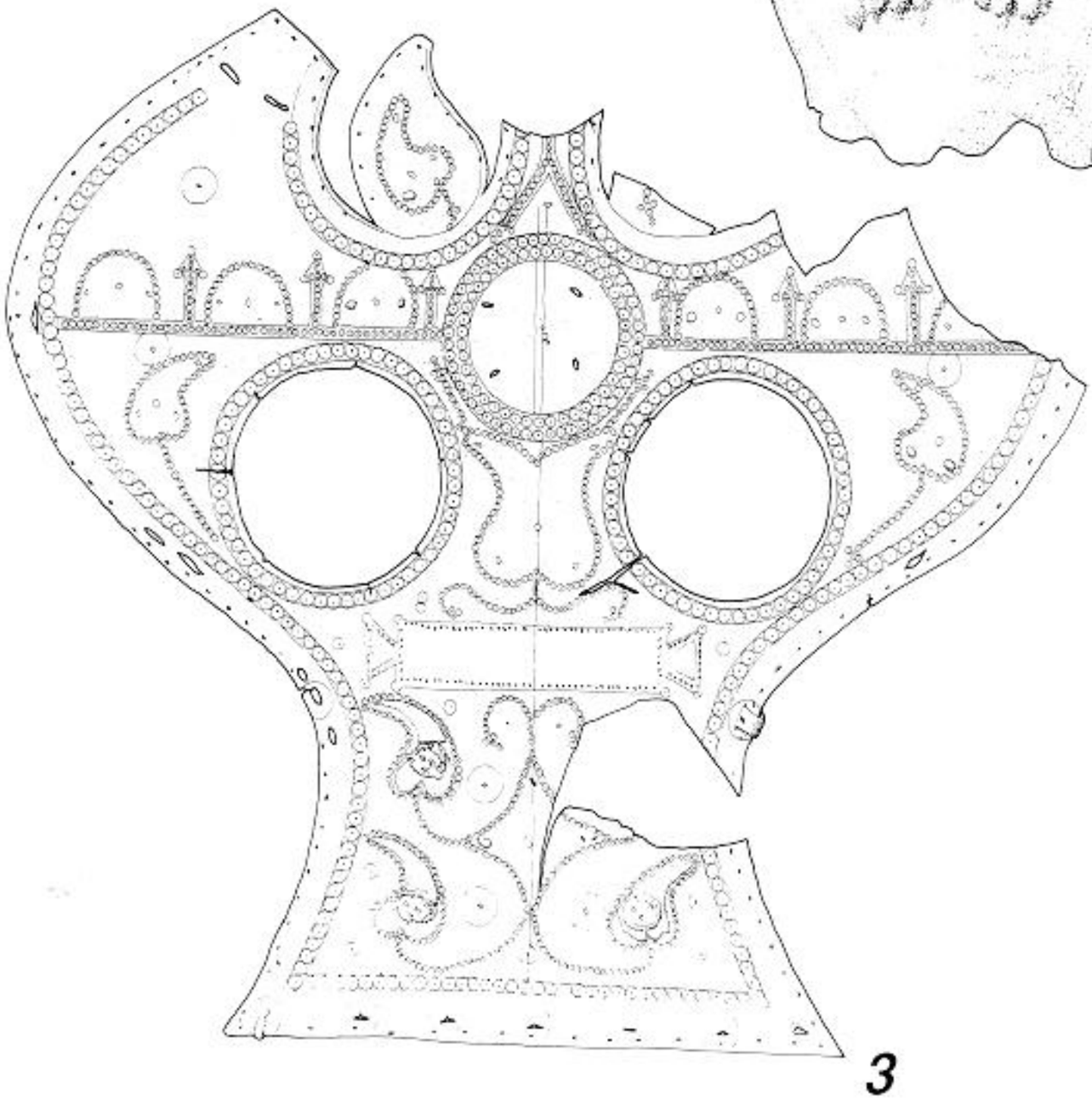

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6

THE ANTONINE REVOLUTION

Whereas the first century AD gives the impression of gradual evolution in equipment design, the period from the death of Hadrian to the accession of Severus seems to present a rapid revolution. This may be a result of the sparse evidence, and some changes in sword-fittings, for example, may be traced over an extended period. It might, therefore, be a mistake to ascribe change to a specific series of events, such as the Marcomannic Wars; nevertheless, there was real development which may be traced in outline, if not in detail.[1]

The funerary reliefs of this period declined in both numbers and quality, whilst propaganda sculpture became increasingly derivative and detached from reality. Nevertheless, the Antonine era, usually thought of as a peaceful time, was not completely devoid of military activity.

The archaeological evidence, although not matching the volume of first-century material, has some reasonably well-dated contexts. In the 140s the frontier in Britain advanced to the Antonine Wall line, involving the reoccupation of old sites and the establishment of new ones, mostly abandoned again by the 180s. Even after the frontier reverted to Hadrian's Wall, the majority of its turrets remained out of use or were finally demolished. These movements formed narrowly defined occupations and created datable abandonment deposits. Thus, pits at Newstead were filled with abandoned Antonine material, distinct from equipment found in the Flavian pit series.[2]

Elsewhere, there was an advance to an outer line between the Rhine and Danube, ending the occupation of forts on the previous frontier. The reign of Marcus saw Roman military activity beyond the Danube and the establishment of a series of bases, such as those at Mušov and Orgovány. These were short-lived and their abandonment involved the deposition of Antonine equipment.[3]

Whilst other advances were made, notably in Syria in the 160s, material did not enter the archaeological record in the quantities seen in earlier or later periods.[4] A Thracian-style burial at Nawa in Syria seems to date to the second century (see below).[5]

Shafted weapons

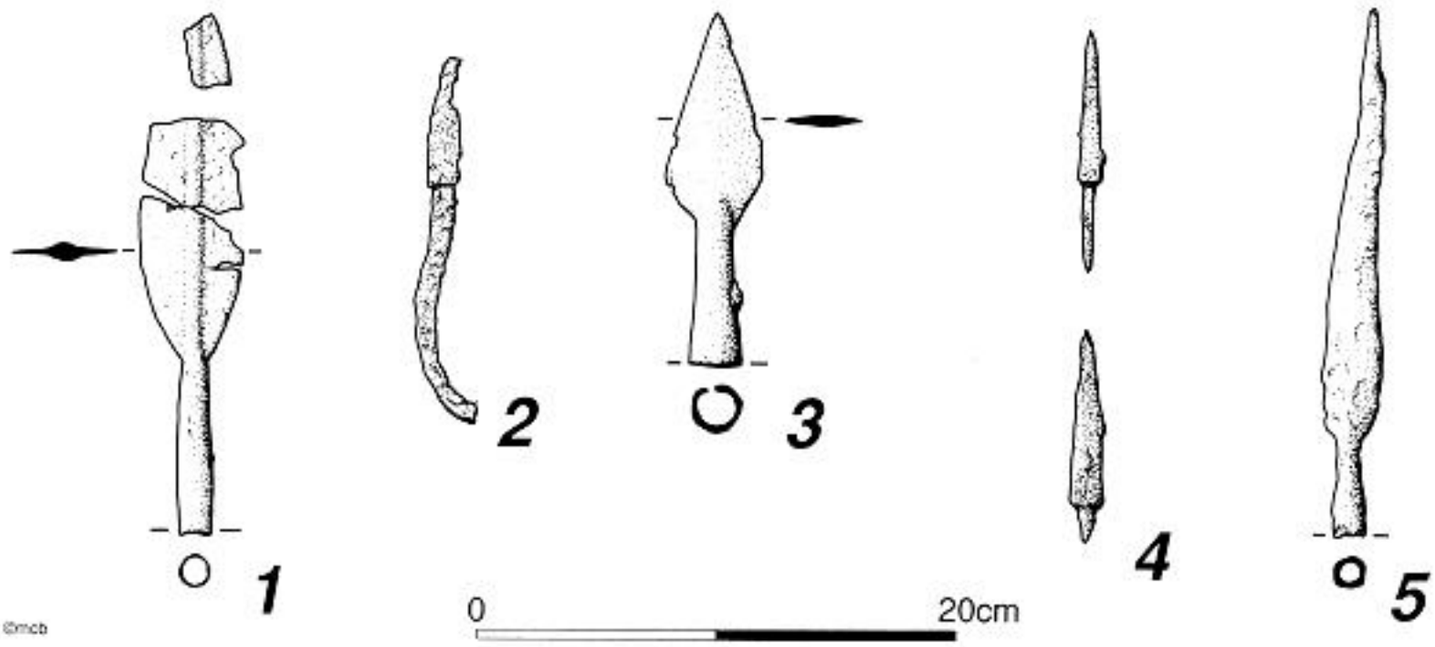
Pila (Figs. 68–69)

The continued use of the *pilum* into the second century is confirmed not only by the presence of examples at Newstead, but also by some rather unusual heads from the Antonine Wall fort at Bar Hill. *Pila* are depicted on a small relief from the nearby fort of Croy Hill which shows three soldiers usually identified as legionaries. The Newstead heads are up to 70 mm (3 in) long, quite large by comparison with earlier forms of the weapon; their dating is not certain, as they do not come from pits but from the vicinity of the Antonine barracks. The Bar Hill heads (22 out of 26 coming from the well in the headquarters building) are short and stocky (between 50 and 58 mm (2 and $2\frac{1}{4}$ in) in length) and doubt has been cast upon their identification as *pilum* heads, even though they share many characteristics of examples elsewhere: square-sectioned pyramidal heads (some with bent tips) and square-sectioned shanks, also showing bending.[6]

Spears and lances (Fig. 70)

The equipment in the Nawa burial included a spearhead 110 mm ($4\frac{1}{3}$ in) long. Other heads that can be dated to the Antonine period include pieces from Newstead and Strageath, with both mid- and low-shouldered heads.[7]

From the reign of Trajan onwards there is firm evidence that some auxiliary cavalry were armed with a lance (*contus*). Gravestones from Tipasa in Algeria show members of *ala I Ulpia contariorum* and *ala I Cannanefatium* wielding lances with both hands. These *alae* were usually stationed in Pannonia, but they both took part in Pius' Mauretanian war in the mid-second century. Despite the lack of a '*contariorum*' title, the fact that *ala Cannanefatium* were lance-armed is confirmed by a lancer on a stone from Bratislava-Rusovce. Arrian mentioned Roman lancers in the eastern theatre during Hadrian's reign, and the *ala I*



68 Antonine shafted weapons. *1* Spearhead (Hadrian's Wall, Turret 10A); *2 pilum* head (Bar Hill); *3* spearhead (Strageath); *4 pilum* heads (Newstead); *5* spearhead (Strageath).

69 Croy Hill relief. (Drawn by A. Gibson-Ankers.)

contariorum is attested in Syria during the third century.[8]

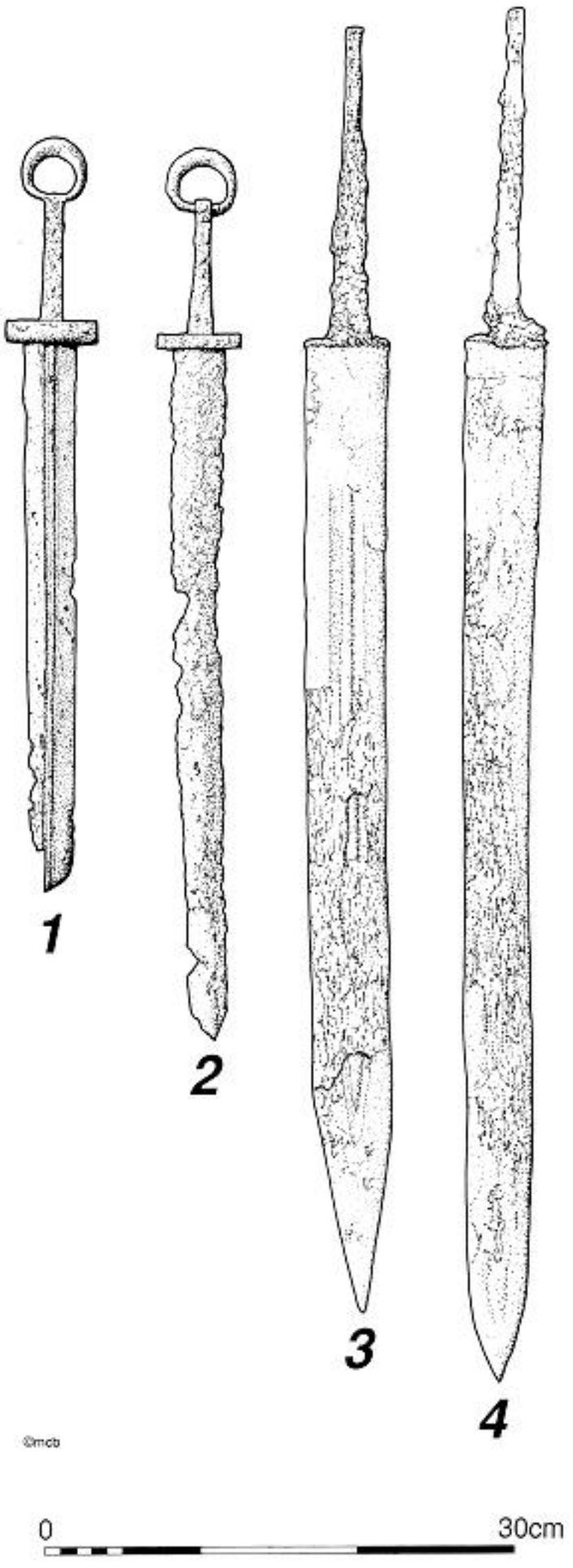
The two-handed use of lances on the Antonine gravestones accords with the fighting styles of Sarmatian and Mesopotamian cavalry as seen in first-century and later artworks. Roman writers associated the *contus* with Sarmatians in particular, and it is likely that Danubian contacts were responsible for second-century Roman adoption of the lance. Double-handed lances could not be used with shields.[9]

70 Antonine tombstone of a lancer (Tipasa). (Not to scale.)

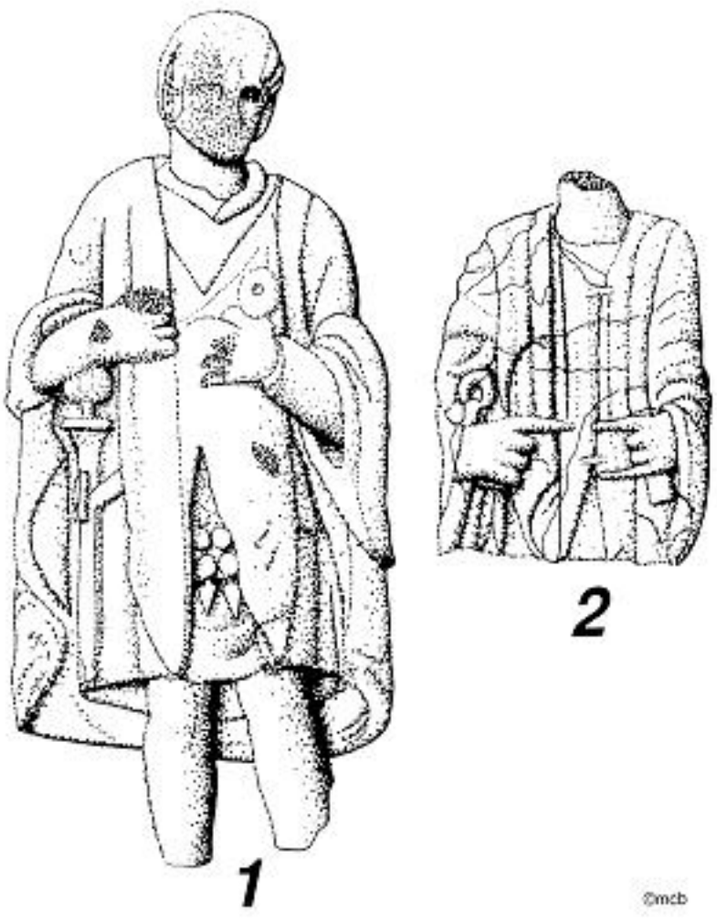
Swords (Figs. 71–72)

Short swords continue to be depicted in Roman art. The Nawa burial contained two swords, 510 mm (20 in) and 710 mm (28 in) in length. Two *spathae* (L. 870 mm (34 in) and 915 mm (36 in)), found with a pair of skeletons at Canterbury, are datable to the later second century by an accompanying button-and-loop fastener and scabbard-fittings (see below, p. 112). Their blades had parallel sides and triangular points, the shorter had longitudinal channels, whilst the longer one had a core which may be described as 'proto pattern-welded'. The shorter weapon had a poplar or willow grip and a maple-wood guard, whilst the other perhaps had an entirely maple grip-assemblage.[10]

A new form of short sword introduced during the second century, and found on fort sites, had a tapering blade (L. 480 mm (19 in)) and a grip-assemblage made up of iron tang, guard and ring-pommel. The latter is the most characteristic feature. A second-(?) century gravestone from Aquincum depicts a ring-pommel sword worn by a *paenula*-clad soldier on his right side. Belt-appliqués and strap-ends were sometimes made in the shape of miniature ring-pommel swords.[11]



71 Antonine swords. *1–2* Ring-pommel swords (*1* Steinamenger, Austria; *2* Linz); *3–4 spathae* (Canterbury).



72 Tombstones from Aquincum. *1* Unknown, with scabbard-slide; *2* unknown, with ring-pommel sword. (Not to scale.)

The earliest representations of such weapons are not in fact Roman, but are on first-century AD Crimean gravestones. Many ring-pommel swords come from Sarmatian graves, or from burials in Free Germany, and trans-Danubian contacts may again explain the Roman adoption of a new equipment type.[12]

Scabbard-fittings were also undergoing change during the period (see Fig. 80). New copper alloy heart-shaped or peltiform chapes appear in the artefactual record: peltate examples accompanied the Canterbury swords. The Marcus Column depicts these and semicircular chapes in use alongside the older triangular guttering chapes.[13]

The new method of fastening the scabbard and baldric together involved the belt passing through a vertical runner or slide which was mounted on the scabbard facing away from the wearer. Another soldier in a *paenula* on a second-century(?) Aquincum gravestone is shown with a short sword on his right, attached by a slide to a narrow baldric. A copper alloy slide from the Bonner Berg may be Hadrianic, and examples come from Antonine contexts along Hadrian's Wall.[14]

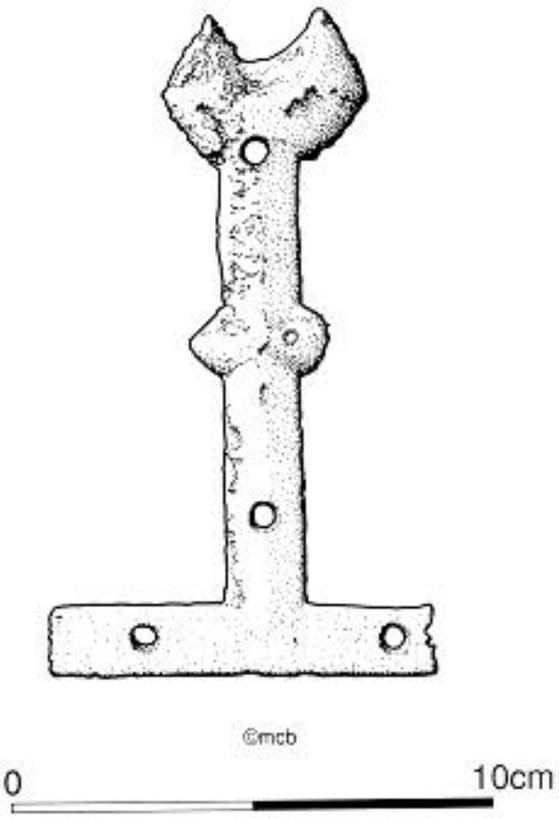
Slides may have originated as early as the seventh to sixth century BC in the Volga-Ural steppe region, and they were used north of the Black Sea by the second to first centuries. In the Roman sphere they first appear on barbarian scabbards on Trajan's Column, then on the Aquincum *stela*. A Chinese slide was found in a first-century AD 'Thracian' burial at Čatalka. Slides also supplanted four-ring suspension in Palmyrene use, but the earliest sculptural representations belong to the last decade of the second century AD. It is difficult to avoid the conclusion that slide-suspension came into Roman use through contact with steppe peoples in the Danubian zone.[15]

Daggers (Fig. 73)

A T-shaped dagger handle with crescentic pommel from Bar Hill is particularly interesting because, in terms of its size (L. 130 mm (5 in)), it more closely resembles third-century daggers than those of earlier periods.[16]

Archery equipment and slings (Fig. 74)

Five fragmentary antler ear-laths from composite bows (see Chapter 7) were found at Bar Hill on the

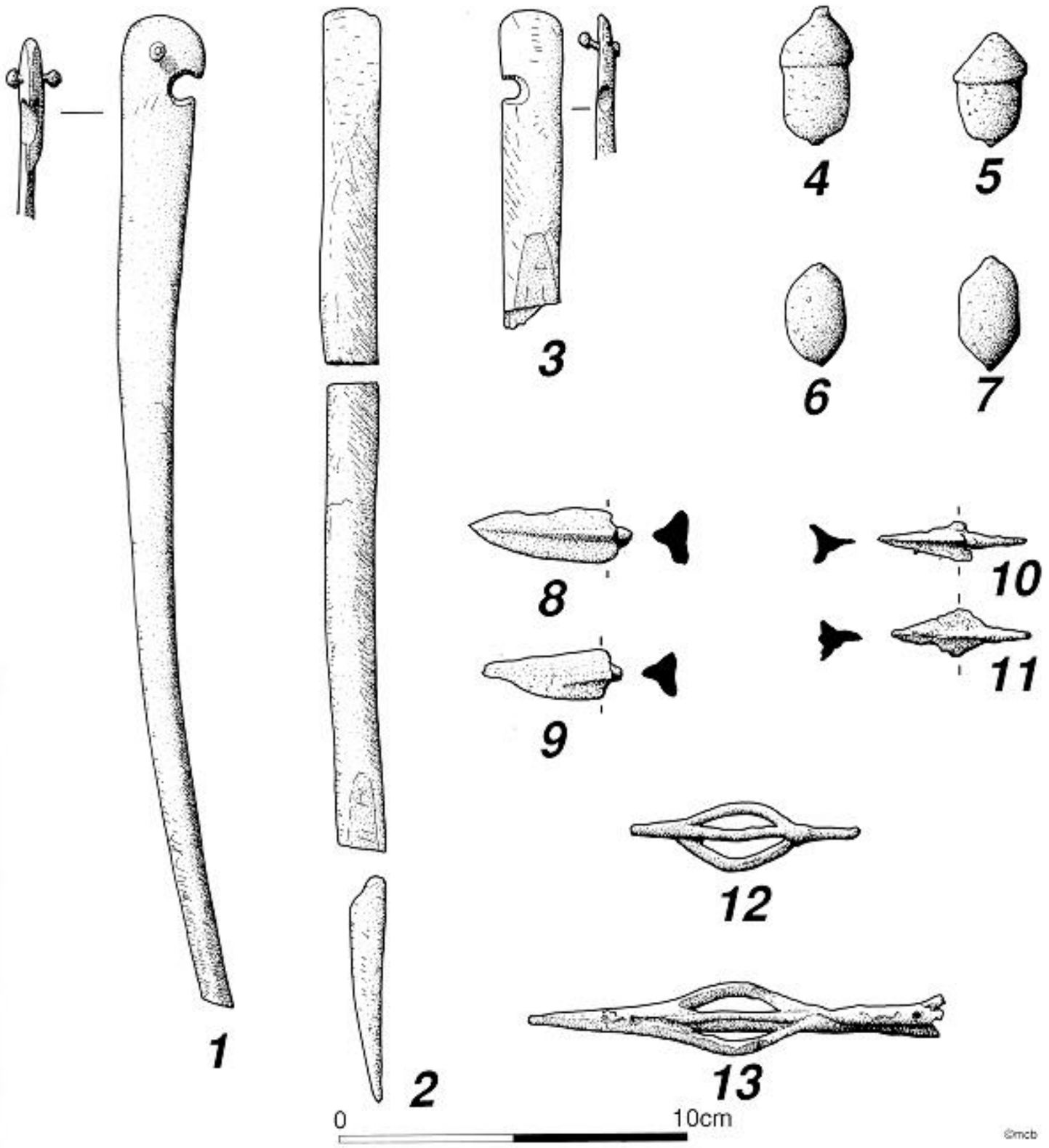


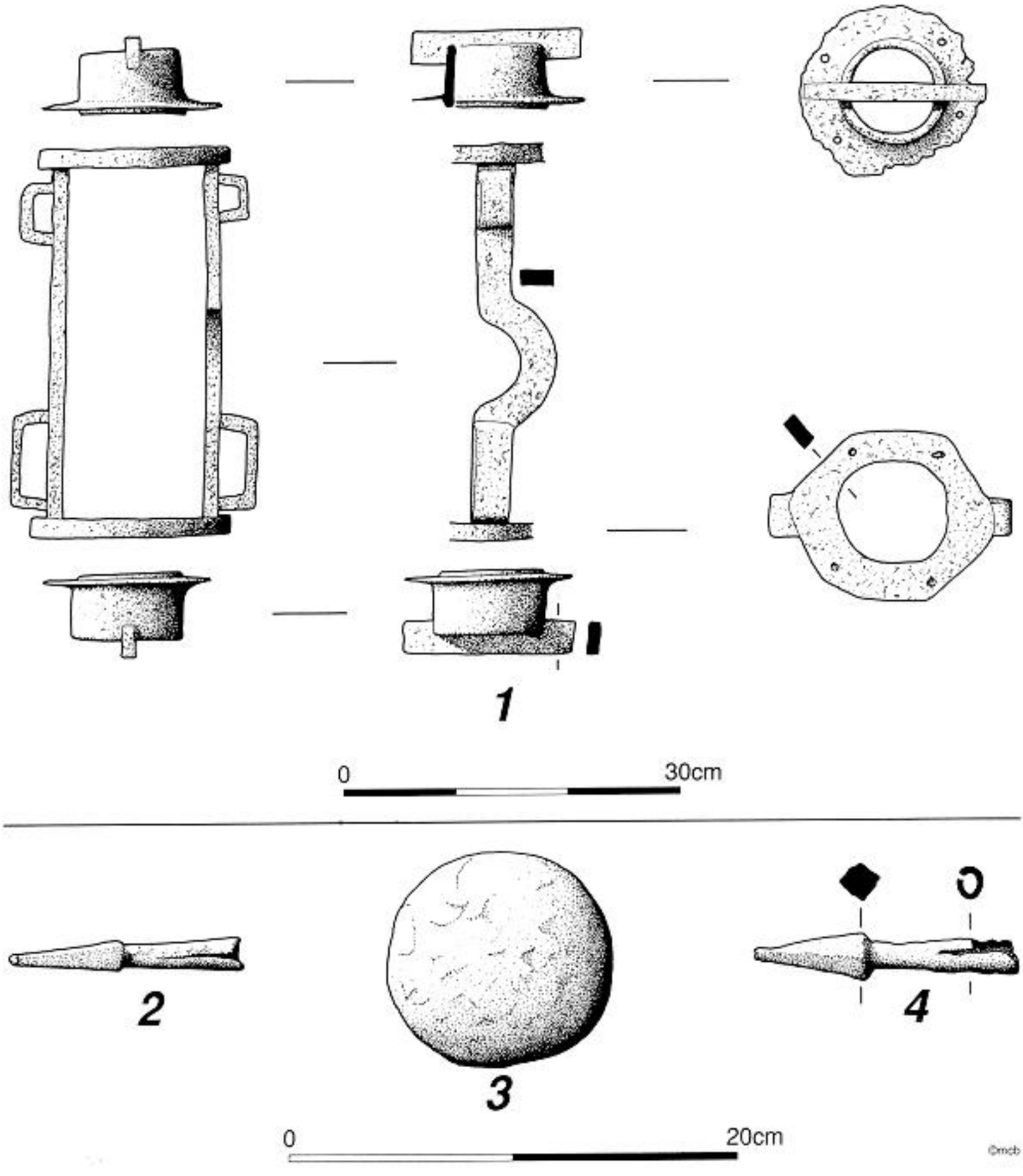
73 Antonine dagger handle (Bar Hill).

74 (*Right*) Antonine archery and slinging equipment. *1–3* Antler ear-laths (Bar Hill); *4–7* lead slingshot (Burnswark); *8–9* iron arrowheads (Burnswark); *10–11* arrowheads (Bar Hill); *12–13* incendiary arrows (*12* Bar Hill; *13* Ptuj).

Antonine Wall. Two of these had a rivet passed through, above the nock, a feature paralleled by a Roman lath from Carnuntum and by Avar ear laths. The longest lath (L. 270 mm (11 in)) had a solid end and was not one of a pair, thus the rivet played no constructional role. Perhaps these rivets were used to hang up the bow when it was not in use.[17]

Trilobate, tanged arrowheads also come from Bar Hill, Burnswark and other Antonine sites in Scotland. Less common are five Bar Hill incendiary heads (L. 52–60 mm (2–2⅓ in)), and a further undated example from Wroxeter (L. 76 mm (3 in)). On each, a short point is attached to a tang by three curving bars which would have enclosed inflammable material. A similarly undated piece from Ptuj has four bars and a nailed socket. It is long for an arrowhead (120 mm (5 in)), but the socket is too narrow for attachment to a catapult bolt or even to a light javelin shaft. All these heads compare well with fire-arrows (*malleoli*) discussed by Ammianus and Vegetius.[18]





75 Antonine artillery fittings. *1* iron field frame and washers (Lyon); *2* iron catapult bolt (Newstead); *3* stone *ballista* ball (Burnswark); *4* iron catapult bolt (Strageath).

Lead sling-bullets seem to have gone out of general use during the second century in much of the Empire. However, elliptical and acorn-shaped *glandes* were expended in Antonine exercises at Burnswark and are found on other contemporary Scottish sites. Elliptical bullets in an Italian collection bear *L(egio) II* ITAL*(ica)* inscriptions which would date them to the reign of Marcus, if not referring to a Republican Italic legion. Hoards of clay shot have also been found in second-century contexts.[19]

Artillery (Fig. 75)

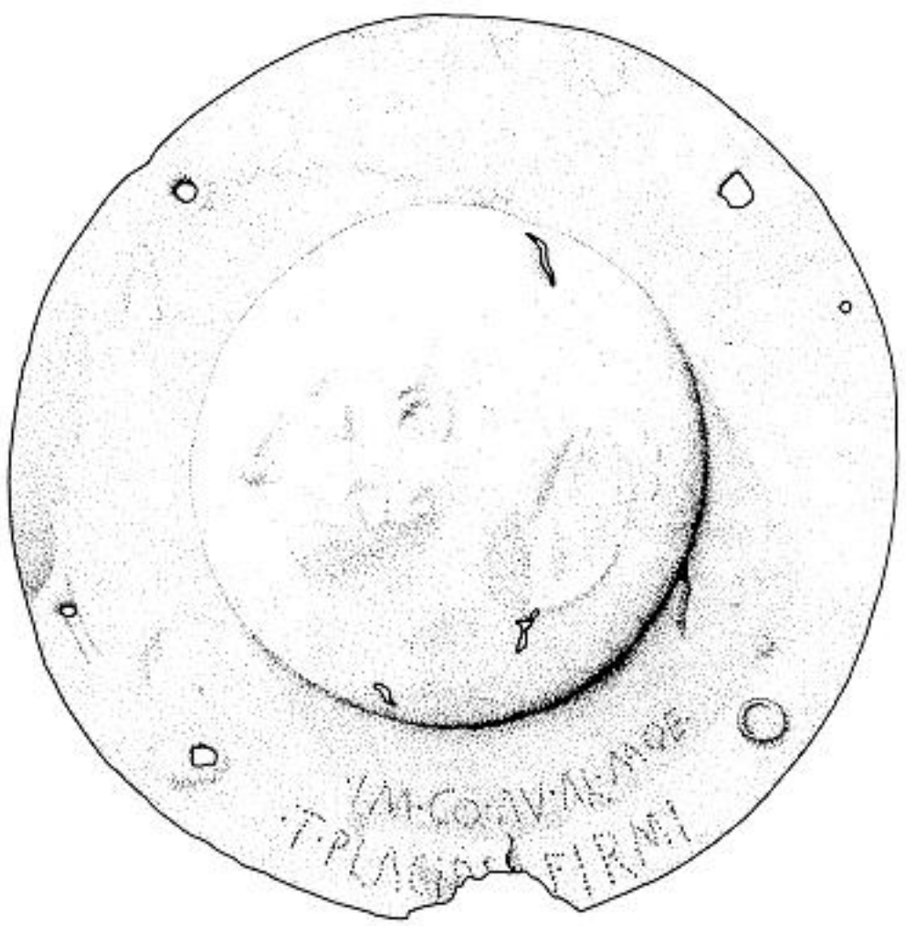
Bolt-heads come from Strageath and there was an impressive collection of stone balls excavated at Burnswark, thought to have been used in practice siege-works during this period. Remains of a field-frame at Lyon represent the new metal-framed artillery pieces, discussed by Heron and illustrated on Trajan's Column. These may have entered the archaeological record after the battle of AD197, and so could well be of Antonine manufacture.[20]

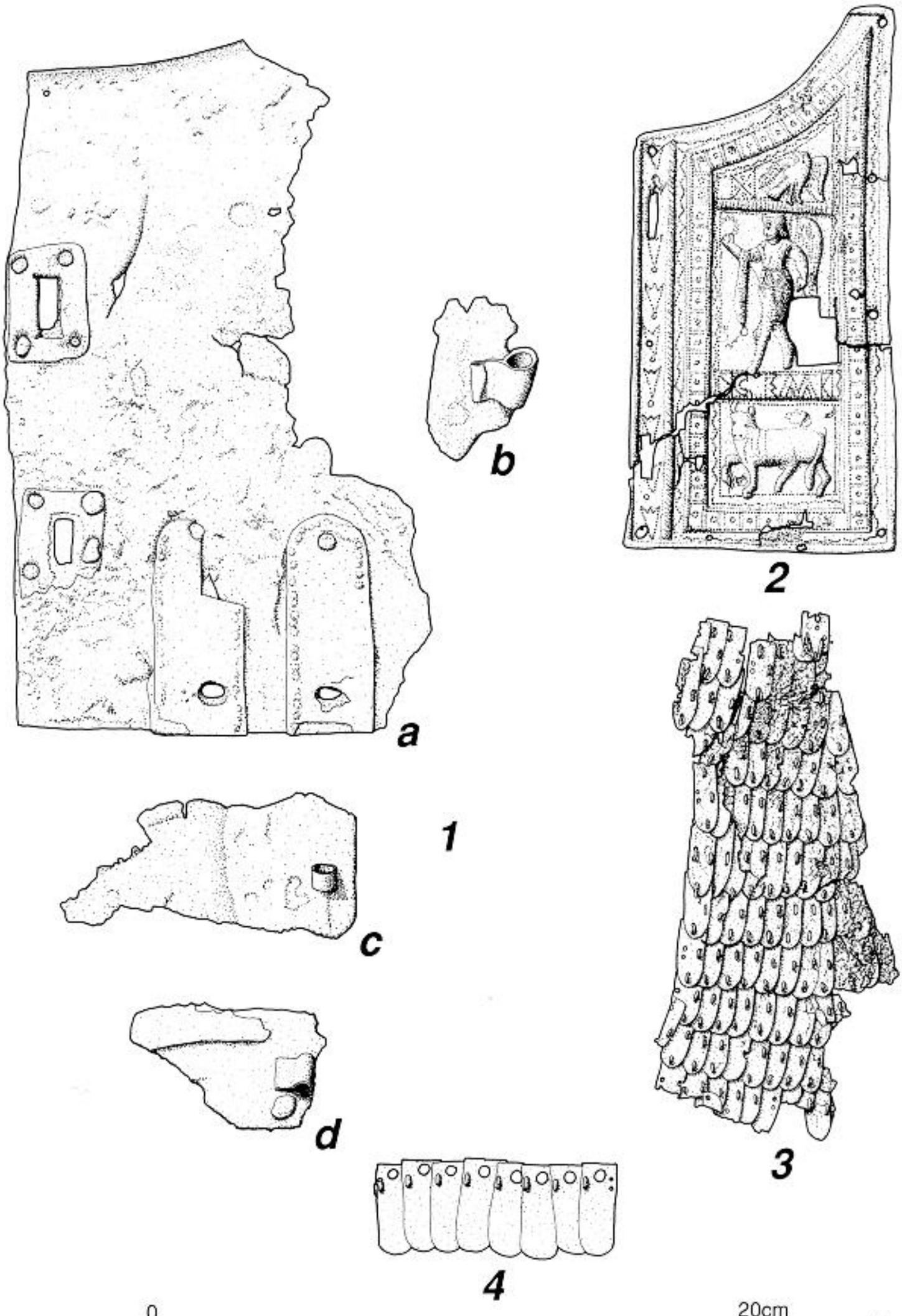
Armour

Shields (Fig. 76)

No examples of Antonine shields survive but the curved rectangular body shield continued in use, and it is seen on the Croy Hill sculpture (see Fig. 69) and on figures of Roman soldiers depicted in relief on one of the helmets found in the Nawa burial. A circular, hemispherical copper alloy shield boss from Butzbach bore an inscription mentioning the unit (*ala Moesica*) and soldier to which it belonged, as well as the emperor Commodus.[21]

76 Antonine shield boss, from Butzbach, belonging to Firmus in the *turma* of Placidus in the *ala Moesica*. The inscription also mentions the emperor Commodus (*Im. Co. Au.*).

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Body armour (Fig. 77)

Whilst there appears to have been little development in body armour between the Flavian and Hadrianic periods, new types of defence were certainly appearing in Antonine use. Although little can be done by way of improvement to mail itself, ergonomic enhancements were possible in the form of the cuirass. Mail fasteners are absent from Antonine sites, having been comparatively common in pre-Antonine deposits. The reason for this seems to have been that a new system of closure was introduced.[22]

Pairs of fairly small, decorated breastplates from second- and third-century contexts have usually been interpreted as belonging to 'parade' or cavalry sports armour, despite the fact that they are not found amongst the better-known hoards of such equipment. Even when they have been discovered with legionary inscriptions on them (LEG X and LEG XIIII), resort has been made to the detachments of 120 legionary 'cavalry' in order to explain away these pieces. Such arguments tend to overemphasize the artistic, and underplay the defensive, qualities of these pieces of armour. The discovery of examples at Mušov and Orgovány, belies such explanations and points the way to reinterpretation of these pieces as fully functional mail and scale cuirass closures of a more sophisticated type than the Celtic-derived pivoting mail hook.[23]

A new form of scale, typified by pieces found at Corbridge and Mušov, was introduced in this period, consisting of defences constructed from scales wired to each of their four neighbours, above and below as well as to either side. Earlier scale armour was usually only wired horizontally and then attached to a flexible backing, although examples of scales wired on four sides were found in the (probably pre-Antonine) *Waffenmagazin* at Carnuntum. The Antonine scales differed in being not only very small, but very long and slender. Cuirasses constructed from such scales are semi-rigid and little movement would be possible in the vertical plane for the wearer, but since experimental reconstructions of this type of armour have yet to be made, it is difficult to generalize about the efficacy of this new type of armour.[24]

'*Lorica segmentata*' also underwent changes in the Antonine period, as the important find from the well in the headquarters building at Newstead demonstrates. Much simpler than the earlier versions of the cuirass, many of the extraneous fittings (such as the semi-functional hinges on the collar and shoulder plates) were done away with and a modified fastening mechanism employed. Shoulder plates were now riveted together and the breastplates were larger than before. The system of attaching the upper portion to the girth hoops was similar to that employed on the Corbridge type B cuirasses. Breastplates were now joined together in a similar way to the new mail and scale closures, whilst the old tie hooks on the girth plates were replaced with simple loops.[25]

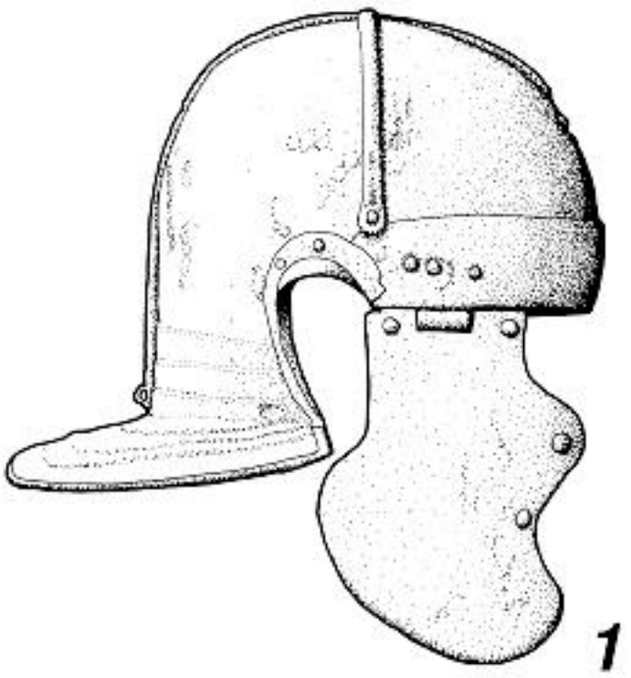
Helmets (Figs. 78–79)

Similarly poorly represented in the archaeological record, the two main contenders for consideration as Antonine infantry helmets both lack a soundly dated archaeological context, so it is conceivable that they do not even belong to this period. One of two helmets from Theilenhofen shows so many affinities with the equipment of the earlier Principate (and hardly any with third-century helmets) that it is at least reasonable to consider it in this context. The appearance of bowl cross-pieces at the beginning of the second century gives us a rough *terminus post quem*, as does the likely foundation date of the earliest fort at Theilenhofen (*c.*AD100), whilst its association with the cavalry helmet (discussed below) may hint at continued use. Whilst fitting into the Imperial-Italic tradition of helmet manufacture, the helmet has a comparatively shallow neck-guard.[26]

A helmet from Niedermörmter, on the other hand, was extremely deep in the region of the neck, as well as ornately decorated. It still retained many of the characteristics of helmets of the earlier Principate – large ear-guards, ribbing on the neck, thick brow-guard – but its cross-pieces had now become largely decorative. It also carried an inscription which showed that it belonged to L. Sollonius Super of *legio XXX Ulpia Victrix*.[27] Fragments of helmets from Newstead show the use of fully developed cross-pieces, similar to those found on third-century helmets.[28]

The Nawa burial contained two helmets, one (Helmet A) conforming to the usual 'sports' type, but the other (Helmet B), hardly any less decoratively embossed, was presumably for battle use. Helmet B had decorated cheek-pieces of cavalry

77 Antonine armour. *1a–d* '*Lorica segmentata*' fittings (Newstead); *2* mail or scale breastplate closure (Orgovány); *3* semi-rigid scale (Mušov); *4* scales (Newstead).



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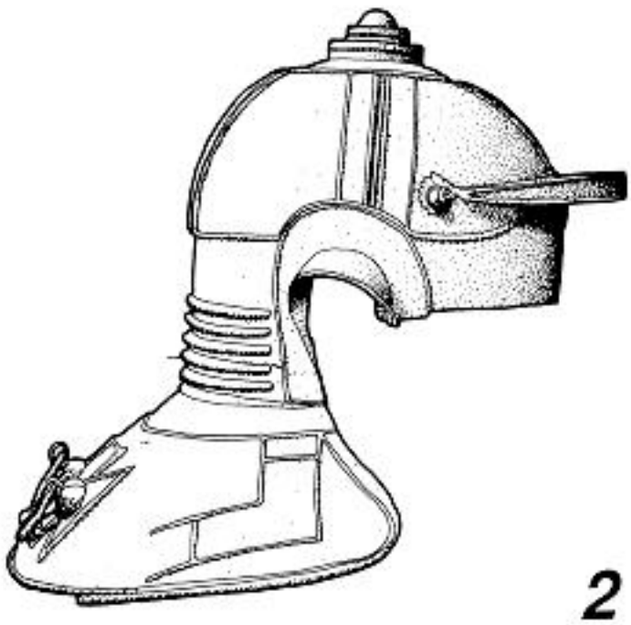

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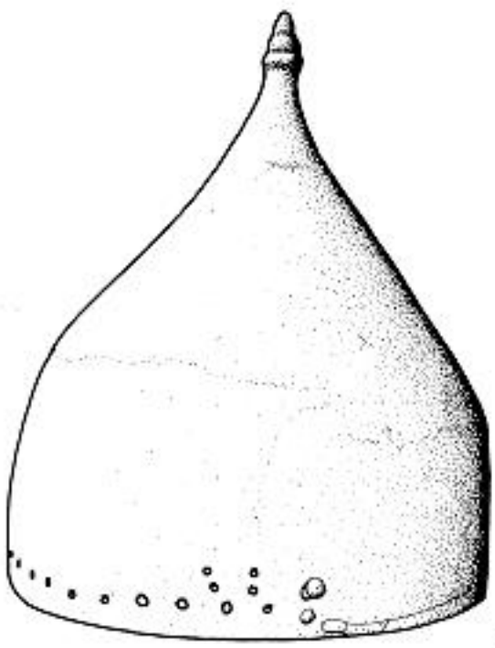

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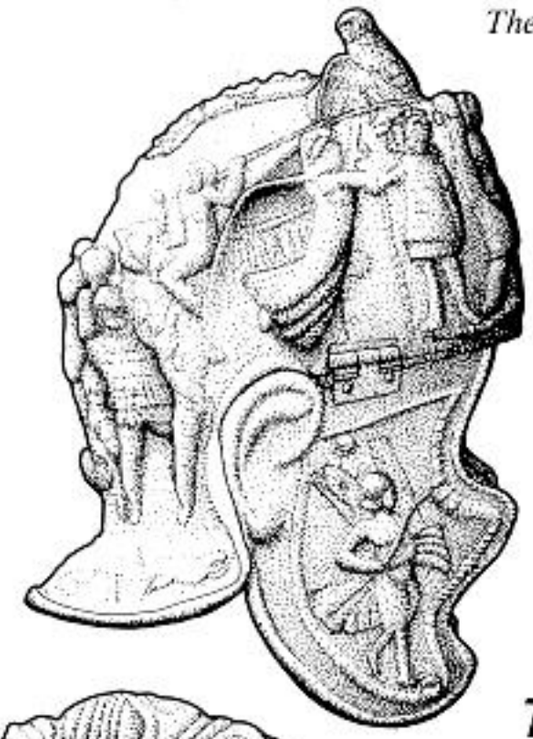
type (covering the ear), rather than a face mask, and relief decoration of battle and sacrifice scenes. Both helmets were very similar in shape. The main functional difference was that A had a central hinge on the forehead for the mask, whilst B had hinges on either side for its cheek-pieces. Helmet A had a hinged mask depicting a bearded, mustachioed man and relief decoration on the bowl showed a cuirassed emperor surrounded by eagles and a Victoria. Another mask was excavated in an Antonine pit at Echzell; it depicts a frowning youth and has many stylistic affinities with masks from the later Straubing hoard (see Chapter 7). Another piece found at Theilenhofen bore splendid embossed eagle decoration and inscriptions showing that it belonged to an *eques* of *cohors I Bracaraugustanorum* (Pl. 2b).[29]

Another form of helmet is so far only represented by finds from the Danubian region. It consists of a one-piece conical copper alloy bowl without a neck-guard. Holes around the sides and back of the rim served to attach a protective textile, leather and/or mail curtain. An example from Karaagach had cheek-pieces and overall embossed figural decoration in the Roman 'sports equipment' style. Another from Dakovo in Bosnia is plain except for classical figures of Jupiter, Mars and Victoria on a strip across the front. There is little direct dating evidence for any of these helmets. One from Bumbeşti in Romania would not have predated the Trajanic conquest of Dacia, and the decoration mentioned above suggests manufacture in the second to third centuries AD.[30]

Conical helmets from Bumbeşti and Intercisa have been linked by commentators with oriental archer units at these forts, and the Intercisa piece bears two *T(urma)* inscriptions which suggest cavalry use. The conical bowl has been seen as an eastern helmet type translated into Roman form by one-piece manufacture and decorative style, partly because 'oriental' archers on Trajan's Column seem to wear them.[31]

78 (*Left*) Antonine helmets. *1* Imperial-Italic (Theilenhofen); *2* Imperial-Italic H (Niedermörmter); *3* Conical (near Intercisa). (Not to scale.)

79 (*Right*) Antonine cavalry helmets. *1* Battle helmet (Nawa); *2* 'sports' helmet mask (Echzell); *3* 'sports' helmet (Nawa). (Not to scale.)



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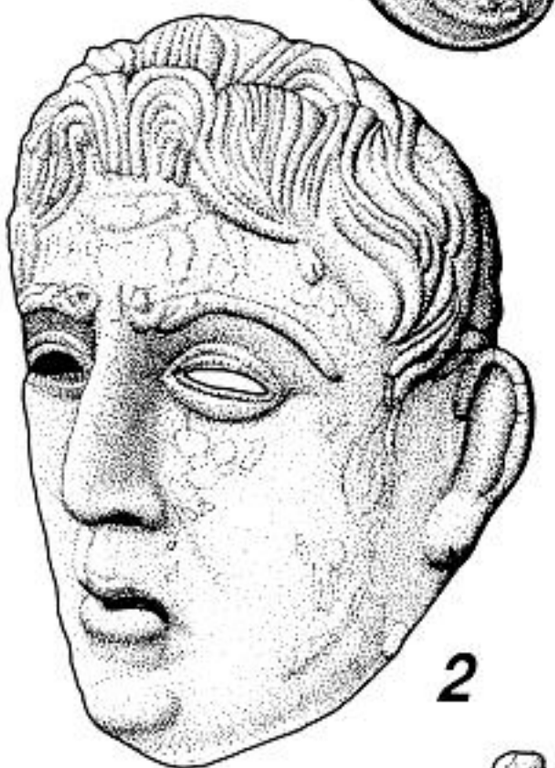

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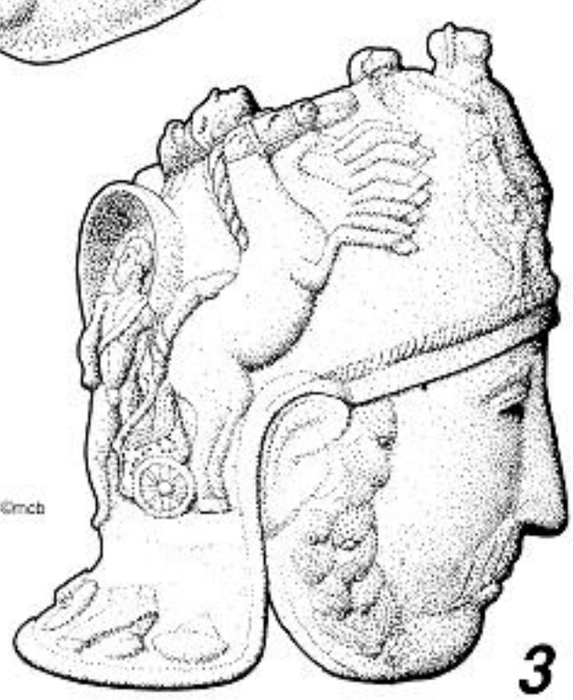

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Unfortunately, the Column archers are represented using a pastiche of captured Danubian barbarian equipment. Roman helmets from the East found so far all follow more conventional 'Imperial' or 'sports' designs, and none bridge the gap between conical second-century BC types and the second-century AD Danubian helmets in question. Parthian helmets had multi-part bowls and were not truly conical in shape. On the other hand, conical segmental helmets ('*Spangenhelme*') were used by the Sarmatians (see Chapter 8), and these may have been the primary influence behind the Roman bowls. Another, related, possibility is that conical helmets also belonged to a Thracian tradition, linked with trans-Danubian developments.[32]

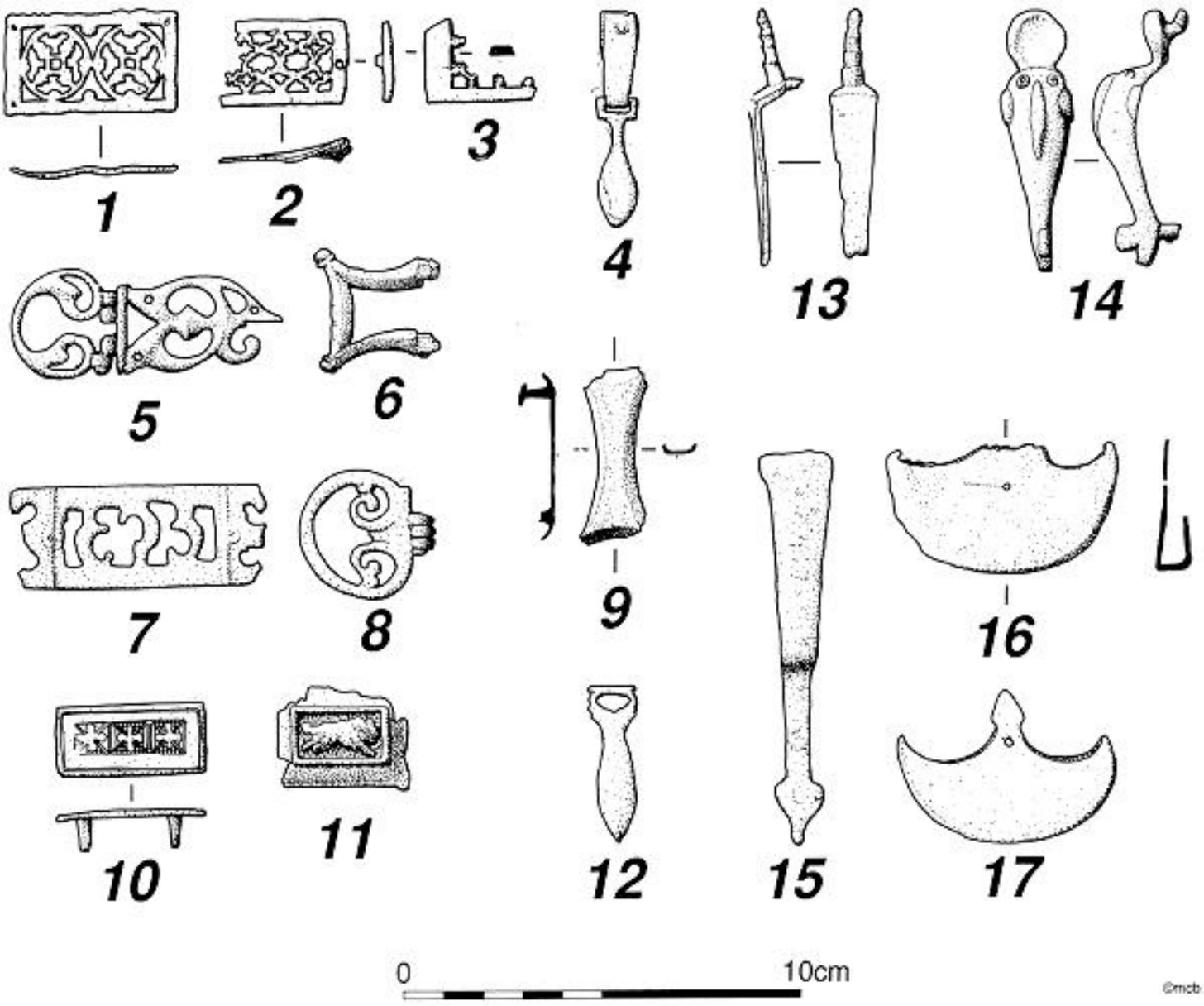
Personal equipment (Fig. 80)

Belt-fittings of this period changed completely from their predecessors, most of them now incorporating openwork designs, many of which show traces of Celtic influence. Although comparatively few in number, these fittings are nevertheless recognizable as the prototypes for those excavated in abundance from the third century. Examples come from Strageath, Newstead and the turrets on Hadrian's Wall. More or less elaborate enamel and *millefiori* inlaid plates begin to be found (an example of the latter was discovered at Newstead) and the general impression from the limited artefactual evidence is that much of the material familiar from the abandonment of third-century sites was first introduced in the Antonine period. Narrow, hinged teardrop strap-terminals come from Hadrian's Wall turrets, and an Antonine panel reused on the Arch of Constantine shows an ivy leaf strap-end.[33]

Footwear and clothing

Archaeological evidence, notably that from the Bonner Berg workshop, suggests that the classic Roman military boot, the *caliga*, had gone out of use in the first quarter of the second century AD. At Strageath, the hobnails of a boot were found retaining their original pattern.

This is also the period in which the *paenula* is last found (being depicted on the Croy Hill relief); the *sagum* was the dominant type of military cloak thereafter. The Croy sculpture (see Fig. 69) suggests that the short-sleeved tunic may also still have been in use, and neither this nor the Nawa helmet show infantrymen wearing leggings.[34]



80 Antonine personal fittings. *1–12* Belt or strap fittings (*1–2, 4, 6, 12* Hadrian's Wall; *3, 9–10* Strageath); *5, 7–8, 10* Newstead); *13–15* scabbard-slides (*13* Hadrian's Wall; *14* Strageath; *15* Newstead); *16–17* chapes (*16* Strageath; *17* Hadrian's Wall).

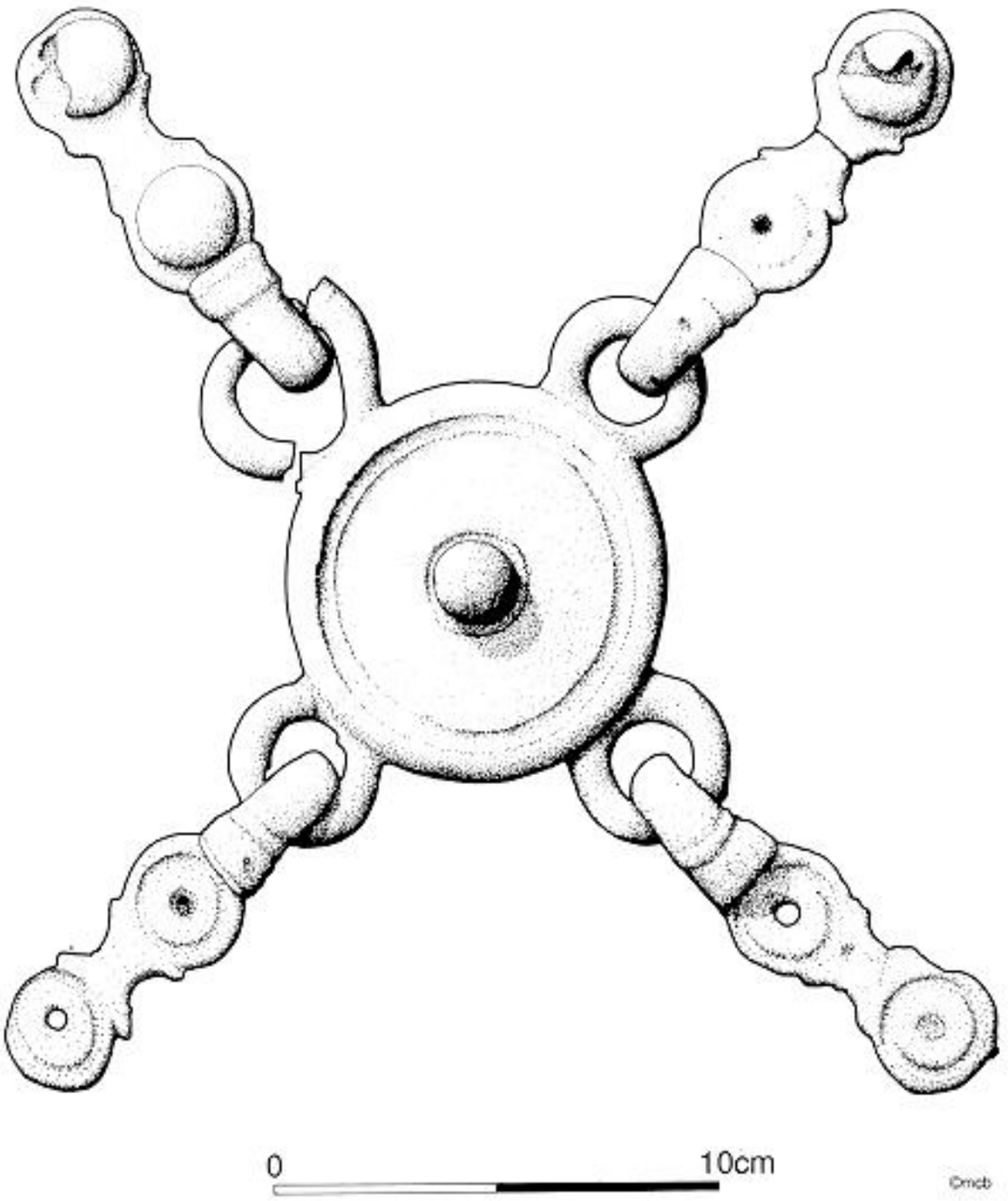
Other equipment

An iron flask from Newstead may have been a military water bottle. Apuleius records a *miles* (centurion?) belabouring a civilian with his *vitis*, then reversing it to hit him again with the knobbed end (*nodulus*).[35]

Equine equipment (Fig. 81)

The Antonine period saw developments in riding harness junctions. Whereas before the junction loop or *phalera* with concealed loops had been favoured, now the *phalera* with loops around its periphery reappeared (previously used in the Augustan period). The example from Newstead still retained some of its junction loops, which were of a similar type to those used earlier, only they were now somewhat larger. The harness items from the Nawa burial – and it would appear to have included all the requisite items such as *phalerae* and pendants – would not have looked out of place in the first century AD, so it is possible that these may have possessed some antique or personal value. There was also a tripartite bronze chamfron with integral eye-guards.[36]

Fronto notes slovenly troops at Antioch padding their cavalry saddles, forcing Verus to slit open the horns and remove the stuffing.[37]



81 Antonine equine equipment. Junction *phalera* with junction loops (Newstead).

7

THE ARMY IN CRISIS

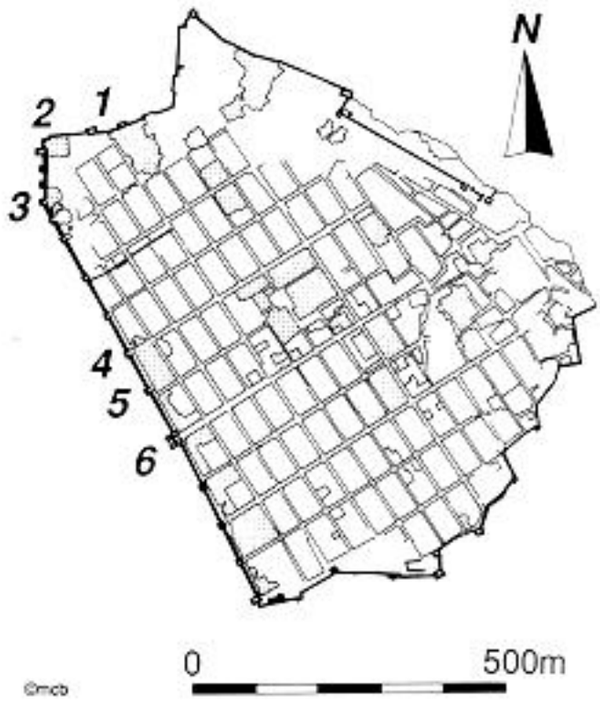
From the death of Commodus to the accession of Diocletian the internal stability of the Empire was disrupted by usurpation and civil war. New confederations of German tribes pressed against the northern frontiers, and in the East the Arsacid Parthians were replaced by the more effective Sassanid Persian dynasty. The Danubian region (Illyricum) provided not only the best soldiers but also many of the third-century emperors who steered the Empire to recovery. With trans-Danubian borrowings, military equipment development in this area was dynamic and influential. Recruitment of *Illyriciani* to Praetorian and legionary units in Italy (from the reign of Severus), and geographically-wide deployment of Illyrian units, brought new equipment forms to other army groups. The renaissance of figural gravestones originated, and spread from, the Danube provinces, especially to Rome.[1]

In the Severan period Roman military control was extended further into northern Britain, Numidia and Mesopotamia, providing a *terminus post quem* for equipment from new sites; conversely, some areas were given up in the third century. Forts on the outer Agri Decumates line and beyond Mainz were abandoned in *c.*259–60, and those in Dacia *c.*271, giving sites a *terminus ante quem*. As usual, orderly Roman withdrawal was accompanied by the deposit of unwanted equipment.[2]

Artefactual comparisons may be made with finds from areas with less strategically dated contexts. Excavations at Corbridge produced a group from a small third-century *fabrica* on Site XL. These finds are directly comparable with equipment left in the north-west rampart-back building at Caerleon when the legionary fortress there was abandoned in the later third century.[3]

The largest single group of military equipment from the Roman Empire was found during Franco-American excavations at Dura-Europos in Syria (1922–37). Dura was a Hellenistic colonial foundation and 'caravan city' taken from the Parthians in AD164. It was held by a number of legionary *vexillationes*, plus *cohors XX Palmyrenorum* and other units, but identities of the latest Roman units are not known with certainty. The city fell to the Sassanid Persians around *c.*254–7 after a siege, and was abandoned thereafter. Much of the military equipment was preserved by arid contexts in collapsed towers and siege-mines and dates to the latest period of occupation (Fig. 82).[4]

Graves and ritual water deposits in northern Europe, especially at Thorsbjerg, Vimose and Simris, often contain Roman armour and weapons preserved in wet conditions. Alongside Roman items are German artefacts and equipment derived from Roman models. The Roman pieces presumably entered Free Germany as *spolia*, diplomatic gifts, service payments and trade-goods, and moved around through inter-German warfare. It is suggested that some large water (now bog) assemblages were created by long-term small-scale offering punctuated by major depositional events involving war-booty.[5]



82 Plan of Dura-Europos. *1* Tower of the Archers; *2* Temple of the Palmyrene Gods; *3* Tower 24; *4* Tower 19 and siege-mine; *5* Synagogue; *6* Palmyrene Gate.

Weapons

Pila (Fig. 83)

Pila are represented on a number of third-century Praetorian gravestones from Rome. Examples now in Naples and Fiesole museum collections show a large, bulbous weight between shaft and shank, analogous with weights on Cancelleria Relief A. The *stela* of M. Aurelius Lucianus (Museo Capitolino) and one in the Castel S.Angelo have a second, smaller weight above the first. A binding usually runs up the full length of these *pilum* shafts, and the weapon on the funerary altar of L. Septimius Valerinus (Museo delle Terme) also has a pointed butt.[6]

Gravestones in the provinces generally do not depict pila, but there are exceptions. The *stela* of a *b(ene)f(iciarius) tr(ibuni) leg(ionis)* from Apamea shows a *pilum* with butt, two or three weights, shank, triangular head and what appear to be ribbons attached to the lower weight. The gravestone of Aurelius Iustinus, *miles* of *legio II Italica*, from Celje shows a *pilum* with two weights.[7]

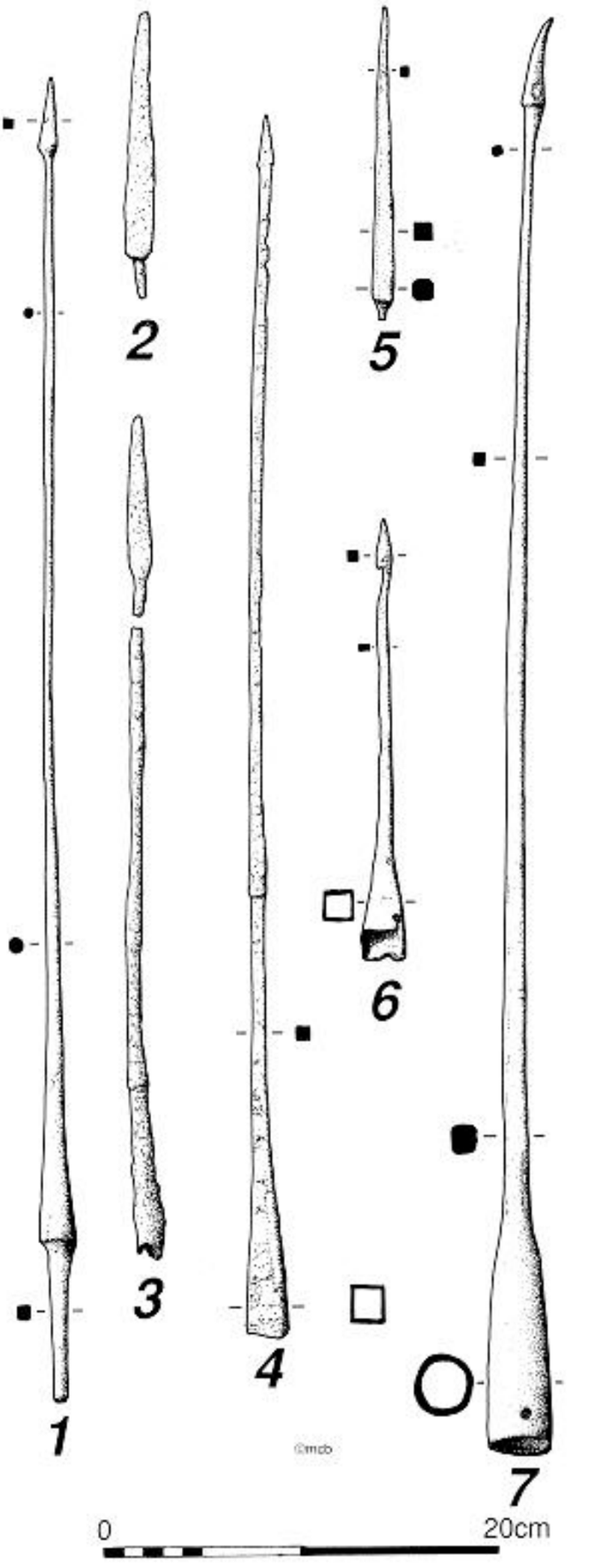
At least 55 *pilum* heads and shanks were found in the Caerleon rampart-back building. They are closely paralleled in proportions and dimensions by heads from Corbridge, and are longer and slimmer than examples from earlier periods. Other heads from Richborough and from German sites may also date to the third century.[8]

Pila therefore continued in use during the third century, but they probably ceased to be the priority shafted weapon for legionaries that they were in earlier periods. Nevertheless, the pictorial and artefactual evidence continues to associate the *pilum* with Praetorian and legionary troops.

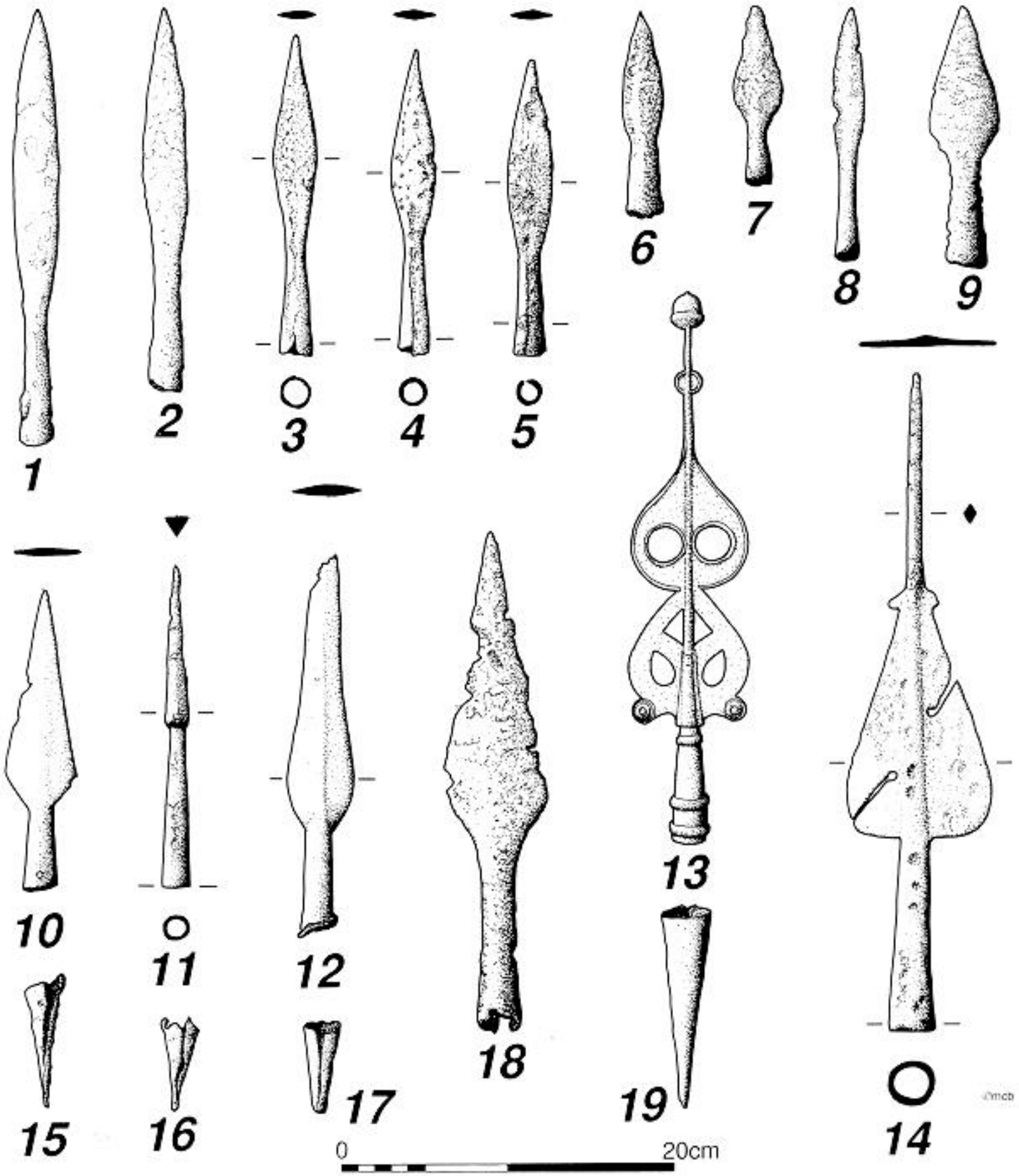
Spears (Figs. 84–85)

Gravestones and provincial sarcophagi sometimes show a standing soldier holding one or two spears. The majority have narrow-shouldered, leaf-shaped heads, but exceptionally a single spear with a broad-shouldered, triangular head is depicted. Most of these representations involve legionaries, with a few Danubian auxiliaries (see Fig. 101).[9]

There are numerous artefactual parallels from British, German and Danubian sites for such gravestone spearheads. These, together with butts, did not differ greatly from those used in earlier periods. Heads from Caerleon, for example, fall into two main types: narrow-shouldered, widest



83 Third-century *pila*. *1, 6–7* Saalburg; *2–3* Caerleon; *4* Eining; *5* Corbridge.



84 (*Above*) Third-century spearheads and butts. *1, 15–16* Buch; *2, 9* Caerleon; *3–5, 11, 14* Künzing; *6–8, 18* Saalburg; *10, 12, 17, 19* Osterburcken; *13* Wiesbaden.

85 (*Right*) Third-century tombstones. *1–2* Unknown (Rome); *3* Aurelius Mucianus (Apamea); *4* Aurelius Lucianus (Rome). (Not to scale.)

1

2

3

4

about half-way along the blade; and broad-shouldered, widest near the socket. Perhaps the narrow type was designed primarily for throwing and deep penetration, whilst the broader form was for thrusting, with ease of withdrawal a priority. A third common form continuing from the second century had a proportionally long and slim solid head with a triangular or square cross-section.[10]

Third-century spear-shafts from Danish bogs were sometimes decoratively carved below the socket. Roman shafts may have been similarly embellished, or at least painted.[11]

Provision of a pair of shafted weapons on *stelae* suggests that one or both were chiefly missiles. Aurelius Mucianus, a *discens lanchiari(um)* of *legio II Parthica*, is represented on his gravestone from Apamea holding a bunch of no less than five shafted weapons with narrow-bladed heads. They are shorter than the spears on other contemporary Apamea *stelae*.[12]

A distinctive class of iron spearhead had a low, broad-shouldered blade exhibiting such features as copper alloy inlays, silvering, circular or slot perforations, and attached rings. These are generally identifiable with heads carved on monuments erected by and for *beneficiarii, frumentarii* and *speculatores*. One head with attached copper alloy rings accompanied a collection of *beneficiarius* altars at Osterburken. Soldiers presumably carried spears ('*Beneficiarierlanze*') as rank insignia whilst engaged in special administrative, supply and policing duties. The spearhead shape was also applied to baldric fastening plates, decorative belt appliqués and strap terminals. Many of the heads have been published as fittings from *signa* or *vexilla*, but they are far too numerous for this to be a general identification.[13]

Swords and baldrics (Figs. 12, 86–94)

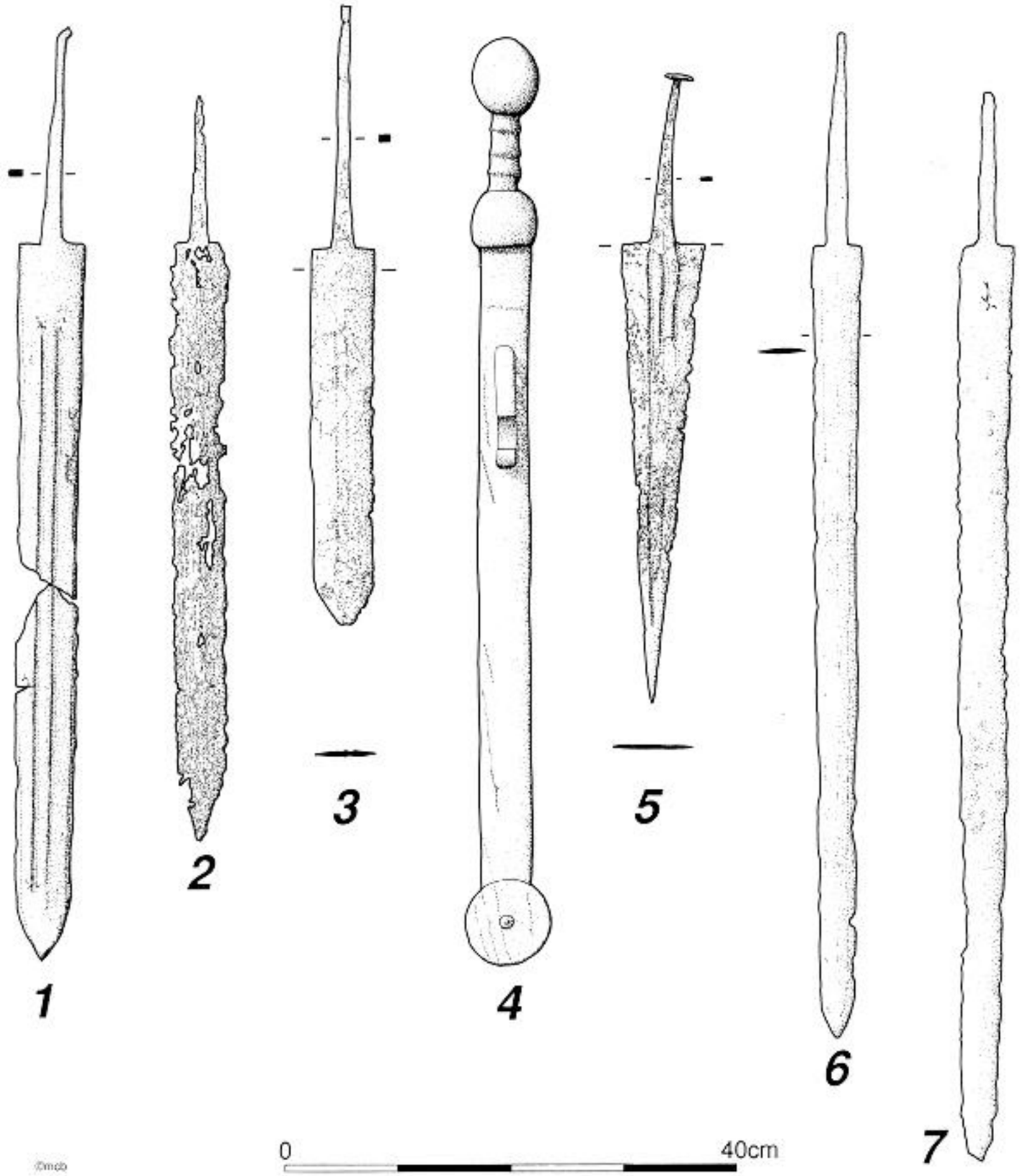
The representational sources indicate that Roman swords underwent three major changes in the later second and third centuries. Firstly, the shorter 'Pompeii' type sword disappeared, to be replaced by *spathae* for all types of troops. Secondly, the sword was now always carried suspended from a broad baldric on the soldier's left side, rather than on his right as before. Thirdly, ring-suspension was entirely replaced by the scabbard-slide. Swords are seldom found with their furniture intact on Roman sites, but Free German burials and water deposits both involved all the fittings entering the archaeological record together. Few swords were deposited in Roman graves but burials at Lyon and Khisfine are important exceptions.

Tanged swords were classified by Ulbert into two categories, based on blade proportions. Firstly, the long, narrow 'Straubing/Nydam' type had a blade length to breadth ratio of 15–17:1 (L. *c.*650–800 mm (26–31 in), W. 44 mm (1¾ in) max.) and, generally, a slightly tapering blade. Secondly, the shorter, wider 'Lauriacum/Hromowka' form had an 8–12:1 ratio (L. *c.*557–655 mm (22–26 in), W. 62–75 mm (2½–3 in)), parallel edges and a triangular point. There is some overlap between groups and some individual exceptions, but this is a useful starting point for future research. Swords from sites abandoned in the third century include five or six *spathae* found at Dura (plus fittings for at least 25 more weapons). Swords of considerable length are worn by Romans on Sassanid reliefs, and are shown on gravestones.[14]

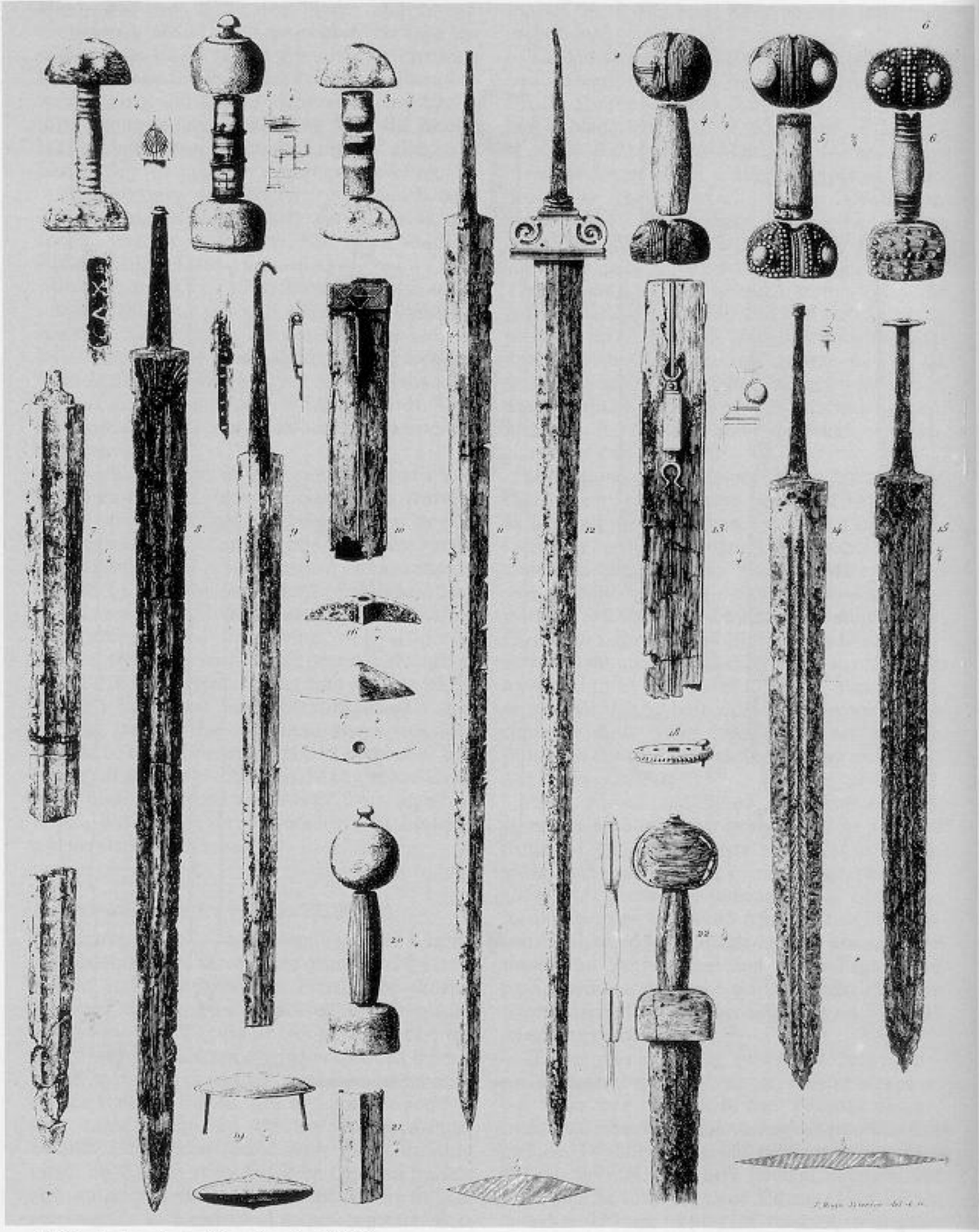
Some third-century sword blades found within the Roman frontiers were decorated with inlaid figures, but more examples are known from Free Germany because of funerary deposition. Military standard, eagle, Mars, Victory, Minerva and wreath motifs were inlaid on the blade close to the guard in *orichalcum* and other contrasting metals. Figures are always head downwards towards the sword-point and to be displayed the sword would have had to be held point upwards. Many third-century swords on both sides of the frontiers have channels down their blades and are pattern-welded in contrast with earlier Roman techniques (see below, Chapter 9).[15]

Plain, ribbed and fluted grips and elliptical pommels of bone have been found at German frontier forts. Guards were semi-oval or rectangular, and made of bone, iron or copper alloy. Complete wooden grip-assemblages of similar form have been recovered from Danish bog contexts and, in addition, eagle-headed pommels are shown on gravestones and sarcophagi. Most beaks pointed along the grip, whereas those on swords carried by Roman emperors on Sassanid reliefs are perpendicular.[16]

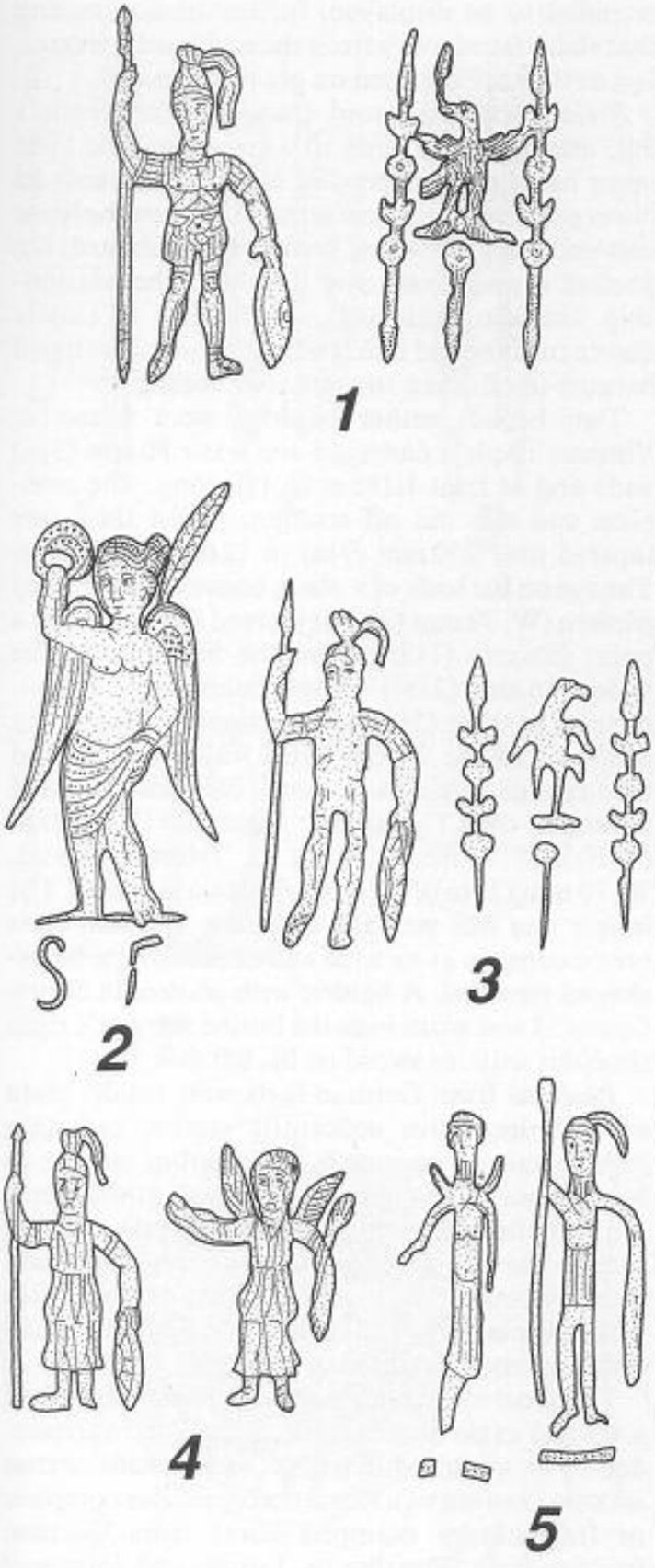
The emphasis on long swords above does not preclude the continued use of shorter weapons, but there was a break in the 'Pompeii *gladius*' tradition. The ironwork hoard from Künzing includes 14 short swords of different proportions (L. 231–389 mm (9–15 in)). Several have parallel edges and the total length of 530 mm (21 in) of one included 210 mm (8¼ in) of tang. A triangular blade (L. 400 mm (16 in); W. 56 mm (2 in)) tapered



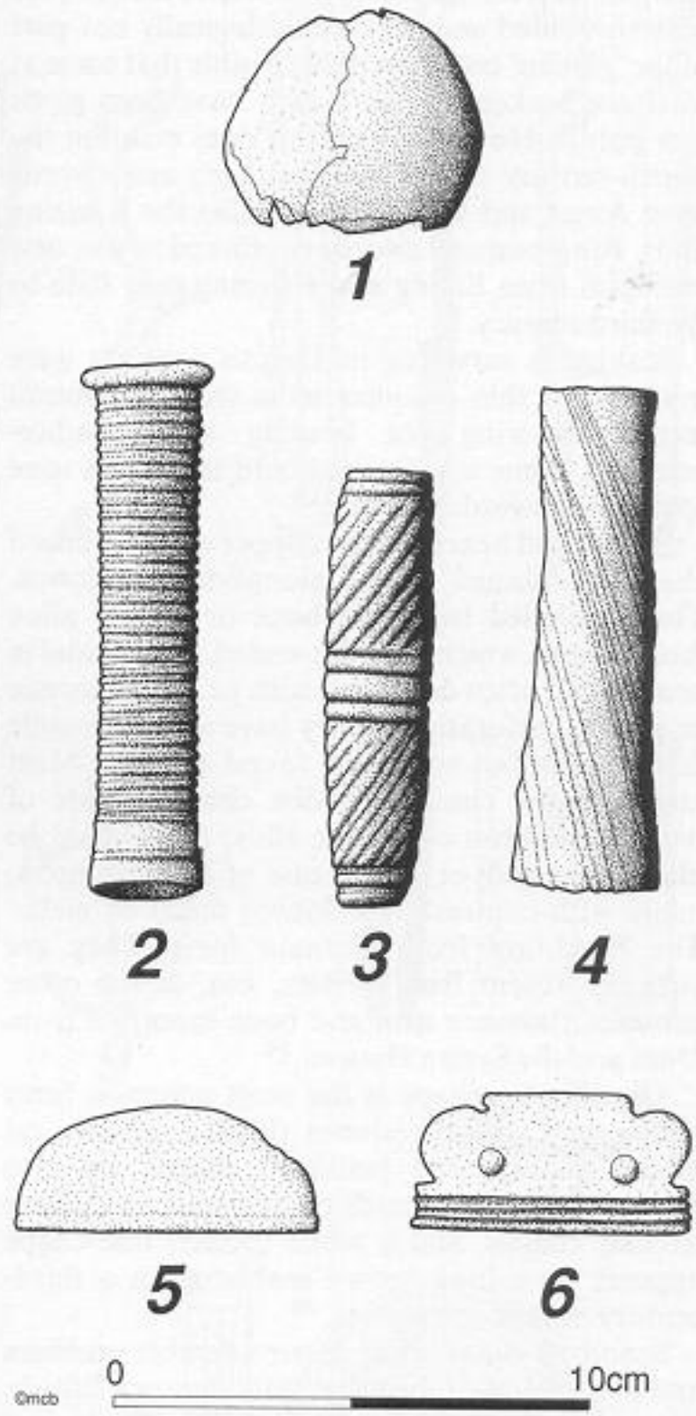
86 Third-century swords. *1, 6* Augst; *2* Lauriacum; *3, 5* Künzing; *4* Khisfine; *7* Straubing.



87 Swords from Nydam (from Engelhardt 1865).



88 Third-century inlaid sword figures. *1* South Shields; *2* Stabu (Norway); *3* Hromowka; *4* Lauriacum; *5* Podlodow (Poland).



89 Third-century sword-grip assemblages. *1* Pommel (Zugmantel); *2–4* handgrips (*2* Cannstatt; *3* Buch; *4* Zugmantel); *5–6* handguards (*5* Butzbach; *6* Niederbieber).

down its entire length to a point. These blades were pattern-welded and thus technologically not part of the '*gladius*' tradition. It is possible that some at least are broken *spathae* which have been given new points. However, Vegetius does mention the fourth-century use of '*semispathae*', and swords from Augst and Wehringen parallel the Künzing finds. Ring-pommel swords continued in use, and examples from Eining and Künzing may date to the third century.[17]

Scabbards surviving in Danish contexts were made from thin wooden laths with an overall leather covering for binding and weather-proofing. Some wooden scabbard fragments were found with swords at Dura.[18]

Peltate and heart-shaped copper alloy scabbard chapes continued in use alongside new forms. These included two-piece bone or copper alloy 'box' chapes, which were flat-ended, trapezoidal in profile, and often decorated with paired crescentic or peltate perforations. They have a Europe-wide distribution, but none were found at Dura. Most attractive are circular or disc chapes, made of ivory, bone, iron or copper alloy; these could be plain, engraved, or, in the case of iron examples, inlaid with contrasting coloured metal or niello. The finest are from German forts. They are virtually absent from Britain, but, at the other extreme, there are iron and bone examples from Dura and the Syrian Hauran.[19]

The circular chape is the most common form represented on gravestones (it also appears on model swords), but peltiform chapes are also shown. Roman scabbards on Sassanid reliefs have circular chapes, and a white (bone?) disc-chape appears on a long brown scabbard on a third-century mosaic at Palmyra.[20]

Scabbard-slides occur in considerable numbers and in a variety of forms on third-century British, Rhenish and Danubian sites, and in Dacia and Syria. Some iron examples were decorated with niello inlay. Copper alloy pieces generally have some cast ribbing and bevelling, and many had foliate, ring, pelta, crescent or heart-shaped terminals. The most elaborate were cast in the shape of a dolphin. Bone slides were either flat and waisted, or had an upstanding lobate profile which is reproduced on bone model scabbards.[21]

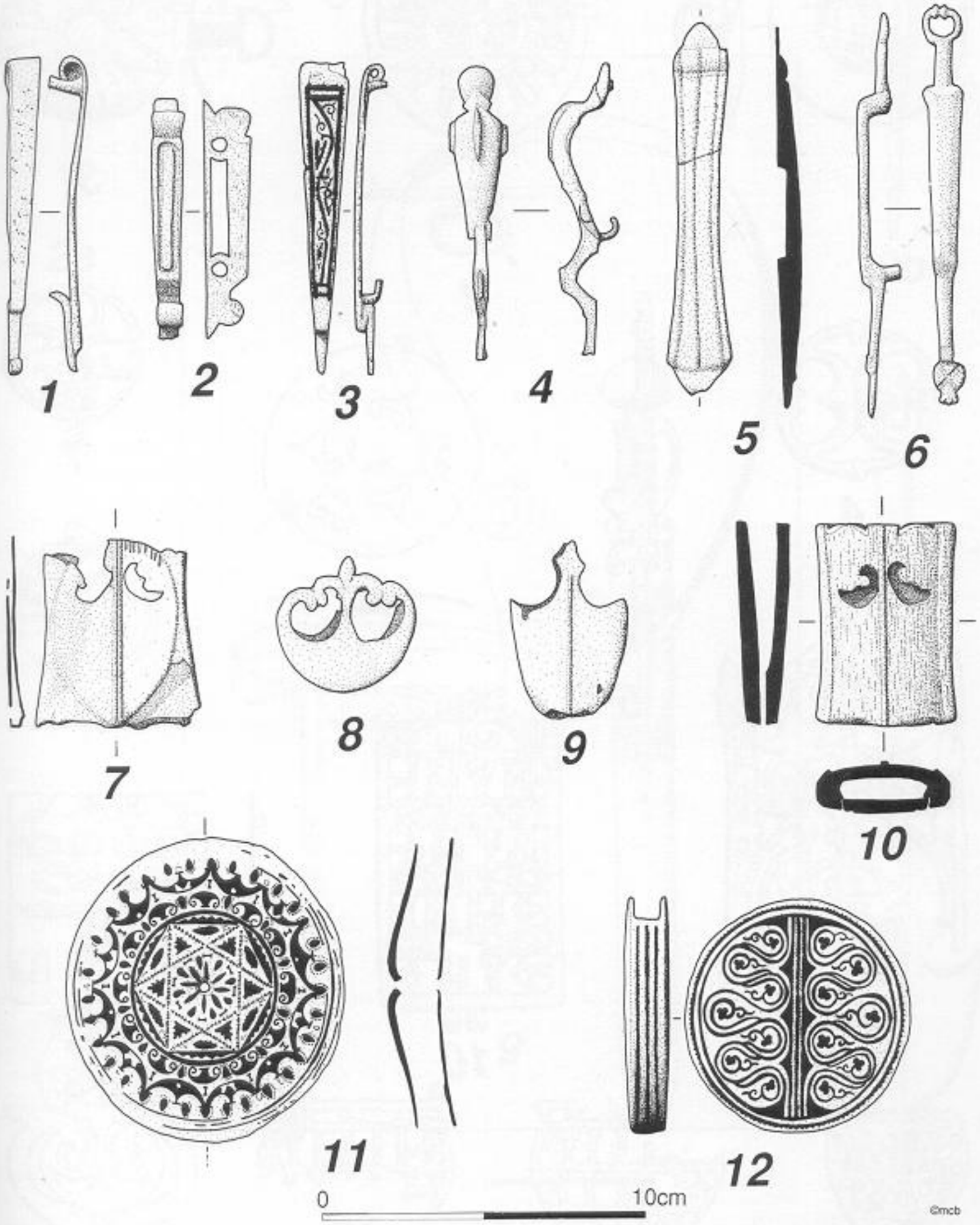
The Khisfine sword has all the elements of blade and scabbard surviving together on one weapon. Grip-assemblage, disc-chape, slide and scabbard body were all made of ivory. The chape was plain, but decorated with a central gold rivet on the same side as the slide. The rivet was presumably intended to be displayed, further demonstrating that slides faced away from the scabbard's wearer, just as they are depicted on gravestones.[22]

Stelae show the sword always on the wearer's left, attached by a slide to a broad baldric. The latter has a circular *phalera* mounted towards its lower end and an ivy-leaf terminal. When the loose belt-end hangs down or crosses the scabbard, the phalera is positioned over the slide. The relationship between scabbard and baldric is clearly shown on Sassanid reliefs where swords are angled because the Roman wearers are kneeling.[23]

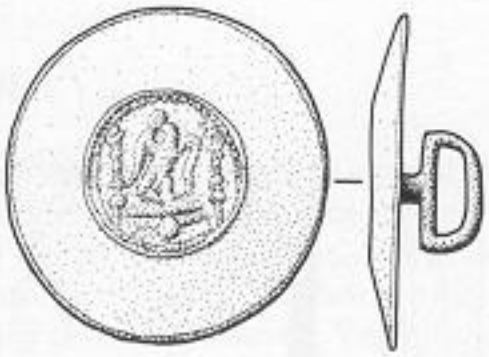
Two broad leather baldrics were found at Vimose. The less damaged one was *c*.80 mm (3 in) wide and at least 1.185 m (*c*.4 ft) long. The complete end was cut off straight, whilst the other tapered over 250 mm (9 in) to 12 mm ($\frac{1}{2}$ in) wide. The eye on the back of a plain, convex copper alloy *phalera* (W. 70 mm ($2\frac{3}{4}$ in)) pierced the baldric at a point 286 mm (11 in) from the broad end. The wider (86 mm (3 in)) second baldric was incomplete at 1.005 m ($3\frac{1}{4}$ ft). Its surviving copper alloy *phalera* had the 20 mm ($\frac{3}{4}$ in) wide belt-end tied through its eye. Two more baldrics occurred amongst the Thorsbjerg material (L. 1.055 m ($3\frac{1}{4}$ ft), W. 91 mm ($3\frac{1}{2}$ in); L. 710 mm (28 in), W. 70 mm ($2\frac{3}{4}$ in)), each bearing two *phalerae*. The longer one was virtually complete and had crescentic cuttings at its wide end delineating a heart-shaped terminal. A baldric with *phalera* in Simris Grave 54 was worn over the buried warrior's right shoulder with his sword on his left side.[24]

Phalerae from German forts were totally plain or had decorative concentric circles, radiating relief petals or geometric perforations similar to box-chapes. The characteristic rear attachment-eye identifies other, more elaborate *phalera* forms, such as the fine series of openwork *phalerae* from Dura-Europos and some North African sites which displayed swastika or Celtic designs, or had radiating spokes, peltae or hearts.[25]

The most elaborate openwork *phalera* type had a central eagle clutching thunder-bolts, surrounded by an annular inscription which reads OPTIME MAXIME CON(SERVA). Remarkably similar complete or fragmentary examples come from German frontier forts, Strasbourg, Lorch, and forts and towns in Britain. A particularly fine and complete *phalera* was recently found at Carlisle (Dia.66.5 mm ($2\frac{1}{2}$ in)) and Thamusida has produced a North African example. The eagle with its allusion to Jupiter was a popular motif commonly applied to body armour, helmets, greaves, shields, chamfrons, medallions and sword-pommels.[26]



90 Third-century scabbard-fittings. *1* Iron (Stockstadt); *2* ivory (South Shields); *3* iron (Zugmantel); *4* copper alloy (South Shields); *5* bone (Niederbieber); *6–7* copper alloy (Corbridge); *8–9* copper alloy (Caerleon); *10* bone (Colchester); *11* silver (Kaiseraugst); *12* iron (Niederbieber).



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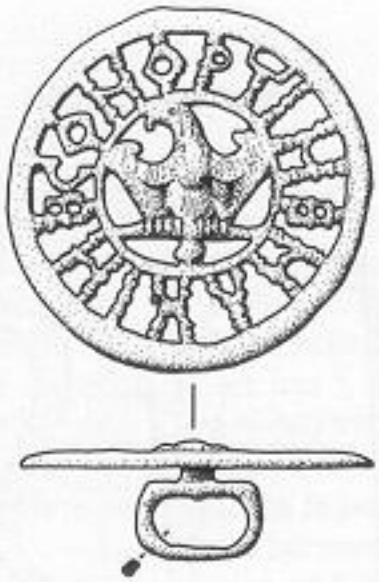

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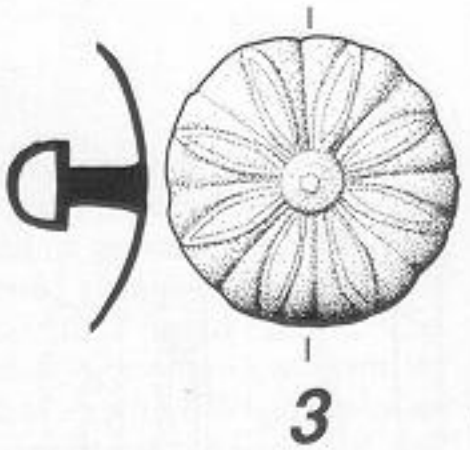

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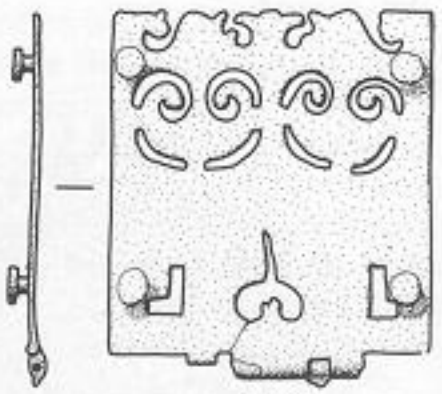

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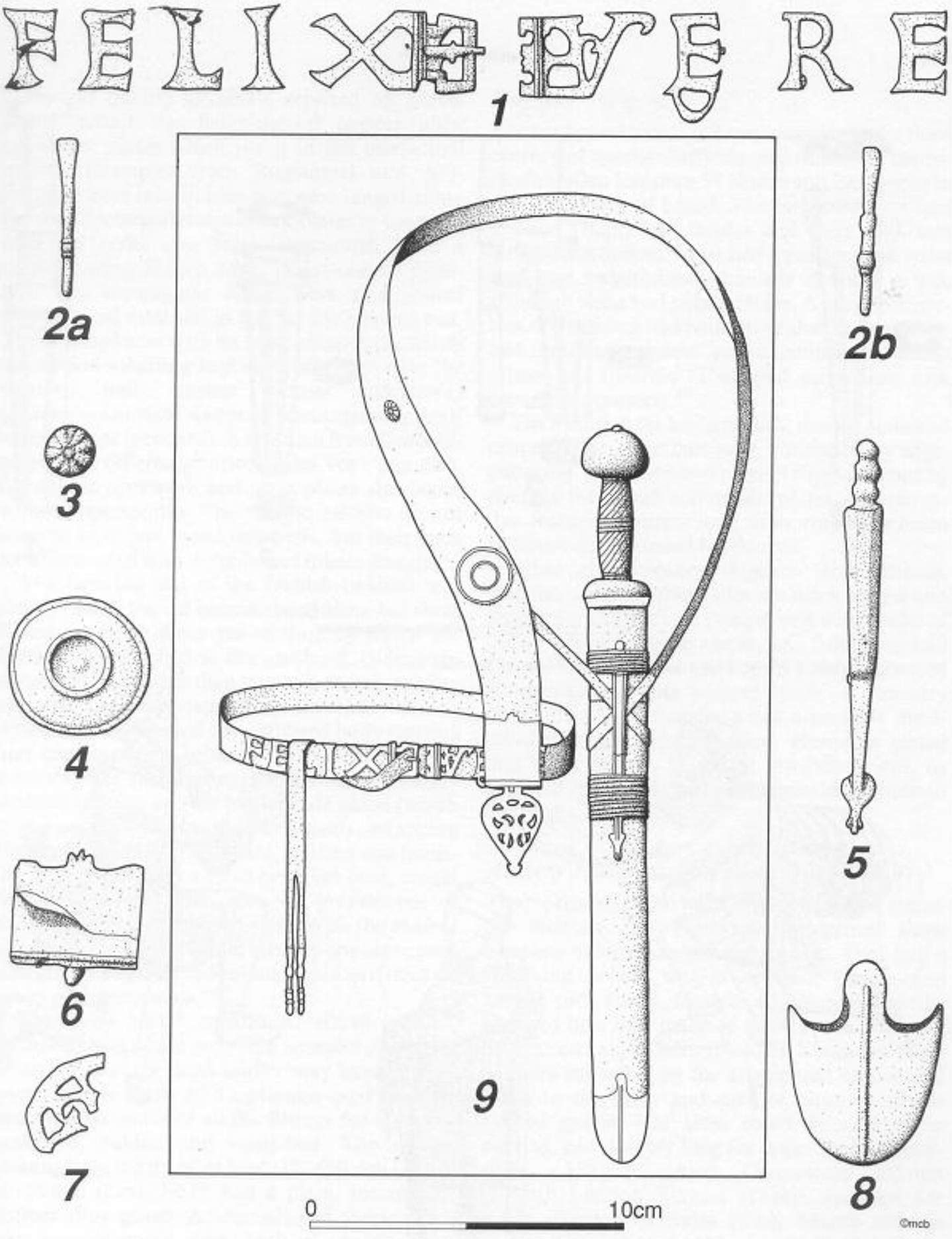
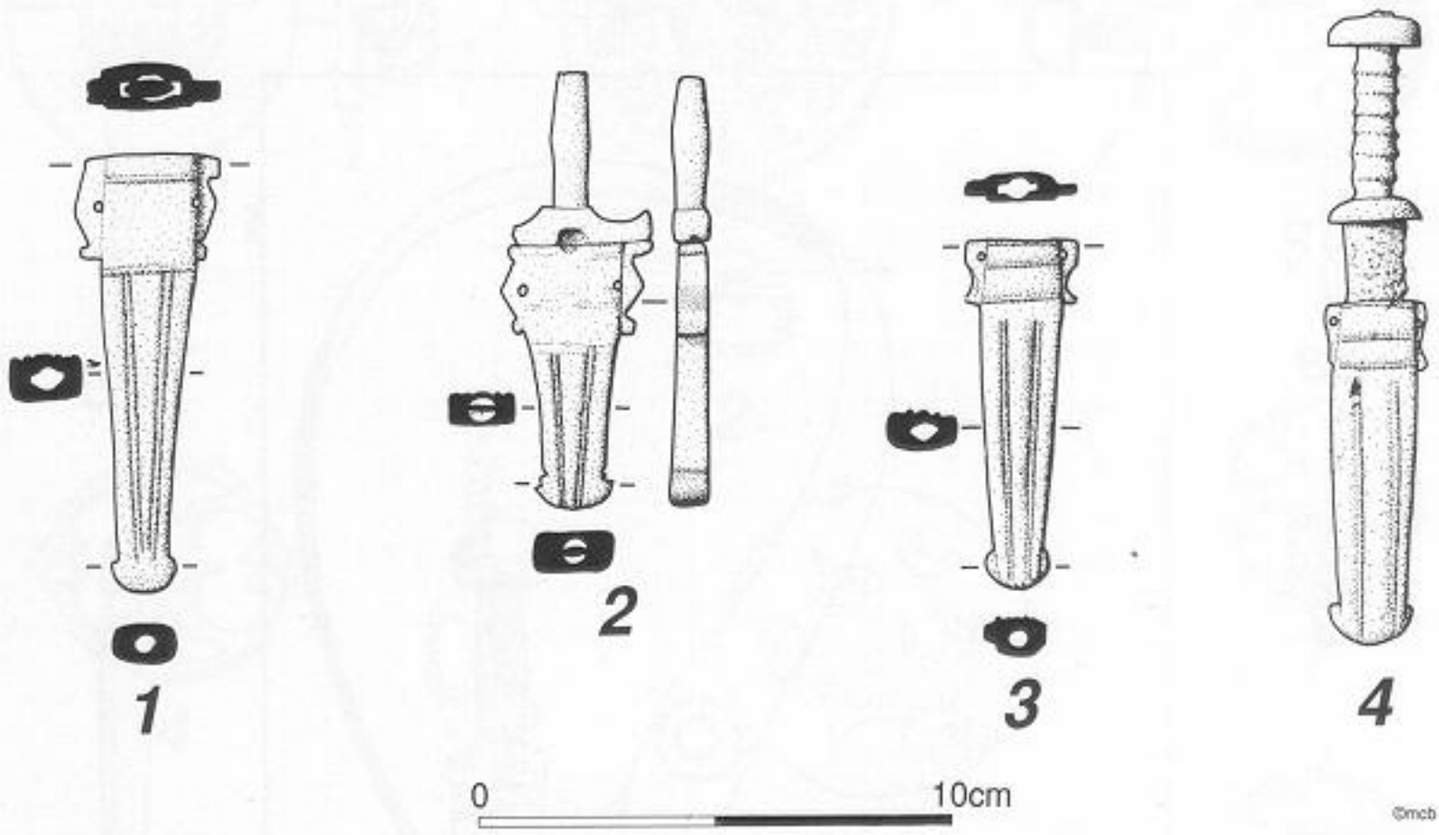
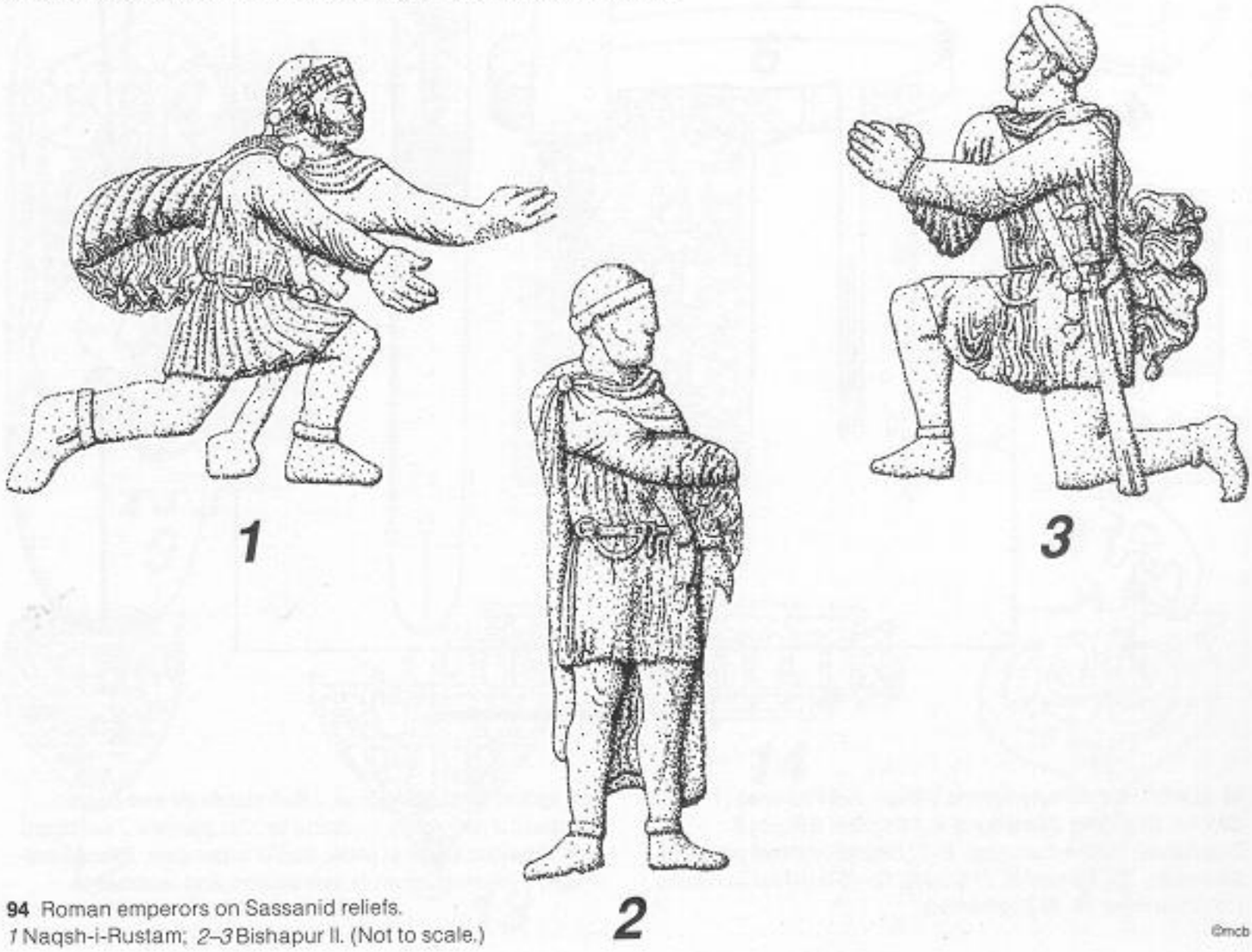


91 (*Left*) Third-century baldric fittings. *1–8 Phalerae* (*1* Vimose; *2* Carlisle; *3* Saalburg; *4, 7* Banasa; *5* Buch; *6* Zugmantel; *8* Dura-Europos); *9–11* hinged terminal plates (*9* Silchester; *10* Zugmantel; *11* Scole); *12–15* terminal pendants (*12* Corbridge; *13–15* Zugmantel).

92 (*Above*) The Lyon burial. *1* Belt-plates; *2a* and *b* strap-terminals; *3* decorative rosette; *4* baldric *phalera*; *5* scabbard-slide; *6* baldric terminal plate; *7* baldric pendant; *8* scabbard-chape; *9* reconstruction of belt, baldric, and scabbard.



93 Sword models. *1, 3* Trier; *2* Millau, France; *4* Saint-Marcel, France.



94 Roman emperors on Sassanid reliefs.
1 Naqsh-i-Rustam; *2–3* Bishapur II. (Not to scale.)

Ivy-leaf baldric terminals depicted on gravestones reflect the heart-shaped copper alloy openwork plates which occur in the artefactual record. Examples from Zugmantel and Aldborough bore inscriptions and were hinged along the top. Rectangular openwork plates in the same inscribed style, also from Zugmantel, have a corresponding hinged edge. Heart-shaped pendants and rectangular plates were thus joined together and attached to the baldric's broad end. They formed a set with an eagle *phalera*, the whole inscription soliciting Jupiter's protection over the wearer's unit: OPTIME MAXIME CON(SERVA) (*phalera*)/NUMERUM OMNIUM (rectangular plate)/ MILITANTIUM (pendant). A terminal from Corbridge had the different motto: OMNIA VOS ('you all'). Geometric openwork and plain plates also occur without inscriptions. The Vimose baldrics do not seem to have had metal terminals, but their ends were decorated with dolphin and foliate designs.[27]

The tapering end of the Danish baldrics was clearly tied to the eye behind the *phalera*, but there is less certainty about the method by which the baldric was attached to the scabbard. Oldenstein suggested that rather than the strap merely passing through the slot opening of the slide, it was wrapped twice around the scabbard body starting and finishing from behind. This would have the advantage of distributing the scabbard's weight without it being carried by the slide alone (which might detach or break). Alternatively, wrapping the strap around the scabbard, starting and finishing at the front with a short piece left over, would best achieve the effect seen on gravestones of *phalera* overlying scabbard-slide. With the *phalera* to one side, the strap would visually appear to pass straight through the slide alone, again as it does on many representations.[28]

The Lyon burial, mentioned above (p. 126), included coins which provide a *terminus post quem* of AD194, and the dead soldier may have participated in the battle of Lugdunum (AD197). The grave goods included all the fittings for a sword, scabbard, baldric and waist-belt. The *spatha*, missing only the tip of its blade (L. 680 mm (27 in), W. 56 mm (2 in); 12:1), had a plain, rectangular copper alloy guard. A heart-shaped chape and a palmette-decorated slide, both of copper alloy, were all that remained of the scabbard. Presumably the sword-grip, pommel and scabbard body were wooden, the last covered with leather. The baldric had a copper alloy *phalera* with simple concentric circle decoration, and a plain rectangular plate hinged to a perforated terminal.[29]

Daggers (Fig. 95)

The continued use of military daggers in the third century is spectacularly demonstrated by the inclusion of no less than 51 blades and 29 sheaths in the Künzing iron hoard. The larger daggers had 280 mm (11 in) long blades and were *c.*400 mm (16 in) long overall. Most had a pronounced waist and two longitudinal channels defining a rib, although some had parallel sides. A small proportion of the group had pattern-welded blades. Some had entirely organic grip-assemblages, whilst others had inverted 'T'-shaped grip-plates with crescentic pommels.[30]

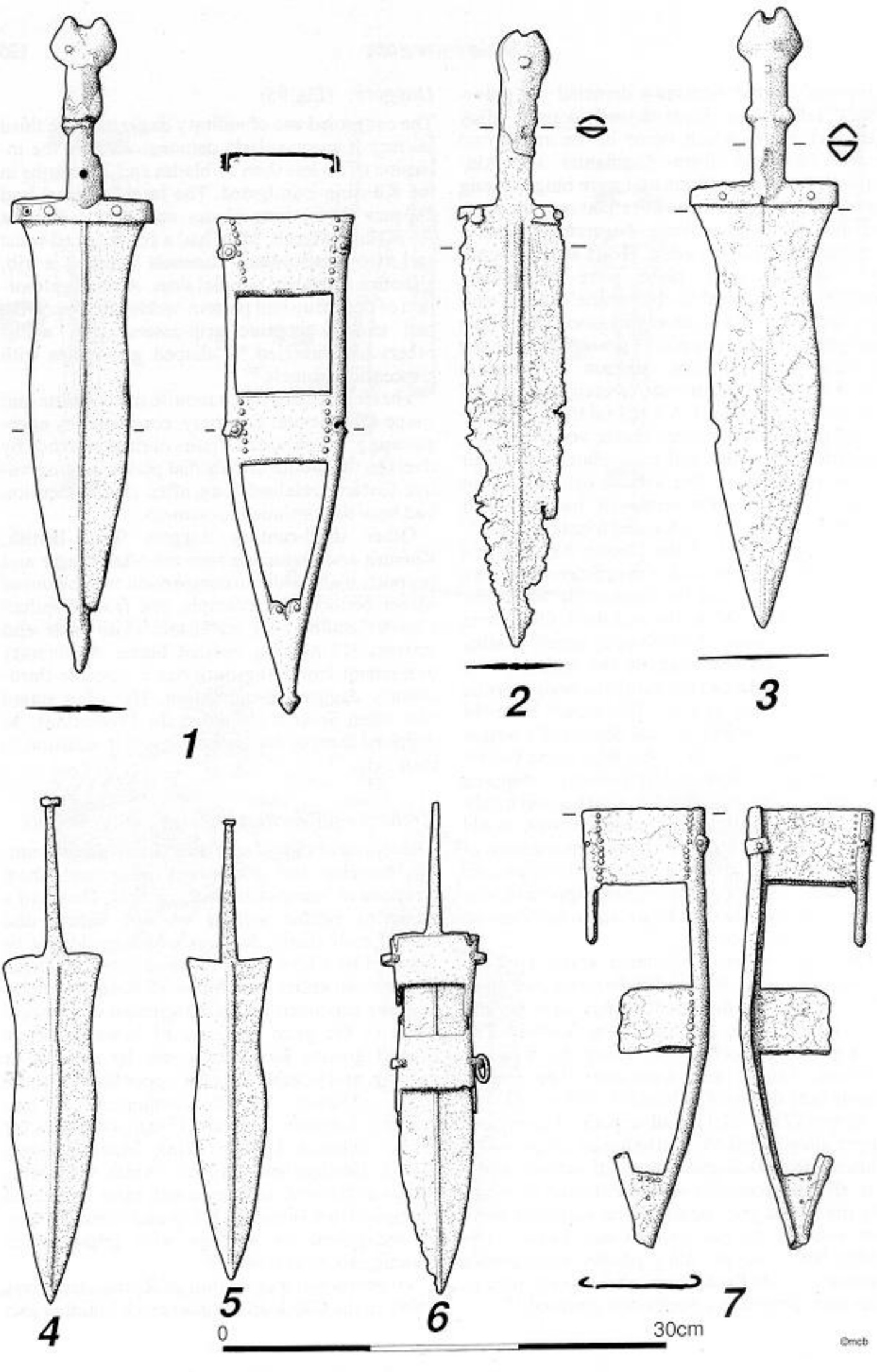
The iron sheaths had a mouth, medial plate and chape on the outer face only, connected by edge-guttering. Many had two pairs of rings attached by rivets to the mouth and medial plates, a conservative feature, retained long after ring-suspension had been discontinued for swords.

Other third-century daggers from British, Rhenish and Danubian sites are often longer and proportionally wider in comparison with blades of earlier periods. For example, one from Copthall Court, London, has an 80 mm (3 in) wide and 300 mm (12 in) long waisted blade. A funerary monument from Augsburg has a possible third-century dagger representation. Herodian stated that when Severus cashiered the Praetorians, he deprived them of decorated daggers in addition to their belts.[31]

Archery equipment and slings (Figs. 96–97)

The representational sources (particularly Levantine mosaics and Palmyrene sculpture) show weapons of 'composite' construction. They had a recurving profile with a set-back handle and angled ends (ears), features which could not be imitated by a bow made of wood alone. The uses of bone and antler laths found on Roman military sites are explained by the attachment of identical items to the grips and ears of bows in steppe nomad graves. Ear laths could be straight or curving, and notably long for upper limbs (Stockstadt *c.*350 mm (14 in); Carnuntum 345 mm (13½ in); London 325 mm (13 in)), or short for lower (Belmesa 155 mm (6 in); Mainz 140 mm (5½ in); Heddernheim 112 mm (4 in)). Grip-laths were waisted and are very much rarer finds, and examples from Intercisa, Micia and Tibiscum may be recognized by analogy with grip-laths in Hunnic and Avar graves.[32]

An outstanding collection of Roman laths was found in the Caerleon rampart-back building and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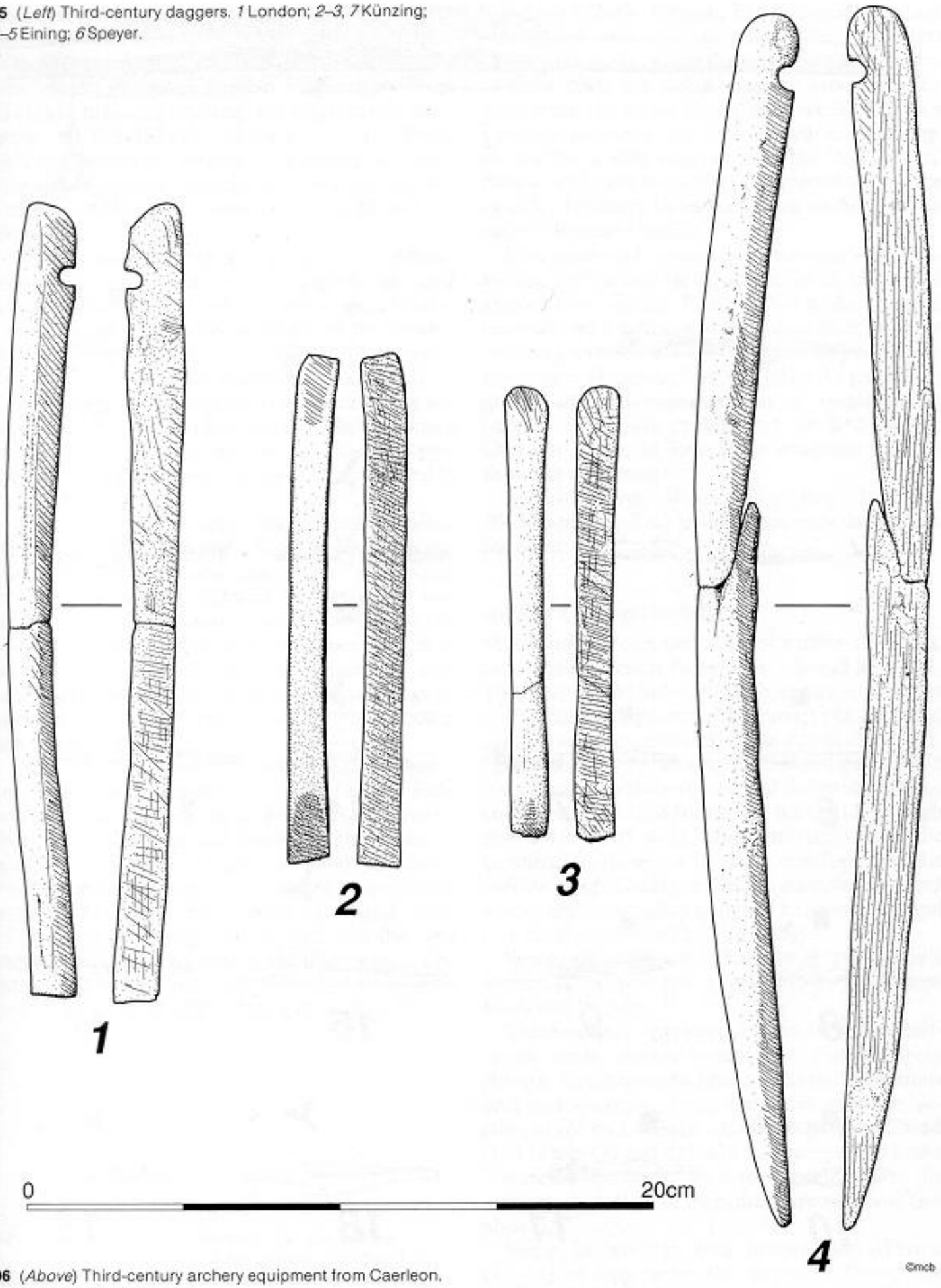
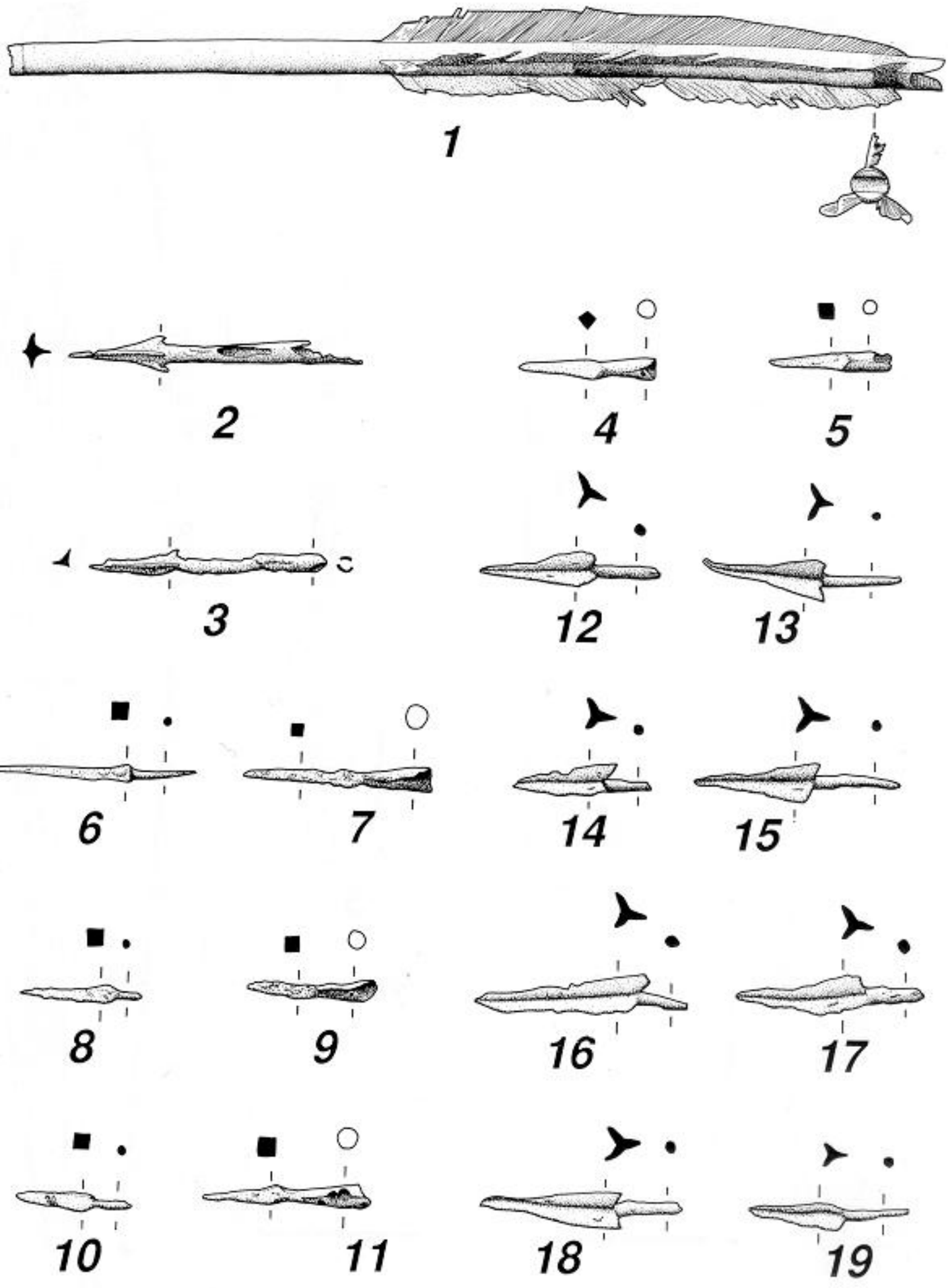
95 (*Left*) Third-century daggers. *1* London; *2–3, 7* Künzing; *4–5* Eining; *6* Speyer.



96 (*Above*) Third-century archery equipment from Caerleon. *1, 4* ear-laths; *2–3* grip-laths.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included 37 fragmentary rounded or flat-ended ear-laths with nocks. The only unbroken lath is 300 mm (12 in) long, but another in two pieces is the longest recorded Roman example (370 mm (14½ in)). Six complete and two fragmentary grip-laths (L. 124–165 mm (5–6½ in), W. 12–18 mm (½–¾ in)) were also present. Unfinished or failed fragments indicate manufacture in progress, the laths probably not having been attached to bows.[33]

Roman bows were thus of composite construction, with a set-back handle, angled ears and asymmetrical limbs. Each ear had a pair of laths, and some bows had one grip-lath on the handle. The variety of lath shapes and lengths suggests a range of bow designs in contemporaneous use.

Hunting cross-bows with composite staves are depicted on two third-century(?) Gallo-Roman reliefs. Accompanying quivers are long and perhaps carried arrows, not the short quarrels used in the Middle Ages.[34]

Arrowheads are common finds on military sites. The tanged, trilobate type continued through the third century, and a new related type, also triple- or quadruple-vaned, but with a long socket, was found at Caerleon and Corbridge. Tanged or socketed bodkin heads with triangular or square sections appear frequently in Germany, and triangular or 'leaf'-bladed flat heads with tangs or sockets, an easier form to manufacture, occur across the Empire.[35]

Arrow shafts (stele) and fletchings rarely survive, although sometimes sockets retain a little wood. Posterior sections of reed or cane arrows from Dura-Europos had fletchings glued onto a roughened surface to give a good purchase. Painted markings served to identify ownership and/or matching sets. Tamarisk wood piles (170 mm (6½ in) long) were tanged into the reed stele and tapered to take a socketed head. The latter was glued on, not pinned. These piles reduced the risk of stele splitting on impact.[36]

97 Third-century arrows. *1* Stele with fletchings (Dura-Europos); *2–3* socketed vaned arrowheads (Corbridge); *4–11* bodkin-head arrowheads (Saalburg); *12–19* trilobate tanged arrowheads (Saalburg).

All the reliable Roman, Parthian and Sassanid representational sources show the 'Mediterranean' release by which the archer used his fingers to draw back the string. Bracers protecting the wrist from the bow-string are shown on Trajan's Column. However, the arrangement of fletchings on the Dura stele suggests that the 'Mongolian' release, using the thumb, was employed during the mid-third century by at least some archers on the eastern Roman frontier.[37]

Bow-cases and quivers were necessary for protecting the vulnerable constituents of bows and arrows from damp. Roman foot-archers would have carried a cylindrical quiver on their back, as seen on gravestones. Nothing is known about their bow-cases. Horse-archers shared in the prevailing quiver and bow-case fashions of neighbouring peoples which are represented on first-century Crimean *stelae*, in Palmyrene sculpture and on Sassanid rock reliefs.[38]

Spherical stone sling-missiles from Buciumi, 30–50 mm (1/10–2 in) in diameter, may date to the third century.[39]

Artillery (Figs. 98–99)

Metal fittings from the frame of a stone-throwing, twin-armed torsion *ballista* were found at Hatra. The weapon had fallen off the back of a tower near the north gate, presumably during the Sassanid capture and depopulation of the city in *c.*AD240/1. It consisted of copper alloy corner fittings, torsion washers and counter-plates, and nailed sheeting to cover the front. The frame was 0.84 m (2¾ ft) high and 2.4 m (8 ft) wide, and similarities with the technical treatises led Baatz to conclude that the *ballista* was probably of Roman manufacture, and was of medium calibre designed to shoot stones of *c.*10 Roman pounds (3.27 kg (7 lb)).[40]

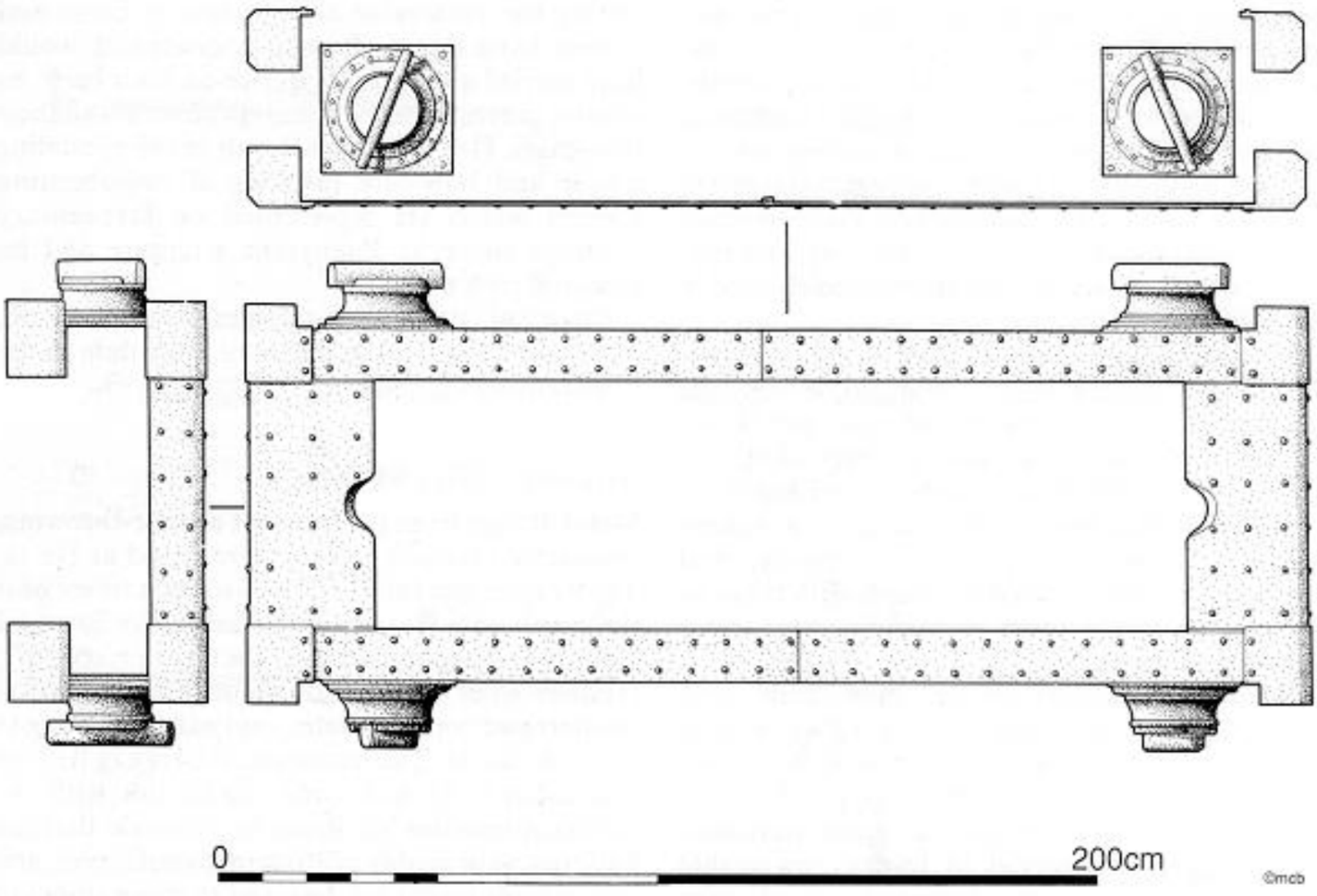
Stones either for use by hand or by artillery in a variety of calibres are represented by finds from Dura and Buciumi.[41]

Third-century pyramidal iron *ballista* bolt-heads occur widely across the Empire from Britain, Germany and Dacia to Syria. Numerous socketed examples from Dura-Europos are accompanied by a unique iron incendiary bolt-head (L. 113 mm (4½ in)). It had a flat, twin-edged blade connected to a socket by three curving bars in the artillery equivalent of incendiary arrow-heads (see above).[42]

Some 30 wooden bolt bodies, 340–375 mm (13–14¾ in) long, were also found at Dura. The majority were made of ash (with some birch and

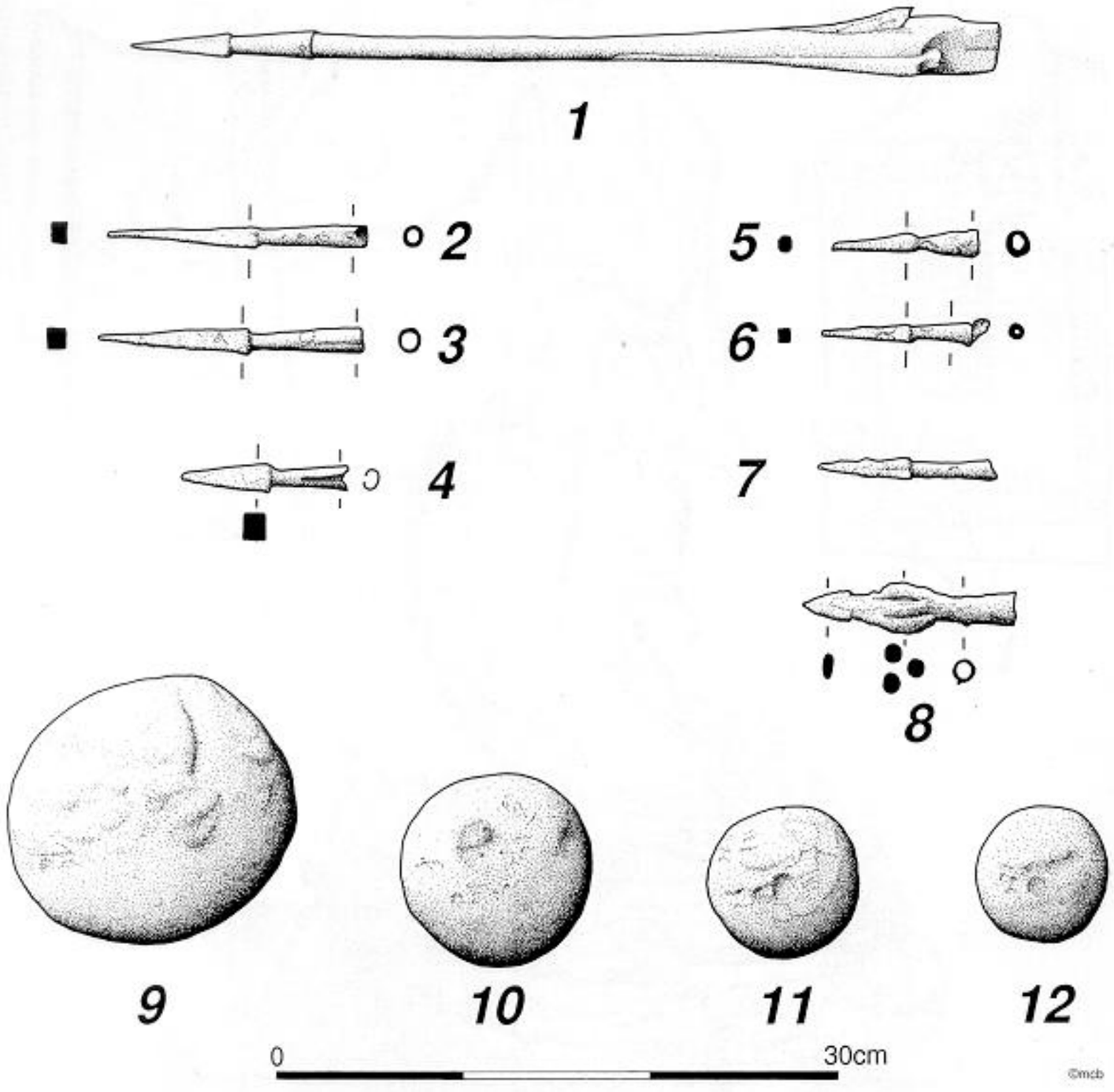
pine), tapered towards the head, and had a vertical tail for projection by the *ballista* sling. Two or three triangular flights of maple wood, 50 mm (20 in) long, were fixed in slots or mortice joints at or near the tail.[43]

A third-century gravestone from Apamea uses the term '*scorpio*' of an artilleryman in *legio II Parthica*. Use of artillery by third-century auxiliaries has been postulated on the basis of two inscriptions from High Rochester which mention *ballistaria*, but the catapults could have been operated by legionary personnel. Rounded stones found at the fort are too heavy (*c.*50 kg (110 lb)) in this context to be artillery missiles.[44]



98 (*Above*) Third-century artillery fittings from a *ballista* frame (Hatra).

99 (*Right*) Third-century artillery missiles. *1* Bolt-head with attached shaft (Dura-Europos); *2–7* bolt-heads (*2–3, 5–6* Künzing; *4* Vindolanda; *7* Caerleon); *8* incendiary bolt-head (Dura); *9–12* stone shot (Dura).



Armour

Body armour (Figs. 100–102)

There is plentiful artefactual evidence for third-century metallic body armour. Site abandonment sometimes entailed the deposition of partial or whole *loricae*, as perhaps at Grosskrotzenburg (copper alloy mail), Künzing (iron mail) and Straubing (copper alloy scale). A section of scale with its surviving textile backing was found in a pit at the Carpow legionary base, probably deposited during Severan demolition. Copper alloy scales (L. 15 mm ($\frac{3}{5}$ in), W. 13 mm ($\frac{1}{2}$ in)) were attached to each other in strips with wire, then sewn to a linen backing with linen cords. Third-century Caerleon equipment included a mail shirt, whilst at Buch pieces of iron mail were found in the fort, and a *lorica hamata* accompanied a helmet in Well 9. Iron mail with decorative copper alloy rings occurred amongst Roman equipment at Vimose, including a complete knee- and elbow-length *lorica hamata*.[45]

Scattered finds of scales and mail rings were made throughout the excavations at Dura-Europos, in addition to complete mail and scale shirts. The 16–18 Roman soldiers entombed by the collapse of a mine at Tower 19 fought in mail

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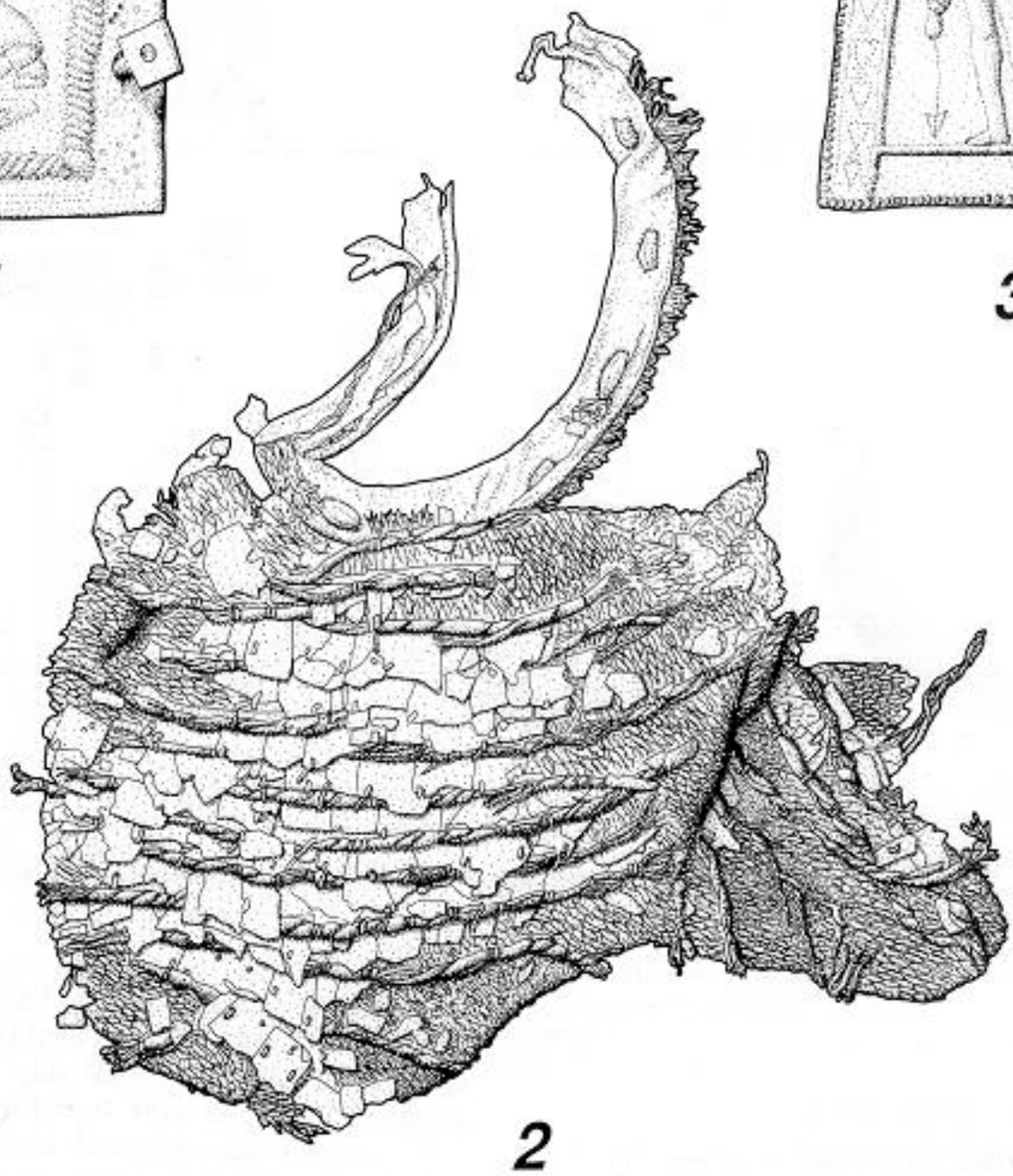

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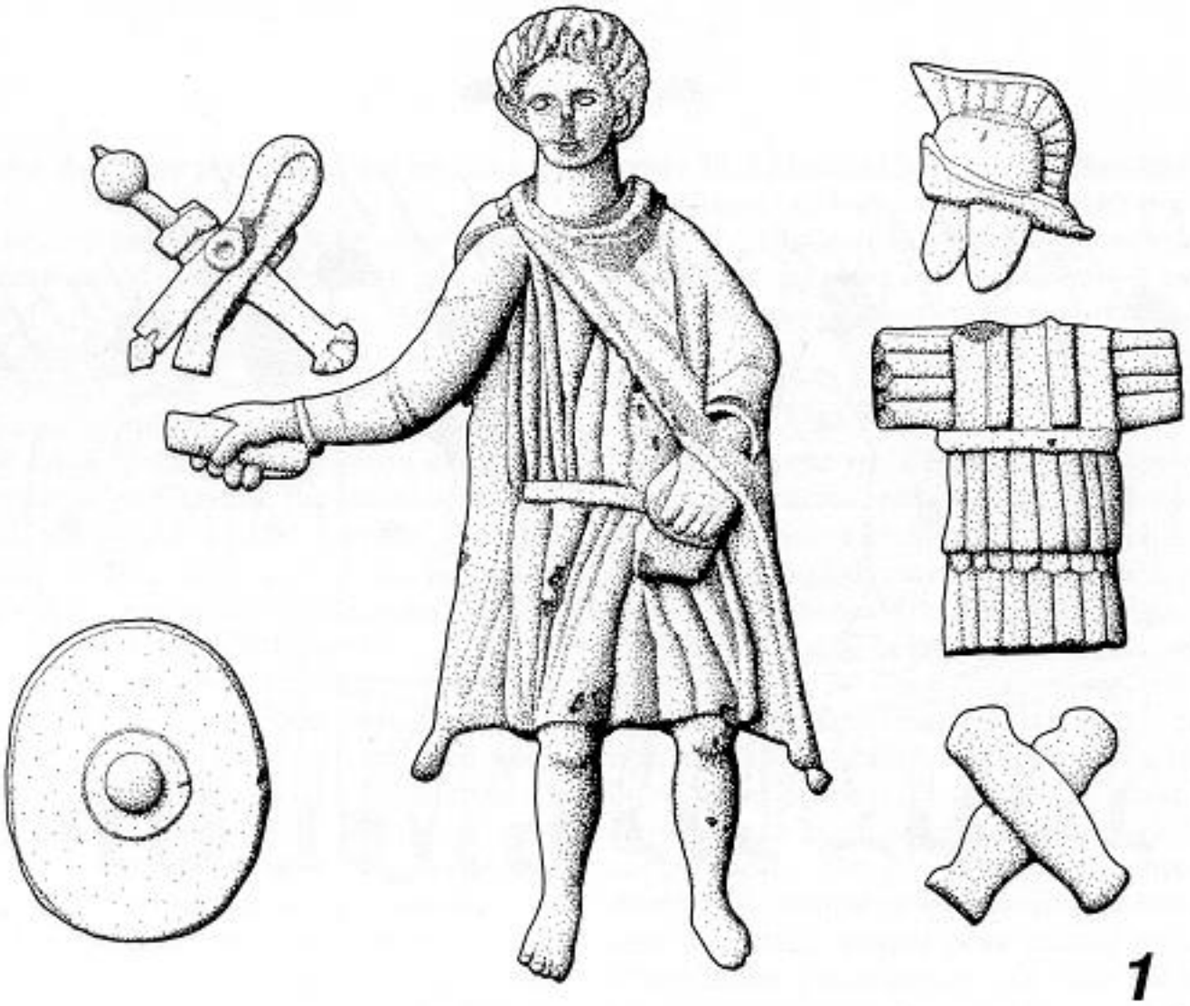
100 (*Above*) Third-century armour. *1, 3* breastplates (*1* Manching; *3* Bertoldsheim); *2* scales with textile backing and leather binding (Carpow).

101 (*Right*) Third-century tombstones. *1* Severius Acceptus (Istanbul); *2* Iulius Aufidius (Veria). (Not to scale.)



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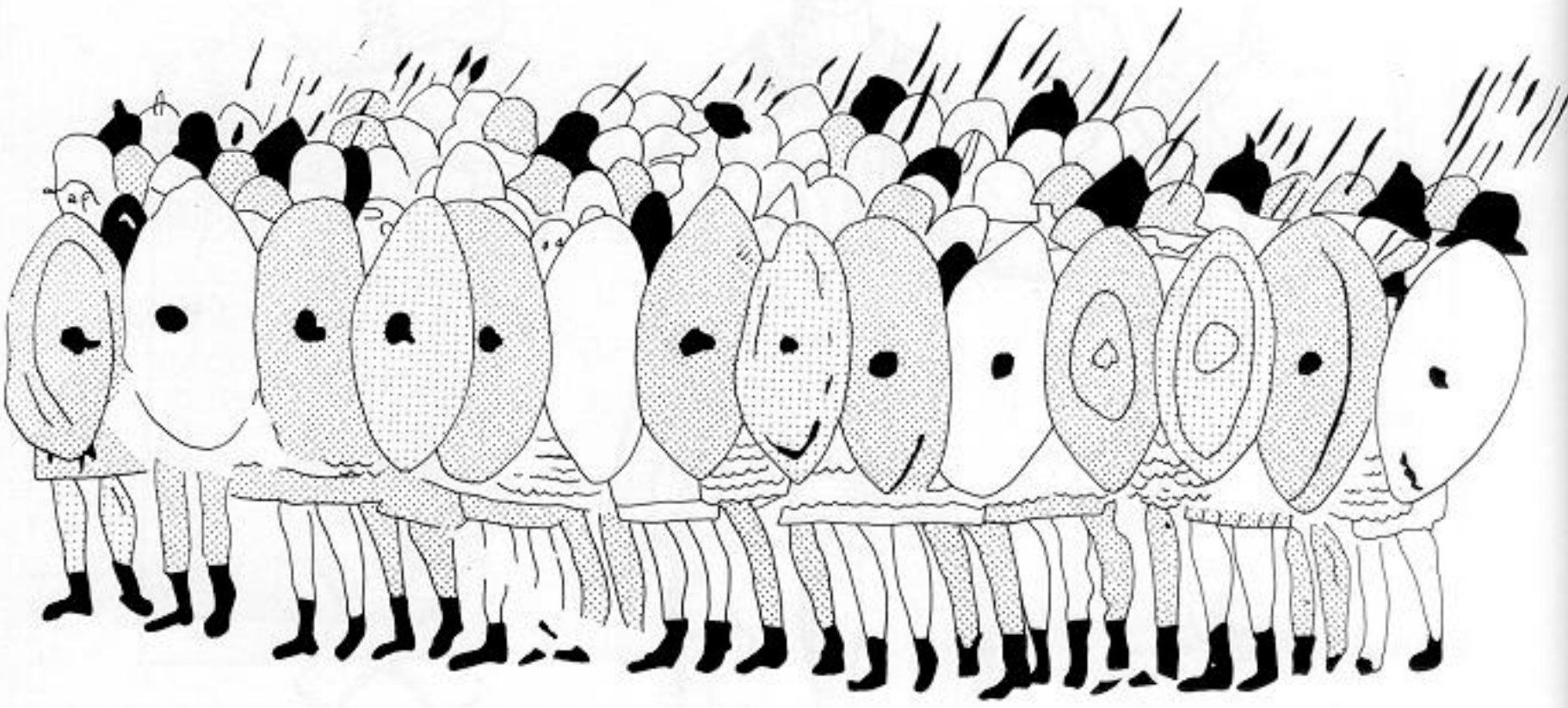

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102 Dura Synagogue soldier paintings. *1* Exodus fresco; *2* Battle of Ebenezer fresco.

armour, and they were probably from an infantry unit.[46]

Third-century embossed copper alloy armour plates come from Manching, Künzing and Pfünz, and a rolled-up *lorica hamata* from Bertoldsheim also has a chest-piece attached. Like some Dura, Danish and other armours, this mail is decorated with copper alloy rings. The chest-pieces differ in decorative detail from second-century examples. As Petculescu demonstrated, the plates were used in the field, not specifically for 'parade', by both infantry and cavalry. Significantly, the hoards of cavalry sports equipment from Eining and Straubing do not include *lorica* chest-pieces.[47]

There is little reliable third-century representational evidence for armour, because infantry and cavalry *stelae* generally show the deceased unarmoured. One exception is the gravestone of Severius Acceptus (*legio VIII Augusta*), from Istanbul, which shows a cuirass with *pteruges* and an unusual body of vertical strips. Another is a sculpture without inscription from Brigetio which shows a legionary(?) wearing a long *lorica*. Around his neck and over the armour he wears a collar which may represent a metallic gorget.[48]

The Dura Synagogue frescoes pay close attention to contemporary dress and include some realistic details of Roman equipment. Ranks of soldiers in the 'Exodus' panel marching below Roman *vexilla* wear knee-length *loricae*, although the convention used makes it unclear whether mail or scale was intended. Armoured warriors in the 'Battle of Ebenezer' panel wear knee-length metallic cuirasses with wrist-length sleeves.[49]

Until recently it was thought that the '*lorica segmentata*' did not survive the early third century, because the latest representations are on monuments of Septimius Severus. However, armour of the Newstead design has been recovered at Eining from a temple constructed in *c.*AD226/229 and abandoned *c.*260. It is thus possible that some at least of the '*lorica segmentata*' finds from other Upper German and Raetian sites date to the third century.[50]

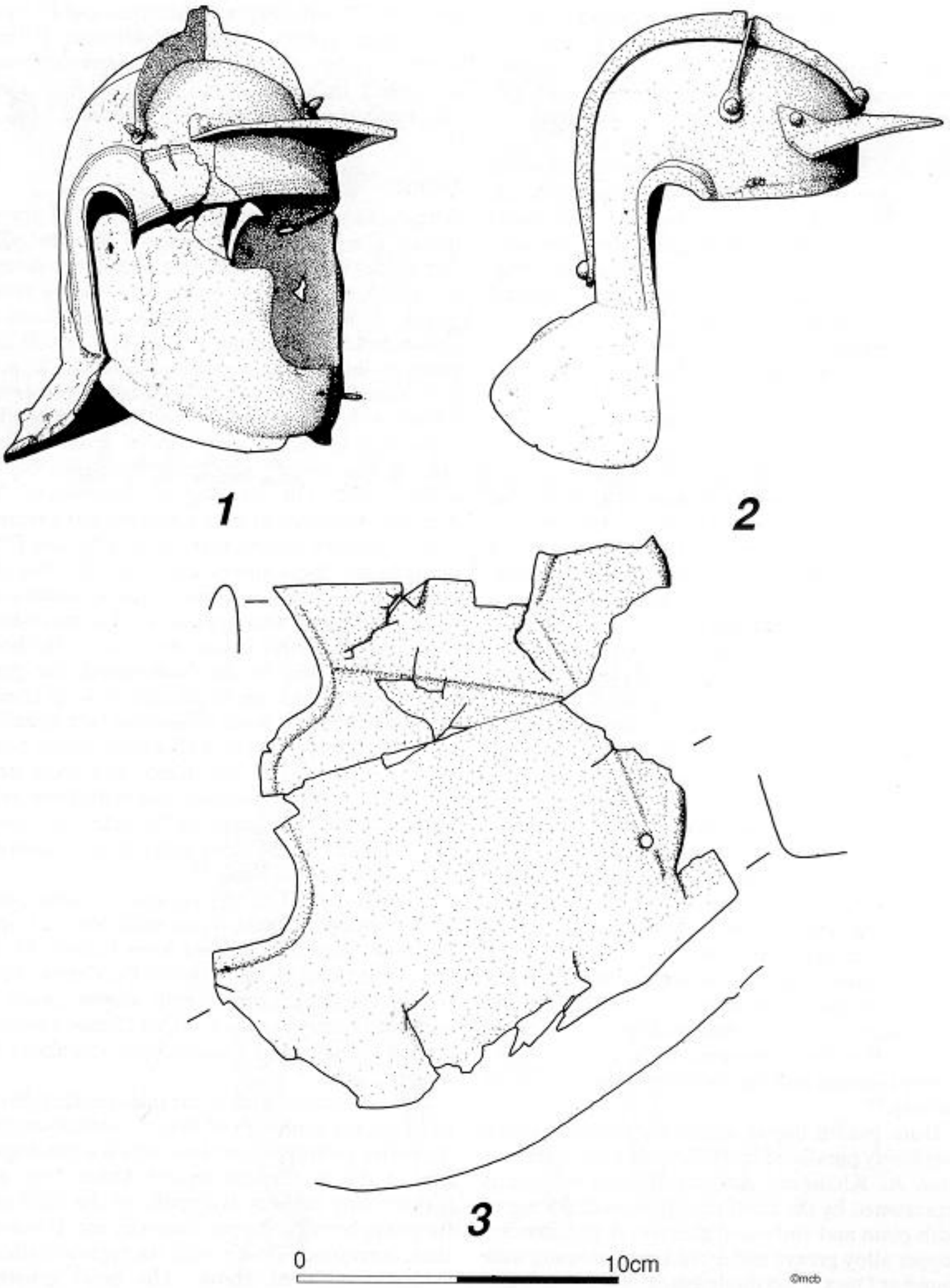
Dura graffiti depict segmental defences which are closely paralleled by Hellenistic period armour from Ai Khanoun. Additional limb defence is represented by the continued third-century use of both plain and embossed greaves. A fragmentary copper alloy greave and a linen greave-lining were found at Dura. Two thigh-guards were also found in Tower 19, one had 14 rows of downward-overlapping leather scales with red leather lacing (L. 770 mm (30 in), upper W. 600 mm (24 in), lower W. 270 mm (10½ in)); the other had 12 rows (L. 610 mm (24 in), upper W. 480 mm (19 in), lower W. 210 mm (8 in)). All of these armour forms were used by cavalry, but infantry may have continued to wear arm and shin defences.[51]

Helmets (Figs. 103–105)

Helmets appear on a small proportion of gravestones. The armoured legionary(?) from Brigetio (see above) wears a helmet with wide cheek-pieces, a pointed, angled peak and a low, flaring neck-guard. A legionary(?) *imaginifer* from Enns is shown holding a helmet on his arm which appears to have a large cheek-piece. On a *stela* from Carnuntum a man holds a better preserved helmet with an upstanding crest and a triangular brow-plate or peak, and a relief from Vienna shows a man being handed a helmet which has an angled peak. On his Brigetio tombstone, M. Aurelius Avitianus of *legio I Adiutrix* has a helmet with a pointed, angled peak resting by one foot; between the cheek-pieces and over the nose the bowl-rim is pointed. Aurelius Surus, a *bucinator* of the same legion, also appears on his gravestone from Istanbul with a helmet by his foot. The bowl comes down low to the neck-guard, the peak projects upwards at an angle, and the large cheek-pieces leave only a small 'T'-shaped face-opening. Iulius Aufidius of *legio XVI Flavia Firma* has a helmet perched over his shield on a *stela* from Veria. The bowl comes down low at the back, with a wide-flaring neck-guard, and a wide cheek-piece covers the ear. Reinforcing strips on the crown are joined by a vertical knob.[52]

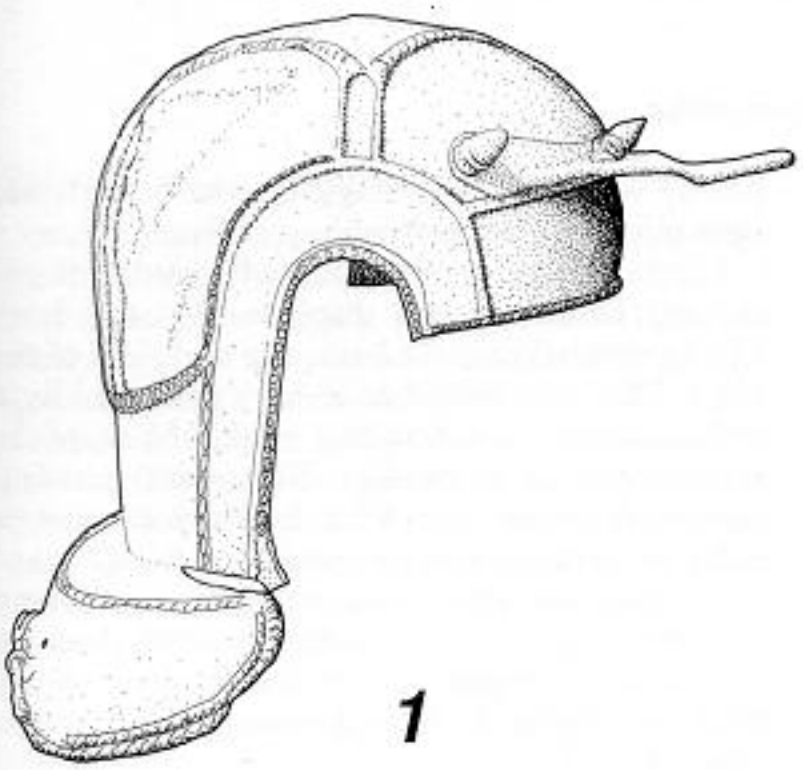
Soldiers in the Dura Synagogue 'Exodus' panel wear crestless helmets, some with ribs and apex knobs. A decorated *phalera* from France (Pl. 3b) which belonged to an Aurelius Cervianus shows soldiers wearing helmets with angled peaks. A sculpted cavalry *vexillarius* from Chesters wears a crested helmet with a pointed bowl-rim above the wearer's nose.[53]

Helmet finds datable to the third century do not continue the evolution of first- to second-century 'Imperial' infantry forms and there is a typological gap in the artefactual record. Other iron and copper alloy helmets assignable to the third century have been attributed to cavalry use. However, these correspond closely with the representational evidence reviewed above. The bowl generally extended down to the base of the neck, and had a low, angled neck-guard, a horizontal or upwardly-angled pointed peak, and crossed reinforcing bars.



103 (*Above*) Third-century infantry(?) helmets. *1* Friedberg (Germany); *2* Kalkar-Hönnepel (Germany) (not to scale); *3* cheek-piece (Caerleon).

104 (*Right*) Third-century cavalry(?) helmets. *1* Bodengraven (Netherlands); *2* Chalon; *3* Vechten; *4* Heddernheim; *5* Straubing; *6* Eining. (Not to scale.)



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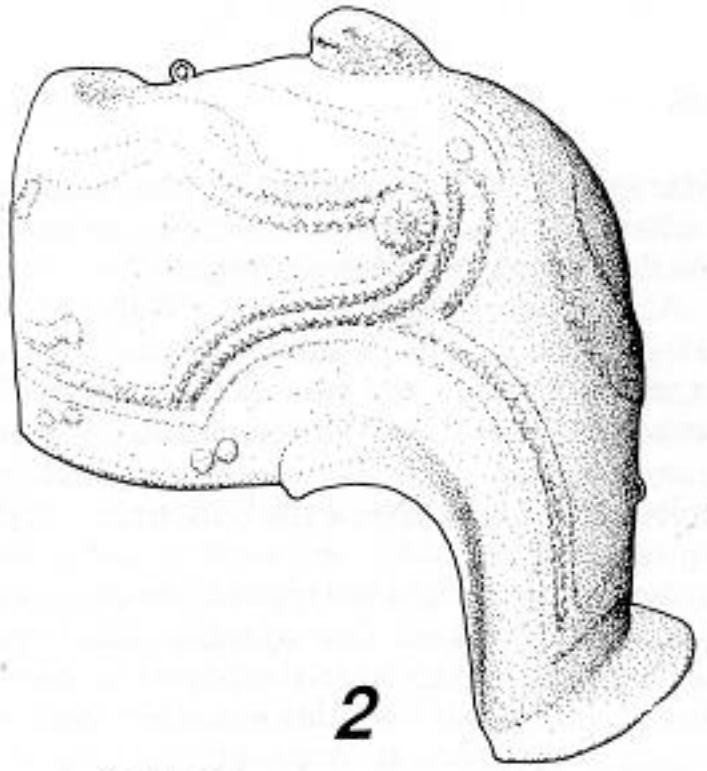

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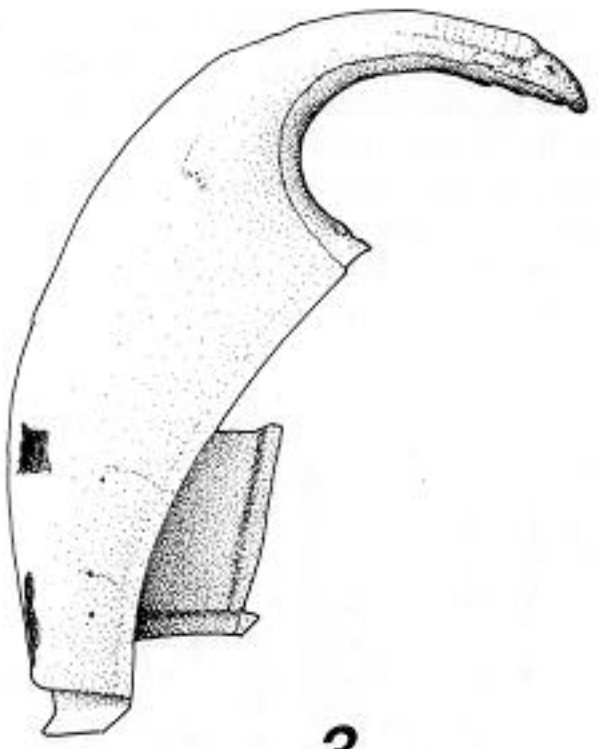

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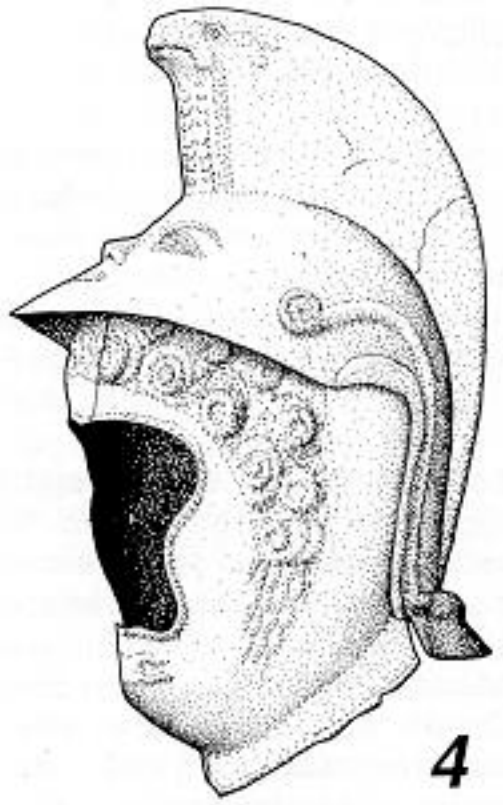

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Examples from Niederbieber and Nijmegen also had a pointed bowl-rim over the nose, as shown on the Brigetio and Chesters sculptures.[54]

An *orichalcum* helmet found in Well 9 at Buch (Pl. 2c) belonged to a related form. The bowl extended down to the base of the neck and has embossed cross-ribs. The unfinished neck-guard was restrained. The peak was missing, but rivet-holes show it was intended to angle slightly upwards. The wide, incomplete cheek-pieces covered the ears and overlapped at the chin leaving a small, 'T'-shaped face-opening. The overall appearance was similar to the helmet on Aurelius Surus' *stela*. Finds from this and other Buch wells suggest a site abandonment date of *c.*AD259–60 and the unfinished helmet was presumably deposited at this time. The Buch fort is thought to have held an infantry unit.[55]

Buch-type cheek-pieces have been found at Regensburg, Eining-Unterfeld (see Fig. 134), in the Caerleon rampart-back building and at Dura, all sites associated with legionary troops. Adoption of similar helmet forms for both infantry and cavalry use would account for, and fill, the apparent typological gap in third-century infantry helmet types.[56]

It is likely that some supposed 'sports' cavalry helmets used with cheek-pieces rather than full face-masks were actually designed for service in battle. Petculescu suggested that this was the case for the 'pseudo-Attic' copper alloy helmet form, of which likely third-century examples come from Guisborough, Chalon and Lunca Mureşului. These exhibited a narrow neck-guard and a vertical brow-plate. Although highly decorated, principally with snakes, they had a greater bowl thickness than mask-helmets.[57]

Another copper alloy helmet type has a bowl which curved over the ears and extended forward as a pointed horizontal peak, adorned by an upward-looking human face. An upstanding crest terminates in an eagle's head. Decorative snakes were present, but eagle imagery predominated. A complete example from Heddernheim had a one-piece face-protection covering chin, cheeks, brow, ears and part of the neck, leaving only a 'T'-shaped opening. Other one-piece protectors have been found in the north-western provinces, and both these and human face peak-decoration are reproduced on a sculpture of Mars from Intercisa. An *orichalcum* helmet from Worthing combined a pseudo-Attic bowl-form with an eagle crest. It had a one-piece face-protection, rather than a pair of cheek-pieces, but the one found with it did not belong with the bowl. Eagle-crested helmets are shown on *stelae* and sarcophagi in Rome.[58]

Mask-helmets were undoubtedly used in third-century cavalry sports displays. A bowl from Eining covered only the back, top and sides of the head. The front would have been protected by a full mask with an upstanding 'peak' of hair, of the type found at Straubing, Eining and Grafenhausen. A helmet from Vechten which has lost its mask had the apex of its bowl extended forward into a graceful eagle's neck with a small head. An unfinished mask, also from Vechten, had an upstanding-hair peak shape, but was completely plain, and had a 'T'-shaped opening rather than a closed face.[59]

The 'Battle of Ebenezer' Dura Synagogue fresco shows soldiers wearing mail or scale coifs, not helmets, and parallels are provided by illuminations in the fourth-century *Vergilius Vaticanus* manuscript. These would have been a defence against arrows, similar to the Mesopotamian-Iranian use of helmet aventails.[60]

105 Vatican manuscript illustration showing soldiers wearing coifs.

Shields (Figs. 106–107 and Pl. 4)

Circular shield-bosses continued in use through the third century, and there are copper alloy and iron finds from British, Rhenish and Danubian sites. A copper alloy boss from Thorsbjerg had a Roman owner's name inscribed on its flange. A number of copper alloy bosses from sites in Britain, Germany and Hungary have been erroneously interpreted as 'parade' items because of their figural and geometric decoration. In some cases, for example Mainz 'B', this was stylistically close to Dura shield ornament (see below) and may indicate a third-century date.[61]

No less than 21 bosses, 6 reinforcing bars and 24 fragmentary or complete shield-boards were found at Dura. Most of the bosses and bars apparently came from the siege-mine by Tower 19, whilst the better-preserved shield-boards were found inside Tower 19, in 'The Tower of the Archers', or buried beneath material dumped against the back of the west wall. Most bosses were domed with flat, round flanges (Dia.185–220 mm (7¼–8½ in)). Some had eight-pointed flanges which have few European parallels.[62]

Many of the best preserved boards were oval and shallowly dished (L. 1.07–1.18 m (3½–4 ft), W. 0.92–0.97 m (*c.*3 ft)). Each shield had between 12 and 15 poplar wood planks, 8–12 mm (⅓–½ in) thick, glued together edge-to-edge. Two holes, one semicircular, the other trapezoidal, were cut in the centre for thumb and fingers. Holes of exactly the same shapes and function are seen on shields from Thorsbjerg. None of the well-preserved oval boards were found with an *umbo* or a grip-bar in place, or even with rivet-holes from a fitted boss. However, the *Iliad* shield (see below) had two rivets for a bar to run horizontally behind the strut. Additional rivets were located to the left of the boss (as seen face-on), and near the upper right rim, ideally placed to serve as attachments for a carrying strap. Holes along the rim were for sewing on a rawhide edging with twine. None of the Dura boards had metallic edge-guttering like shields of earlier periods, nor does it occur in third-century Roman contexts elsewhere. Modern experiments suggest that shrunken rawhide not only imparts solidity to the shield structure, but also efficiently resists blows to the rim.[63]

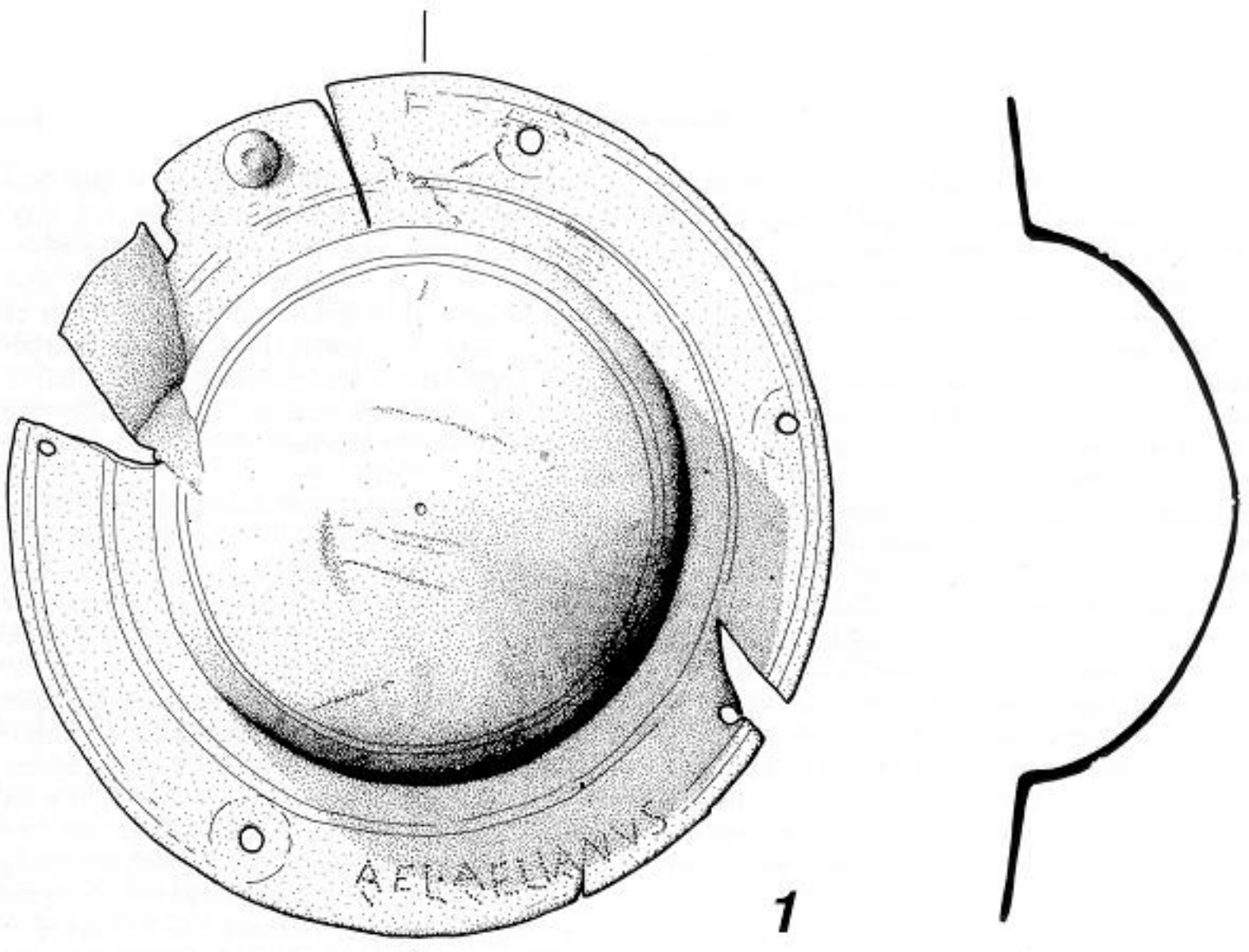
One shield from Dura was unpainted, whilst several of the boards in the mine and elsewhere were painted pink. Other shields were extremely richly adorned. One figured a full-length Palmyrene-style warrior god on a grey-green field. Two had red fields with concentric wreath and wave-crest motifs around the boss. On the field proper, one displayed figural scenes from the *Iliad*, whilst the other exhibited an *Amazonomachy* (Pl. 4b). The back of the Amazon shield was painted blue with rosettes and radiating lines of white-bordered red hearts (Pl. 4c). The construction of these boards is identical to shields used in combat found down the mine, and elaborate painting cannot be equated simply with 'parade' use.[64]

Dished and bossed oval shields are carried by soldiers on gravestones and on the 'Exodus' Dura Synagogue fresco, although the 'Battle of Ebenezer' coif-wearers have hexagonal boards (see Fig. 102). Very small shields on *stelae* may be attributed to sculptural convention.[65]

Only two *stelae* depict third-century rectangular shields. However, artefacts from Dura substantiate the continued use of curved, rectangular boards in the mid-third century. Parts of at least three curved rectangular shield-boards were recovered, and one fragmentary boss with a curving rectangular flange. A well-preserved shield from Tower 19 was 1.02 m (3⅓ ft) long and 0.83 m (2¾ ft) wide (0.66 m (2 ft) along the cord). Its construction was completely different from the oval boards, strips of plane wood, 30–80 mm (1–3 in) wide, 15–20 mm (½–¾ in) thick, being glued together and laid in three superimposed layers. The overall thickness was 50 mm (2 in). As with the Kasr el-Harit shield, the outer and inner layers ran transversely across the board whilst the middle strips were longitudinal. In the centre was a 120 mm (4¾ in) diameter circular opening. The back had a framework of pegged and glued transverse and longitudinal wooden strips (W. 20 mm (¾ in)). One strip crossed the central aperture and was strengthened to form the horizontal hand-grip.[66]

Both sides of the shield were covered with thin leather, which was painted. The rim had a 35–50 mm (1⅓–2 in) wide leather binding stitched over it and four rawhide corner-pieces. No boss was found with the shield, but there were four rivet holes for attaching a rectangular flange. Concentric rectangles with wave-crests, *guilloche*, and laurel motifs were painted on the red field surrounding the boss-flange. In the upper field, there was an eagle flanked by two Victories, whilst a lion and two sun-bursts (or stars) were below the boss (Pl. 4a).

This was neither an outdated relic nor a 'parade' shield, as has been suggested. The lion was probably a badge belonging to one of the legionary



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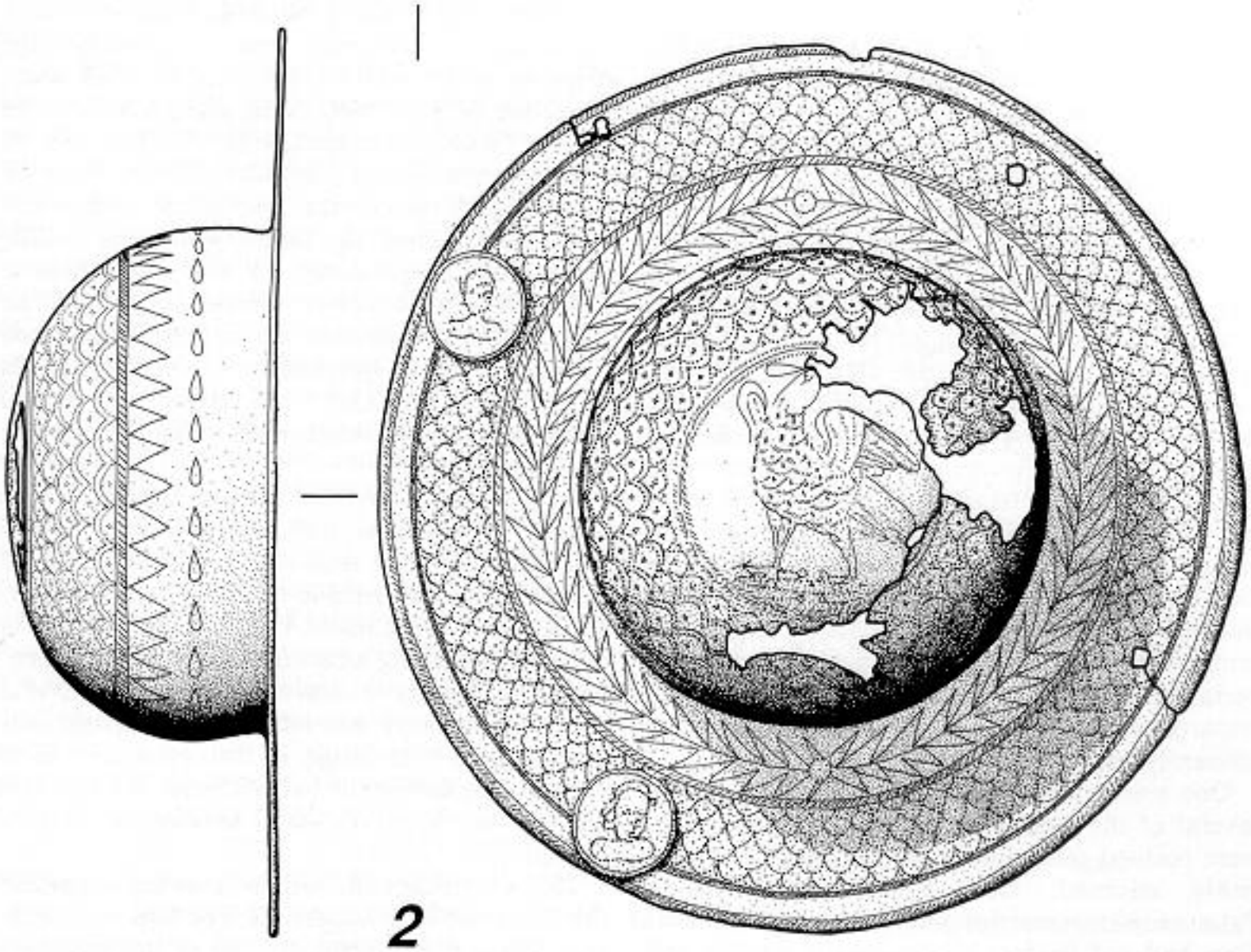

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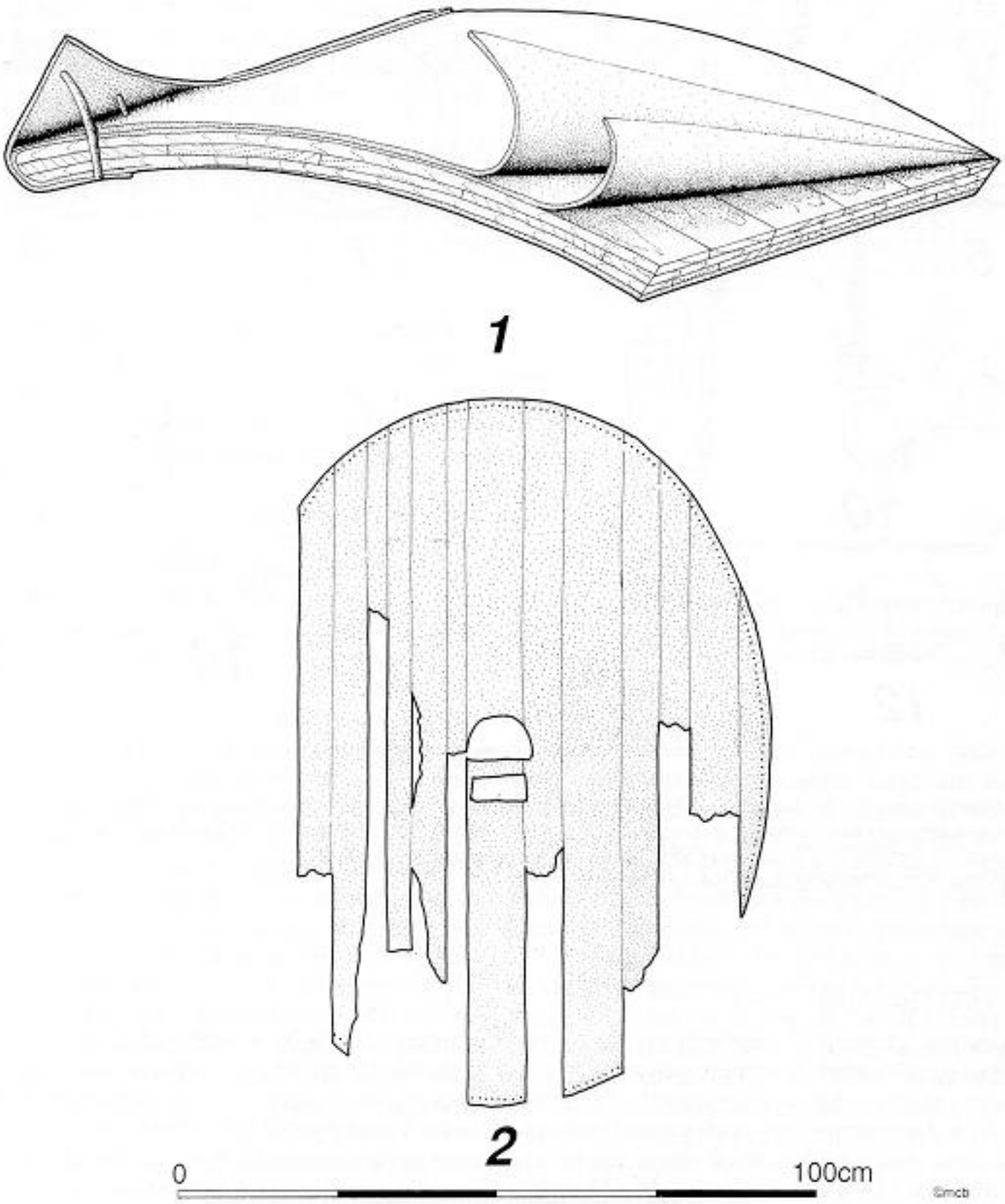
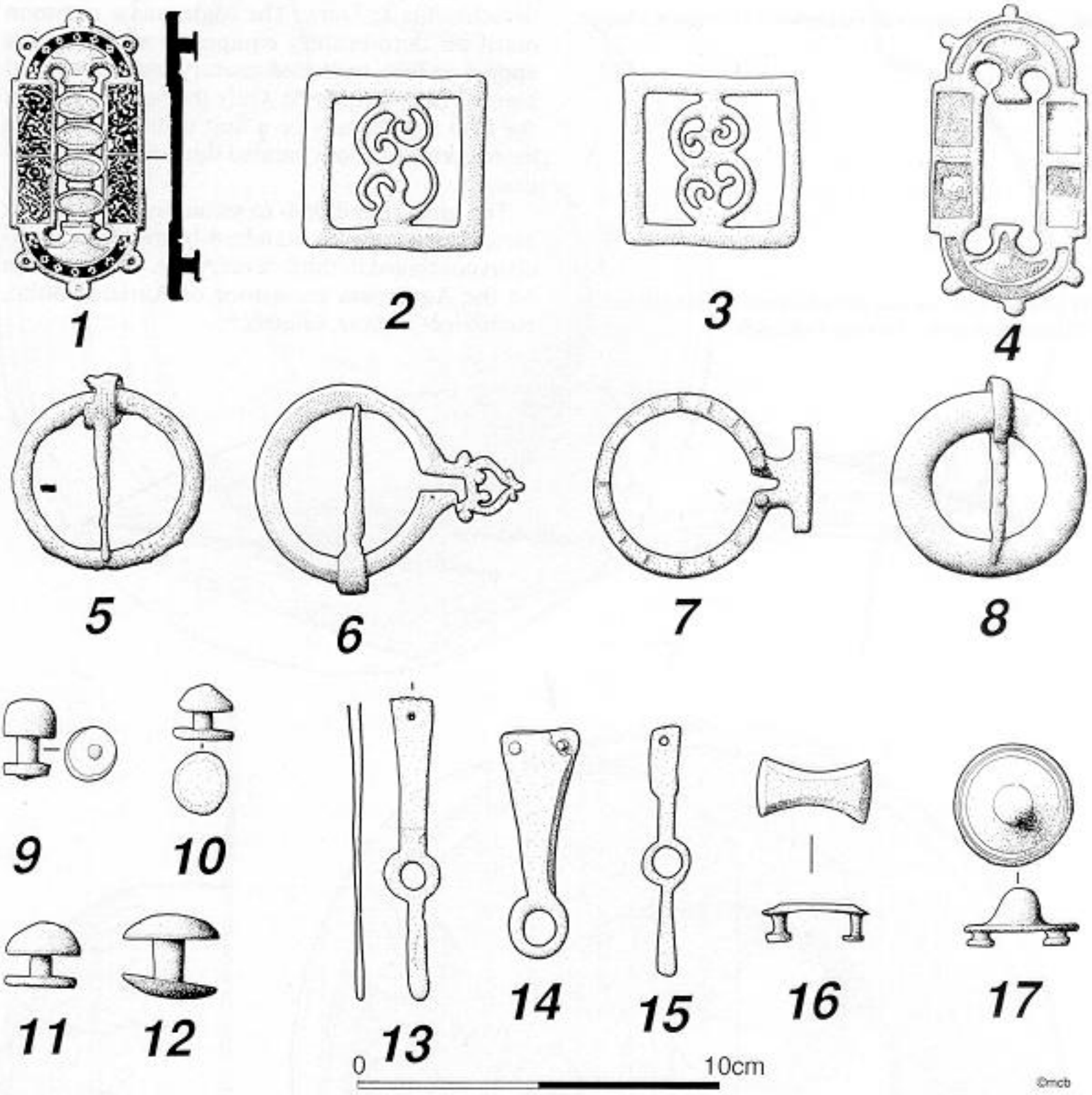
106 (*Left*) Third-century shield bosses. *1* Thorsbjerg; *2* Mainz.

detachments at Dura. The eagle was a common motif on third-century equipment and the stars appear on first- to second-century legionary shield blazons (see Chapter 5). Only the warrior god on the oval shields may be a unit emblem. Nothing more is known about painted third-century shield-designs.

The small round first- to second-century shields carried especially by standard-bearers and musicians continued in third-century use. One is shown on the Aquincum gravestone of Aurelius Bitho, *cornicen* of *legio II Adiutrix*.[67]

107 (*Below*) Third-century Dura-Europos shield construction. *1* Curved rectangular; *2* domed, oval plank.





108 Third-century belt-fittings. *1, 4 Millefiori* and enamel inlaid plates (*1* Carnuntum; *4* Dura-Europos); *2–3* rectangular buckles (*2* Pfünz; *3* Banasa); *5–8* ring-buckles (*5* Straubing; *6* Saalburg; *7* Carnuntum; *8* Niederbieber); *9–12* fungiform studs (*9* Holzhausen; *10* Porolissum; *11–12* Volubilis); *13–15* strap terminals (*13* Porolissum; *14* Saalburg; *15* Pfünz); *16–17* belt mounts (Volubilis).

Belts (Figs. 108–109)

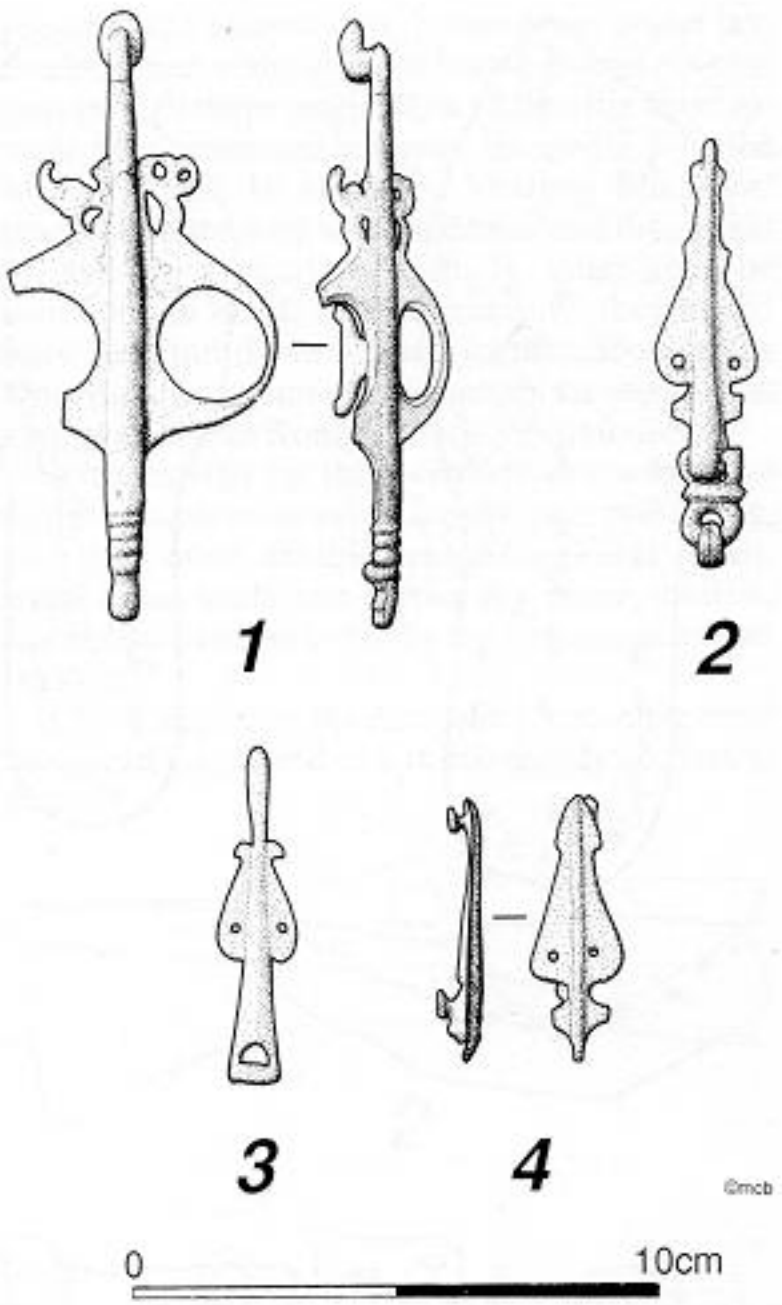
Third-century gravestone representations of infantry and cavalry most commonly show a broad waist-belt fastened by a ring-buckle. Detailed works show the tapering belt-ends passed through the ring from behind, then back along the front, and held in place by a stud on each side. Often the end on the wearer's right is long and narrow, hanging down in a crescentic loop, and then tucked back up behind the broad belt. This narrow strip appears again at the right hip and hangs down by the right thigh. Alternatively, the narrow strip passes along the front of the belt to the hip. The strip-end has one or two teardrop terminals.

Both ring-buckle and crescent loop are worn by Roman emperors on Sassanid reliefs (see Fig. 94), and by officers in the Dura Tribune Terentius fresco. The earliest securely dated ring-buckle representation is on an altar from Eining, dated by consular year to AD211.[68]

No actual waist-belts survive, but the buckles have been found in a variety of forms on military sites and in graves. These were plain iron or copper alloy rings, with or without a tongue, or decorated copper alloy rings with an extension to enclose one of the belt-studs. Fungiform studs for leather fastenings are common finds. Many narrow, hinged strap-terminals occurred in heart, pear, phallus, ring, triangle, ring-pommel sword and *beneficiarius* spearhead forms. Belt-fittings in the Lyon burial were accompanied by a pair of bulbous strap-ends.[69]

Plain rectangular buckles appear on several gravestones, reflecting finds with a rectangular openwork frame enclosing a double-pelta or curvilinear Celtic design. The ends of the belt could be slipped through the frame, and these buckles are associated with fungiform studs in graves excavated at Regensburg. Buckles with peltiform loops, sometimes attached to a rectangular openwork plate, occur widely along the northern frontiers, and at Thamusida and Dura. Emperors and soldiers on some Bishapur reliefs may wear belts with similar buckles.[70]

A small rectangular buckle and a counter-plate on the Lyon belt were cast with the letters 'X' and 'VT' respectively (see Fig. 92). Separate appliqués spelt the motto FELIX VTERE ('Use with good luck'). This is the best dated and most complete example of the narrow belt-type bearing this motif (W. *c.*25–35 mm (*c.*1–1⅓ in)). The letters served to stiffen the belt and prevent it curling over with wear. They had limited regional use: letters are chiefly found on sites along the Middle and Lower Danube and in Dacia. Outlying examples at Lyon and Dura may be explained by the presence of Danubian troops. Some gravestones show variously-shaped stiffening-plates on both waist-belts and baldrics in addition to *phalerae*, terminals and buckles. These plates correspond with purely decorative copper alloy appliqués from military sites.[71] Enamelled rectangular openwork plates with peltiform ends occur across the Empire from Britain, along the Rhine and Danube, to Syria (Dura). Four plates from South Shields (L. 83 mm (3¼ in), W. 36 mm (1⅓ in)) were chained together on a broad leather belt with their long axes aligned vertically.[72]

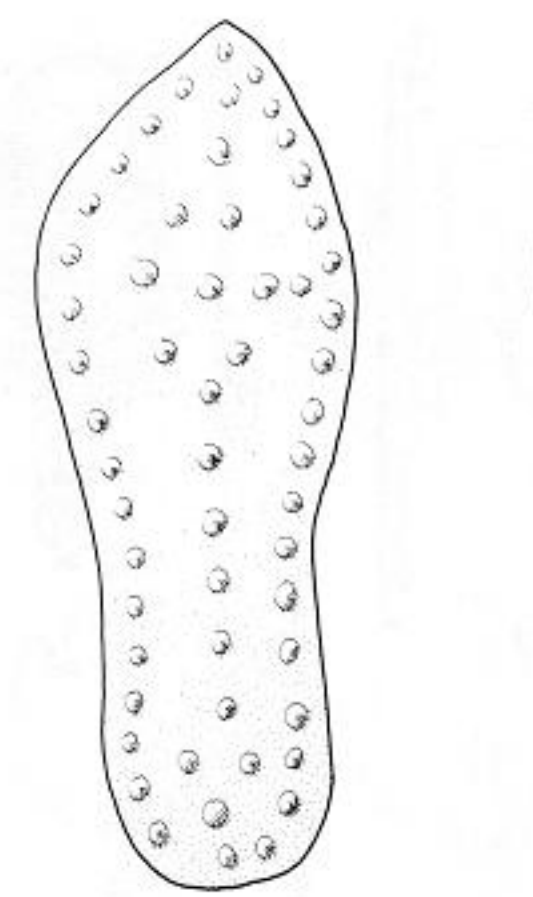


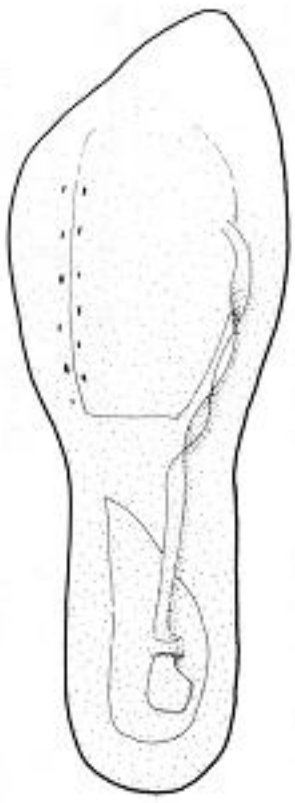
109 Third-century *beneficiarius* spear fittings. *1* Baldric fastener (Buch); *2* mount with pendant (Zugmantel); *3* mount with loop (Heddernheim); *4* mount (South Shields).

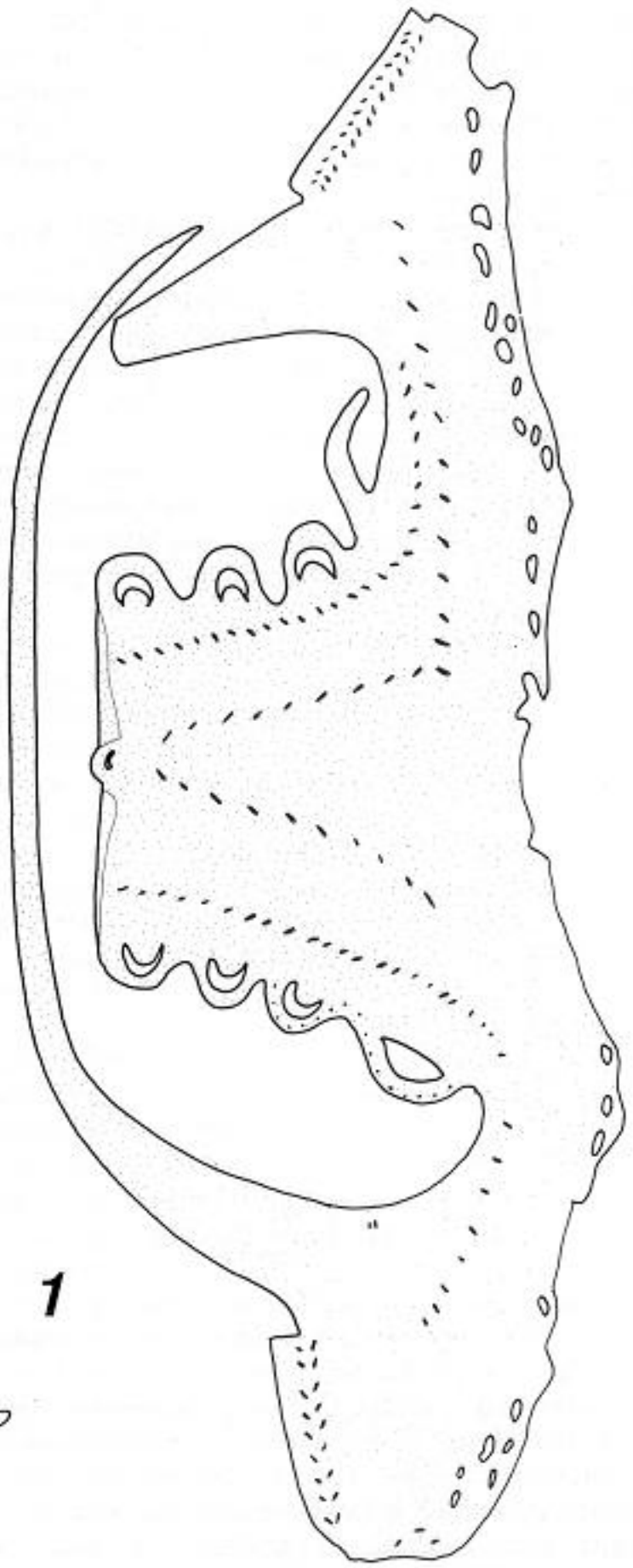
Clothing (Fig. 110)

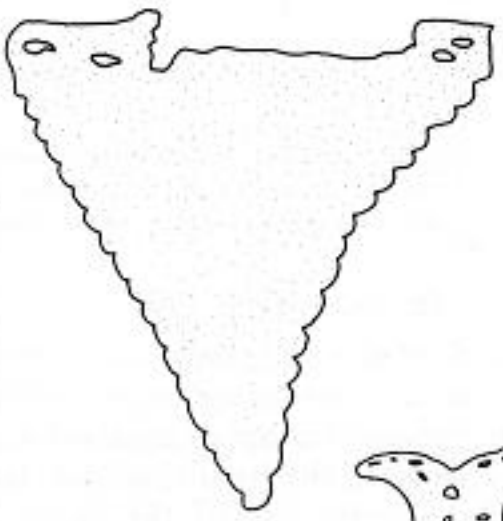
Soldiers on gravestones are shown wearing a wrist- and knee-length tunic. Legs are bare or covered by tight trousers. A *sagum* is worn fastened at the right shoulder, falling open to reveal the right side of the body, hanging down the wearer's back to behind the knees or even calves. Hems are often fringed or have corner tassels.[73]

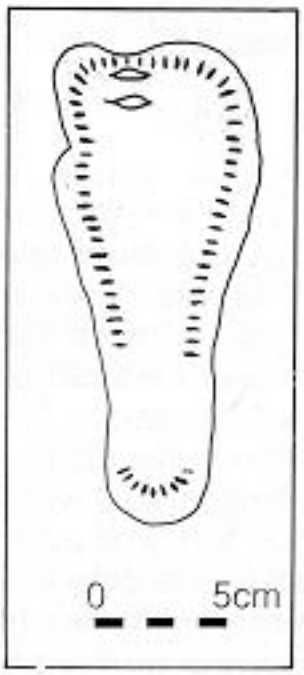
The Dura Tribune Terentius fresco and the Der el-Medineh mummy portrait both depict white tunics with purple bands on the hem and cuffs, worn with chocolate or reddish-brown coloured cloaks. Textiles at Dura were predominantly woollen, and tunics were woven in one piece, with a neck-slit and chest and cuff bands. True purple was a less common dye than cheaper, madder-based substitutes.[74]











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110 (*Above*) Third-century footwear. *1* Eyelet boot (Zwammerdam); *2* sole of sandal (Zugmantel).

111 (*Right*) Other equipment of the third century from Künzing (*1–7*) and Corbridge (*8–11*). *1–2* Pickaxes; *3, 7* entrenching tools; *4–6* tethering pegs; *8–11* caltrops.

Fibulae fastening cloaks are usually represented as circular with decorative insets and, sometimes, attached pendants. Comparison may be made with copper alloy disc-brooch finds.[75]

Both pointed and flat-ended boots are depicted on sculptures. Some open-topped shoes have a strap across the front of the ankle, notably on a statue from Alba Iulia.[76]

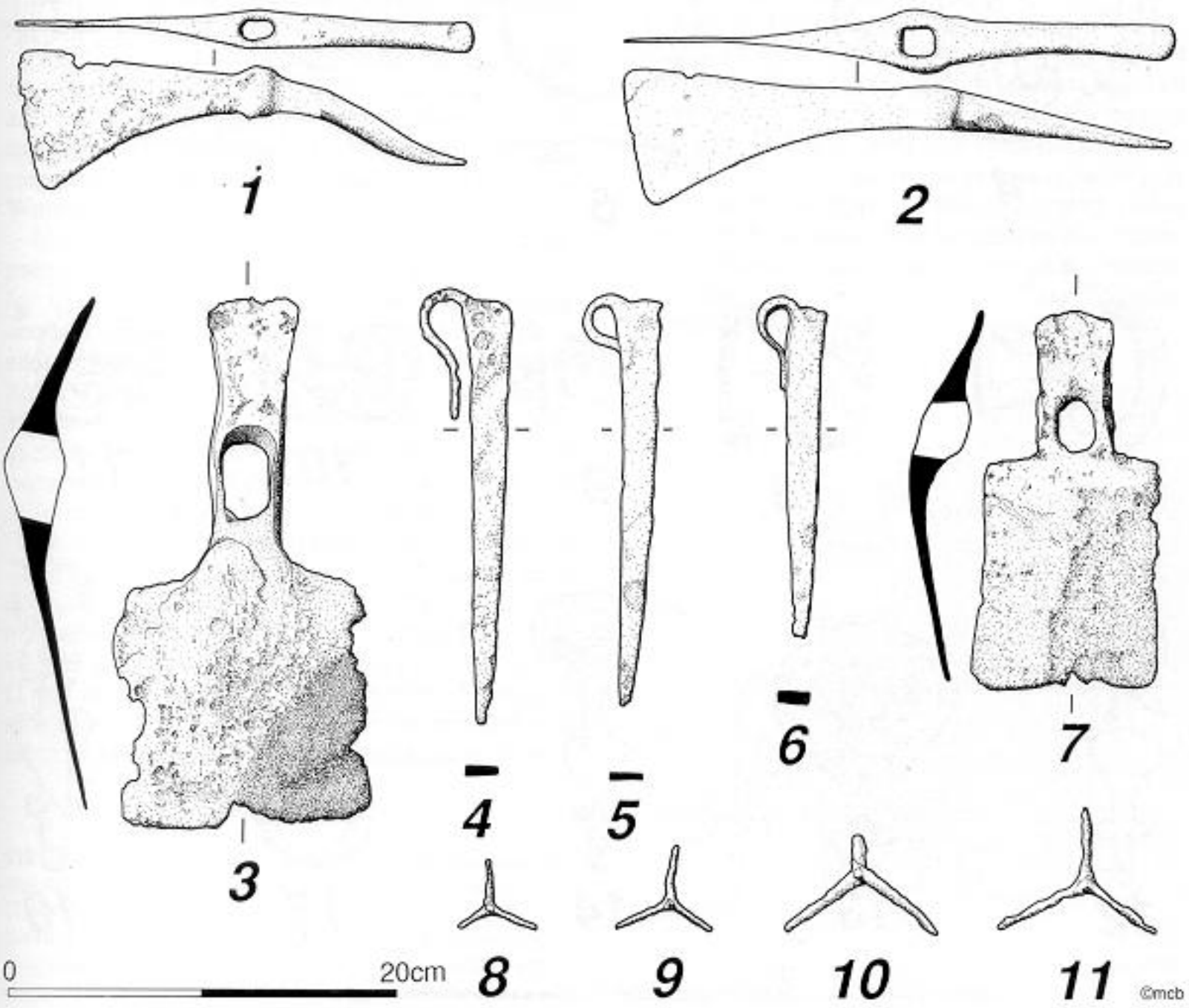
Other equipment (Fig. 111)

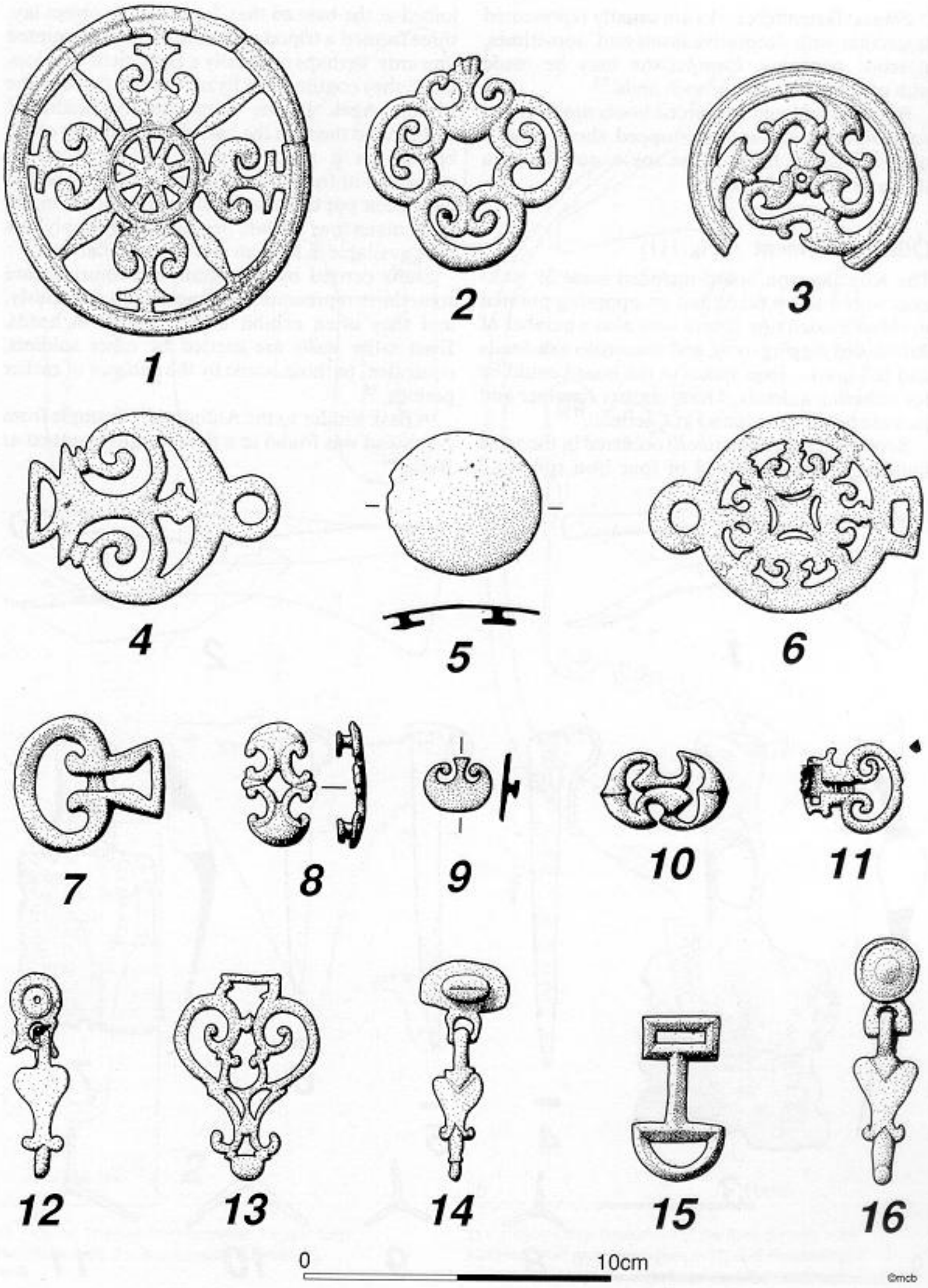
The Künzing iron hoard included some 39 pick-axes with a sharp blade and an opposing pointed or chisel-bladed tine. There were also a number of flat-bladed digging tools, and numerous axe-heads and bill-hooks. Iron spikes in the hoard could be for tethering animals. Third-century hammer and pickaxe heads were found at Caerleon.[77]

Seventeen caltrops (*triboli*) occurred in the same building. These consisted of four iron spikes all joined at the base so that, however the object lay, three formed a tripod and a fourth always pointed upwards. Perhaps originally a Hellenistic development, they continued in Byzantine use through the Middle Ages. In the third century Macrinus' troops used them on the battlefield, and they could be laid as a nasty surprise in long grass or concealed in fords. More commonly, they would have been put down around fortifications, in the same manner as *stimuli*; presumably a supply was kept available in Roman military installations.[78]

Staffs carried by third-century centurions are sometimes represented as longer than previously, and they often exhibit broad fungiform heads. Even taller staffs are carried by other soldiers, equivalent to those borne by the *optiones* of earlier periods.[79]

A flask similar to the Antonine(?) example from Newstead was found in a third-century context at Buch.[80]

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Equine equipment (Figs. 112–114)

Our knowledge of Roman riding harness in this period is highly dependent on the archaeological evidence because the representational material is not nearly as detailed as before. However, this is partially compensated for by a number of horse burials in central Europe which included items of harness apparently *in situ*. Normal site finds are quite prolific, their distribution ranging from Dura to the German and Raetian frontiers, and from Britain to Mauretania.[81]

By the early third century, *phalerae* had changed again and seem to have completely discarded the use of junction loops, direct attachment to the disc being preferred. The system had the advantage of possessing fewer fragile components than before. Harness ornament came in a variety of forms, such as studs of a range of types, strap terminals, pendant streamers and elaborate bridle cheek-pieces. The dominant decorative motifs were now a mixture of Classical (waves, swastika) and Celtic (trumpet, lotus blossom) elements.[82]

The horned saddle was still in use, as it is visible on one of the Bishapur reliefs, along with breast and haunch straps and ivy-leaf pendants. Actual examples of contemporary harness have been recovered from a tumulus at Celles-les-Waremmes.[83]

Horse-armour had two distinct functions: face-protection during sports displays, and protection for head, neck and body in battle. Hinged third-century triple chamfron-plates from Straubing and Gherla covered the front and sides of the horse's head, and were decorated with Mars, Minerva, Dioscuri, Victory, snake and eagle motifs. Smaller guards covering the eyes alone occurred at Straubing and Künzing, and were little different from second-century examples.[84]

Three scale armour trappers were found in Tower 19 at Dura-Europos. One with copper alloy scales was in fragments, but the other two were exceptionally well preserved. Housing I also had copper alloy scales (L. 35 mm (1⅓ in), W. 25 mm (1 in)) attached to each other in rows by copper alloy wire. The 31 rows per side were stitched with linen to a textile backing in two rectangular panels, 140 mm (5½ in) apart. When worn by a horse, the trapper hung down over the sides, and measured 1.22 m (4 ft) along the spine and 1.69 m (5½ ft) across. An oval opening, 0.37 m (1 ft) along the spine and 0.68 m (2¼ ft) across, accommodated the saddle. This opening, the spine and the lower edges of the trapper were covered with strips of red leather. A triangular section of scale protected the base of the tail. Two thongs at the rear of the saddle-opening may have looped over the saddle-horns or around the haunch straps to increase the trapper's stability. Leather thongs near the front edge of the housing were presumably tied to the back of a separate scale frontlet.[85]

Housing II was proportionally longer (L. 1.48 m (5 ft), W. 1.10 m (3½ ft)), with curving extensions at the front which meet across the horse's chest, and a saddle-opening perpendicular to the spine. The iron scales (L. 60 mm (2⅓ in), W. 45 mm (1¾ in)) were attached to the fabric backing with leather laces in 19 rows per side.

The Dura trappers compare with armour described by such writers as Xenophon, Arrian and Heliodorus. One Dura graffito shows the full provision of a trapper (*parapleuridion*), separate overlapping pieces for neck and chest (*prosteridia*), and a chamfron for the head (*prometopidion*). A second sketch pictures a frontlet hanging down lower than the trapper. Full Sarmatian and Parthian scale horse-armours are shown on a Crimean gravestone and a relief at Tang-i-Sarvak respectively.[86]

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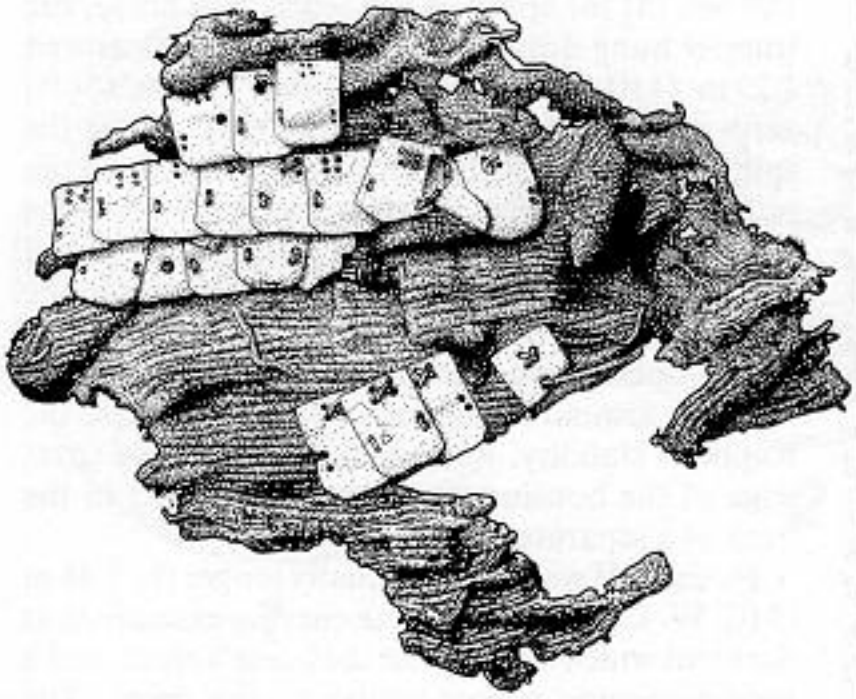
113 Graffito of cataphract from Dura-Europos.

112 Third-century equine equipment. *1 Phalera* (Banasa); *2* mount (Volubilis); *3 phalera* (Zugmantel); *4* bit cheek-piece (Thamusida); *5* mount (Niederbieber); *6* bit cheek-piece (Dura-Europos); *7* buckle (Dura); *8–10* mounts (*8* Cirencester; *9–10* Saalburg); *11* buckle (Corbridge); *12–16* pendants (*12* Dura; *13,15–16* Zugmantel; *14* Saalburg).



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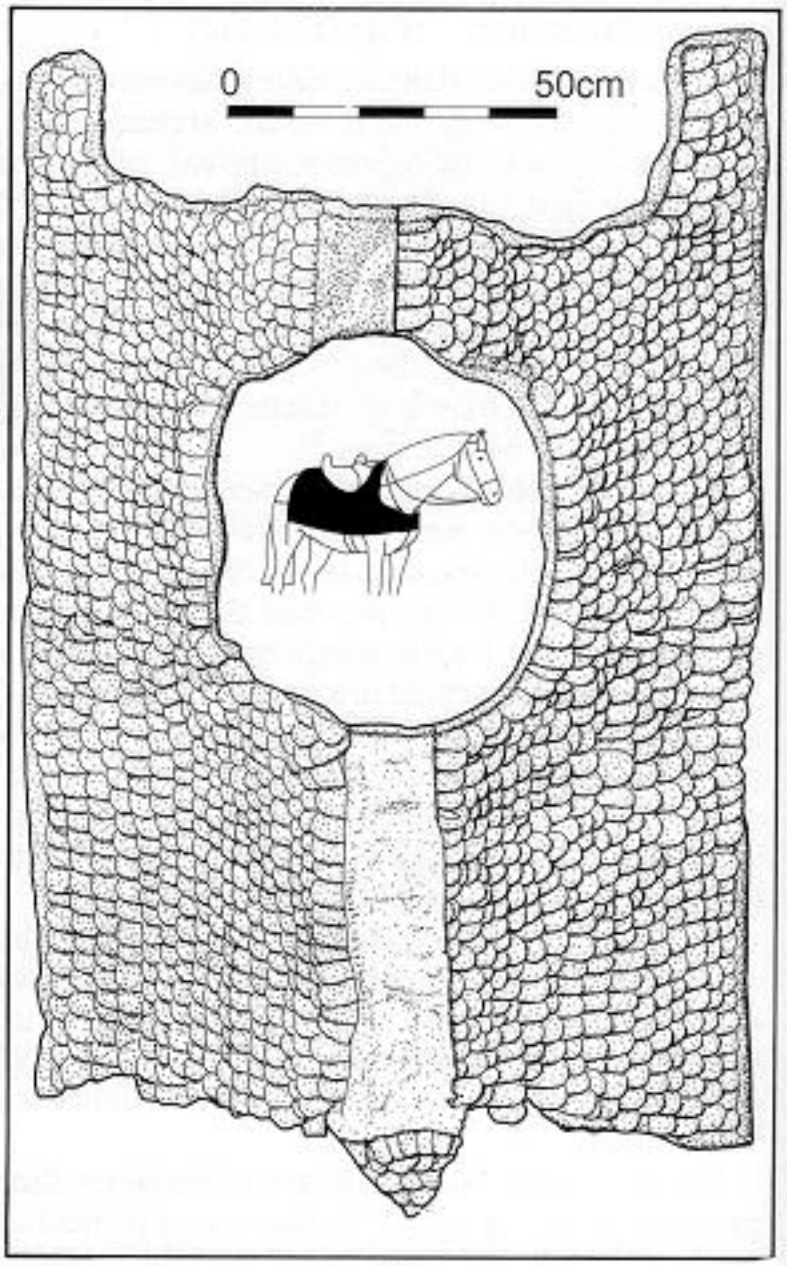

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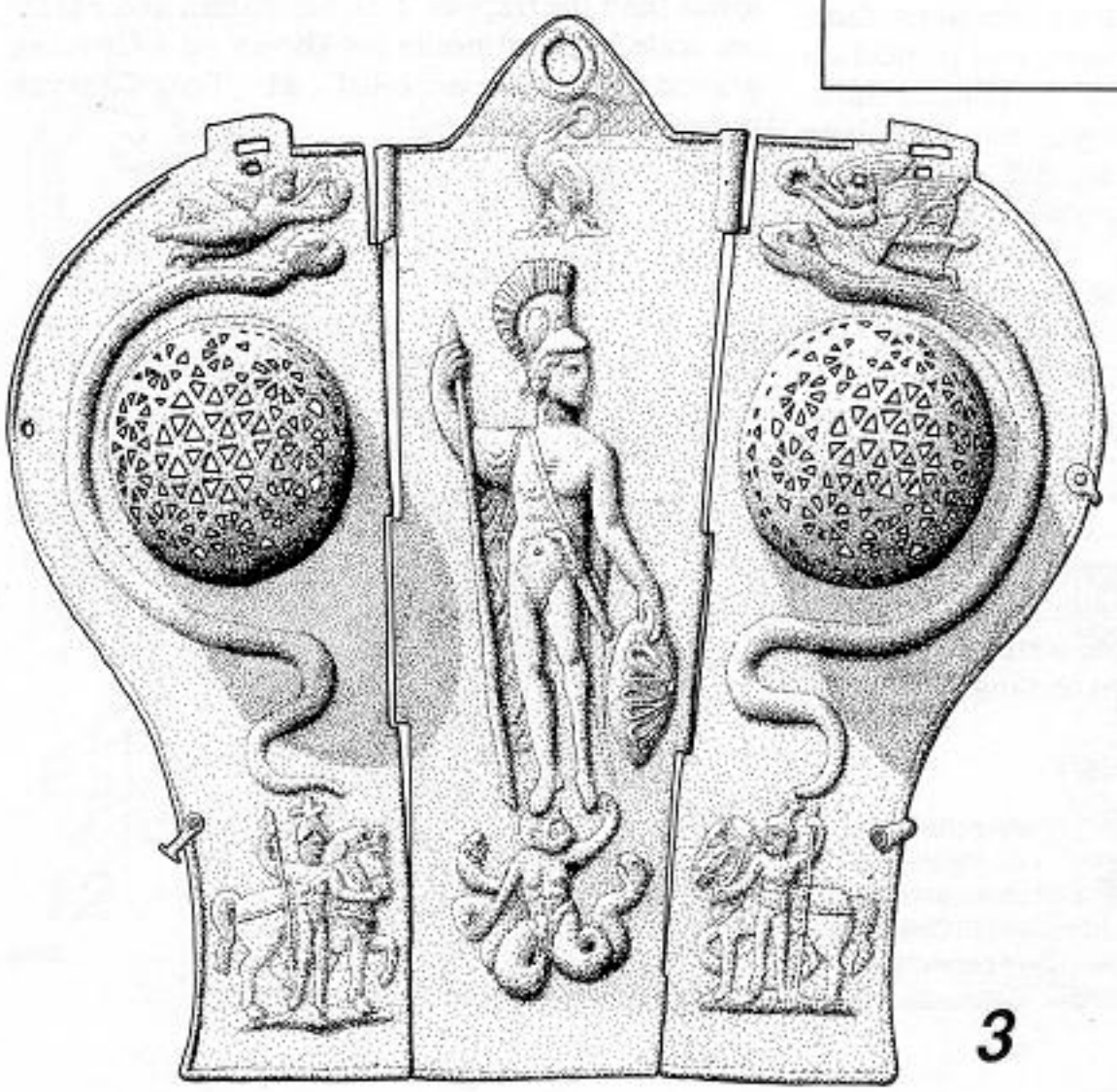

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These horse-armours were primarily a defence against arrows and, for a trained animal, heat-exhaustion would have been a more debilitating problem than the burden of weight. Standard equipment for wealthy cavalry in Partho-Sassanid armies, its use was emulated by Roman troops from at least the early second century AD. In the third century, heavily-armoured cavalry (*catafractarii*) were taken into Italy by Maximinus Thrax, and were prominent in Palmyrene armies.[87]

114 Third-century horse armour. *1* Fragment of housing III (Dura-Europos); *2* housing II (Dura); *3* chamfron (Straubing).

8
THE DOMINATE

Under the Tetrarchy and the emperors of the House of Constantine the frontiers were maintained and strengthened. Diocletian increased the size of the army, whilst continuing to rely upon the traditional frontier legions. Constantine and his successors built up more centralized field armies drawing upon frontier forces. New types of units were also created, with a western emphasis on German officers and recruits. Old army regiments, some dating back to the Augustan period, had a continuous life in more peaceful areas like Egypt, perhaps up to the seventh century.

However, Germanic pressure on the northern frontiers during the fourth century could not be resisted indefinitely. The Goths, with accompanying groups, crossed *en masse* into the Danubian provinces and crushed the eastern Roman army at Hadrianopolis in AD378. The Roman forces were rebuilt, initially using large numbers of barbarian *foederatae*. German military and political dominance was avoided in the East, but western emperors came increasingly under the control of their German generals. The Rhine frontier finally collapsed at the beginning of the fifth century, and the western provinces generally slipped away from Roman control.[1]

Frontier reorganizations from the Tetrarchy onwards involved the establishment of some new installations, thus dating Dominate period material between foundation and final Roman abandonment. However, the latter usually did not involve the orderly deposit of equipment as in earlier periods. Material was sometimes simply left where it had been stored, as at Housesteads, Intercisa and Lambaesis, or where it had been installed, as at Gornea and Orşova.[2]

Ritual deposition of equipment in water continued in fourth- to fifth-century Free Germany, as at Nydam, Kragehul and Ejsbøl Mose. Funerary deposition took on a new importance, especially within the Roman frontiers. In cemeteries outside forts, such as Oudenburg and Intercisa, and near towns, like Winchester and Ságvár, soldiers were more commonly buried with their clothing, brooches, knives and military belts. Weapons were occasionally included in what may have been specifically Germanic, rather than Roman provincial, practice. Weapon-graves in northern Spain, northern France and the Rhineland ('*Laetengräber*') have been associated with units of German warriors (*laeti*), known from the *Notitia Dignitatum* to have been located in these areas. However, the deposited equipment itself need not have been 'Germanic'.[3]

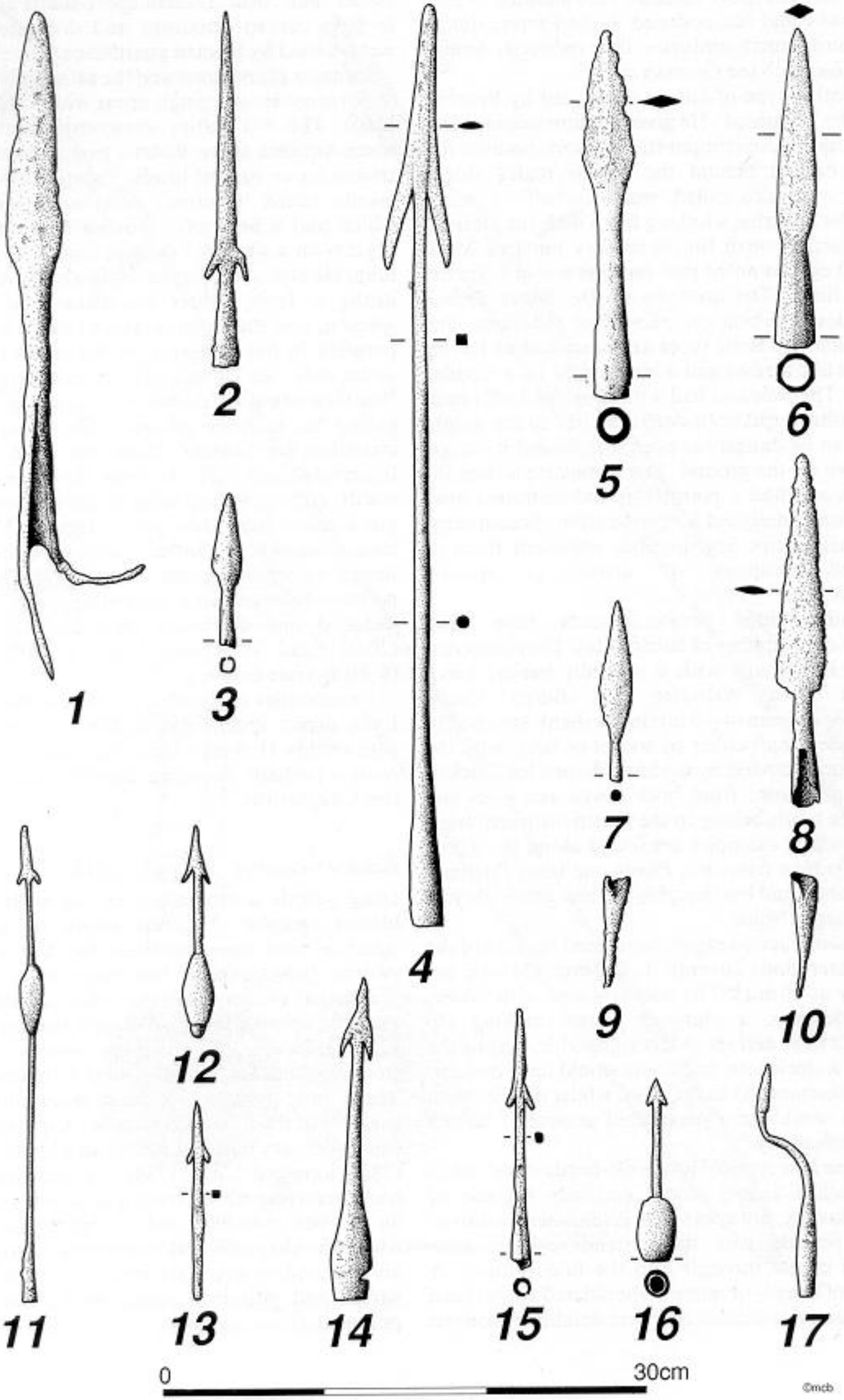
Weapons

Shafted weapons (Fig. 115)

Vegetius lists a series of shafted weapons in his description of legionary equipment. Amongst them are the *spiculum*, which used to be termed *pilum*, with a head 9 Roman inches (200 mm (8 in)) long on a 5.5 Roman foot (1.628 m (5 ft)) shaft. Elsewhere he says that the *pilum* had an iron head 9–12 Roman inches (222–296 mm ($8\frac{1}{2}$–$11\frac{1}{2}$ in)) long, and its equivalent, the *bebra*, was carried in twos or threes by contemporary barbarians. The length of iron head might seem conservative by comparison with earlier *pila*, but, as the preceding chapters demonstrate, '*pila*' at any one time exhibited a range of dimensions and head types.[4]

Several heads from northern Britain and elsewhere had a long iron shank like a *pilum* and were more substantial than those Vegetius described. Undated examples from Carvoran and Lorch with flat, double-barbed heads were 549 and 590 mm long (22 and 23 in) respectively. Close parallels occurred at Vimose, Illerup (third century), Ejsbøl and Nydam (fourth century), suggesting a Germanic link. In similar fashion German heads from Nydam, Kragehul and Illerup with a long, narrow point and barbs close to the socket, were analogous with a head from Roman Pilismarót. Perhaps

115 Dominate spearheads. *1, 3, 13,15* Catterick; *2* Pilismarót; *4* Carvoran; *5, 7, 9–10* Gundremmingen; *6, 8* Gornea; *11,14, 17* Sisak; *12* Wroxeter; *16* Carnuntum.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some Roman spear variants were adopted in Free Germany and reintroduced to the Empire during the third–fourth centuries, thus indirectly linking the *pilum* with the German *ango*.[5]

Another type of missile advocated by Vegetius was the '*plumbata*'. He gives no dimensions, but it must have been comparatively short, because five were carried behind the infantryman's shield. They were also called '*mattiobarbuli*' or '*martiobarbuli*', perhaps linking them with the German Mattiaci, or with fourth-century units of Mattiarii. Vegetius noted that two *legiones* in Illyricum used them. The anonymous *De Rebus Bellicis* includes a section on '*plumbatae tribolatae*' and '*mamillatae*'. Both types are described as having flights like arrows and a lead weight on a wooden shaft. The *tribolata* had a hunting (barbed?) head and caltrop spikes (*triboli*) attached to the weight so as to be dangerous even if it missed its target and fell on the ground. The *mamillata* lacked the spikes and had a pointed, round-sectioned head specifically designed for penetration. Accompanying manuscript illuminations represent them as shafted weapons of arrow or quarrel proportions.[6]

Lead-weighted projectile-heads have been found on a number of British sites. They consisted of an iron shank with a wickedly barbed head. Those from Wroxeter and Burgh Castle (L. 118–158 mm (4½–6 in)) had a shank attached to a wooden shaft either by socket or tang, with the junction encircled by a barrel-shaped lead jacket. Examples come from both towns and forts and datable heads belong to the fourth–fifth centuries. Continental examples are found along the Rhine and Danube frontiers. *Plumbatae* from Pitsunda in Georgia had lead weights but had small, narrow leaf-shaped heads.[7]

Reconstruction experiments used replicas of the Wroxeter finds (overall L. 600 mm (24 in)); accuracy at 60 m (197 ft) was achieved with underarm delivery, a plunging course making the target's head and shoulders vulnerable, despite the use of a shield. Barbed heads would have discomfited unarmoured barbarians, whilst the Pitsunda points would have penetrated armoured targets more efficiently.[8]

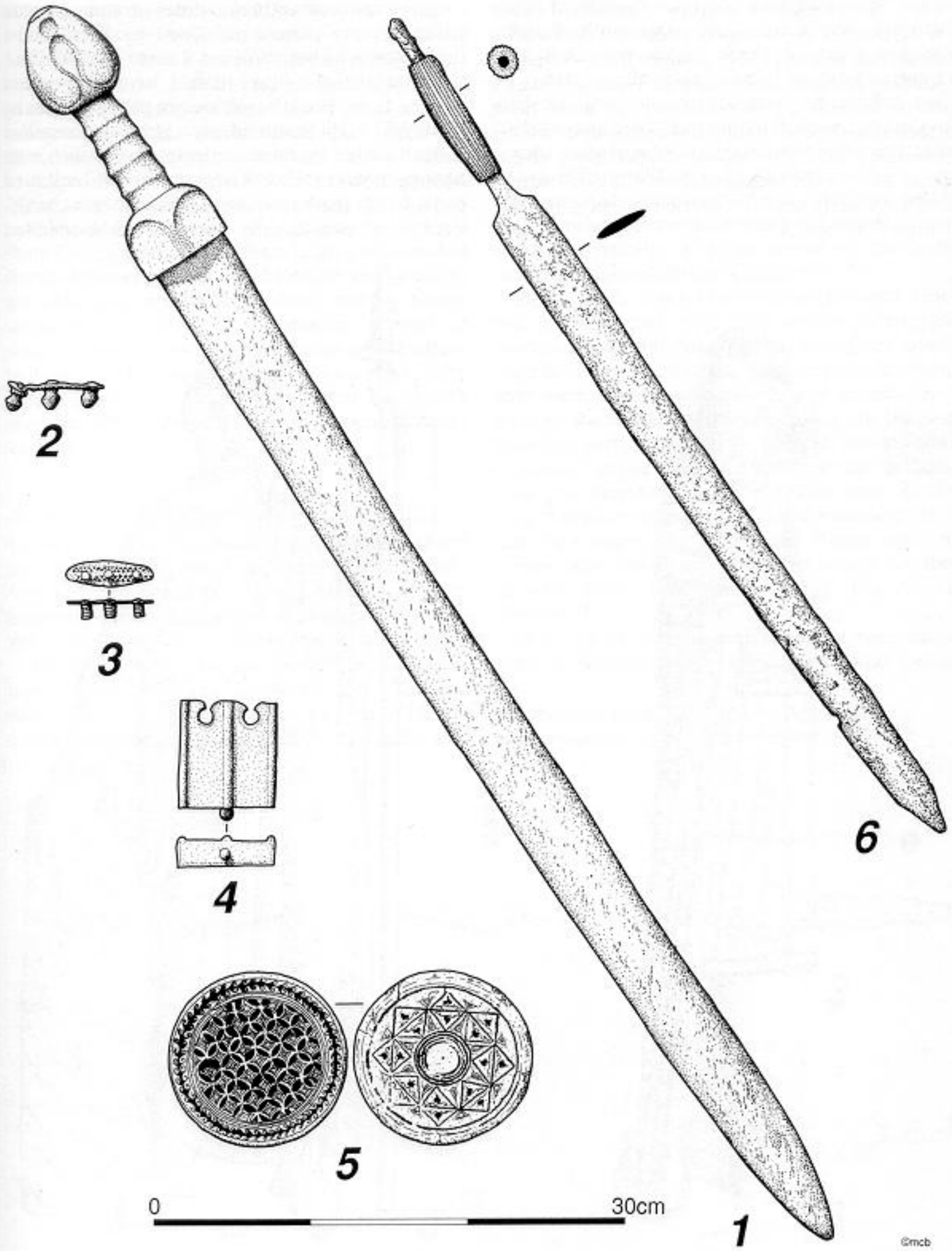
These new types of projectile-heads stand out in the archaeological record precisely because of their novelty, but spear- and javelin-head forms of early periods, with their attendant butts, continued in use through into the fifth century. A range of broad- or narrow-shouldered blades (and the triangular-section type) are datable by context rather than form. Danish spear-shafts continued to have carved ornament and decorated shafts were carried by Roman guardsmen.[9]

Infantry gravestones and the catacomb painting at Syracuse show a single spear with a substantial blade. The Via Latina catacomb painting and some Aquileia *stelae* depict a pair of javelins with triangular or barbed heads. Vegetius described a javelin called '*verutum*', previously '*vericulum*', which had a head of 9 Roman inches (222 mm (8½ in)) on a shaft 3.5 Roman feet (1.03 m (3½ ft) long. He also used '*lancea*' equivalently (distinguishing it from lighter *plumbatae* and heavier *spicula*), and the short shaft and small head find parallels in five weapons on the Apamea *lanchiarius stela* (see Chapter 7). In AD296 the soldier Paniskos wrote to his wife from Koptos in Egypt asking her to bring various items of equipment including five '*lonchia*'. '*Lanciarii*' appeared as a regimental title from the later third century onwards, and some units were formed by separating out *lanciarii* from their parent legions. None the less, a variety of shafted weapons clearly continued in legionary use. A grave at Vermand perhaps belonged to a field-army soldier, and it included one decorated spearhead (L. 500 mm (20 in)) and 10 lighter heads (L. 200–250 mm (8–10 in)) (see below, p. 173).[10]

Gravestones of *catafractarii* from Worms and Lyon depict spears and javelins in conjunction with shields. However, the Lyon *stela* also shows a *contus*, perhaps denoting eastern tactical usage (see Chapter 10).[11]

Bladed weapons (Figs. 116–118)

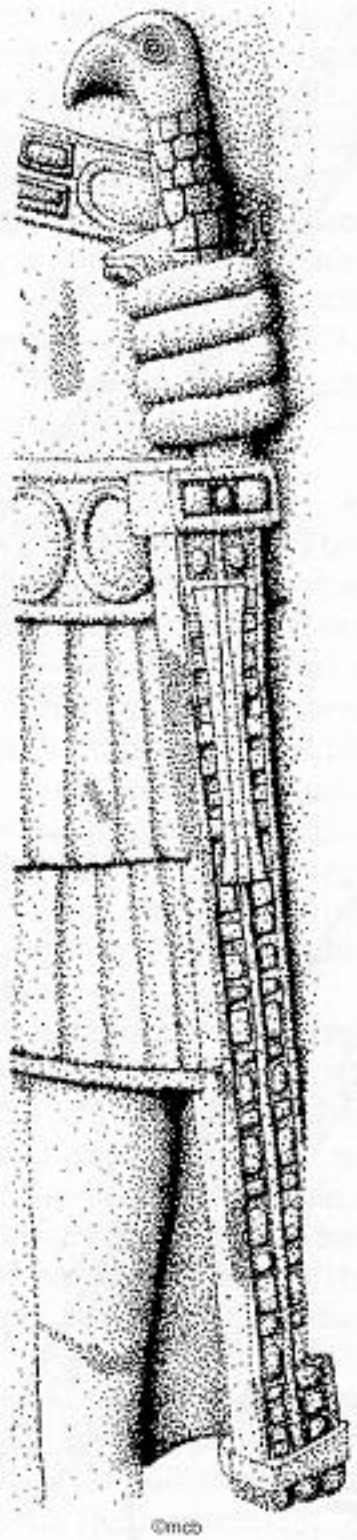
Long swords continued to be the main type of bladed weapon. Vegetius refers to these as '*spathae*' and also mentions the use of short swords (*semispathae*), but there is as yet no artefactual evidence for the latter. *Spathae* presumably continued with Ulbert's two types, and *Laetengräber* usually include swords. Swords from Nydam are stamped and pattern-welded, whilst one from Augst may represent a late example of the 'Lauriacum' type. A *spatha* from a fourth-century burial at Köln had a blade 720 mm (28 in) long and 52 mm (2 in) wide (*c.*14:1). It also had a surviving ribbed ivory grip, a narrow guard, an elliptical pommel, and a niello-inlaid, gilded silver disc-chape (W. 110 mm (4 in)). Long swords are depicted on porphyry imperial statues, gravestones and paintings, some with eagle-headed pommels.[12]



116 Dominate swords. *1* Sword (Köln); *2–5* chapes (*2* Trier; *3* Gundremmingen; *4* unknown; *5* Köln); *6* sword (Alzey).

A fragmentary leather scabbard-cover (W. 60 mm (2⅓ in)) was associated with the Deurne helmet (see below, p. 171). Chapes from Vermand, Gundremmingen, Liebenau and Trier represent a new type with an elliptical copper alloy plate attached to the end of the scabbard by three ribbed cylindrical or dome-headed copper alloy rivets. These date to the fourth and early fifth centuries, and are clearly depicted carried by the porphyry Venice Tetrarchs.[13]

Large, waisted scabbard-slides on these Venice scabbards are closely paralleled by bone slides from Niederbieber, Worms, Lorch and Nydam. The first is third century in date, whilst the others may be later. Fourth-century porphyry statues at Ravenna and Berlin depict large rectangular slides, whilst the ivory diptych of Stilicho at Monza shows a slide of German form with splayed ends. From the Tetrarchic period onwards, scabbards are occasionally represented suspended



117 Details of one of the swords of the Venice Tetrarchs. (Not to scale.)

118 The Stilicho diptych (Monza).

from a narrow baldric, but more usually from a hip-belt. This is also often narrow, corresponding with finds of narrow belt-fittings; the broad third-century type of baldric, with its characteristic plates, went out of use.[14]

Germanic weapons, the sax and the throwing-axe (*francisca*), were introduced by barbarians into the Empire from the fourth century onwards. More conventional axes were used by Roman cavalry, and one is shown on a Tetrarchic *stela* from Gamzigrad. As yet there is no evidence that the traditional double-edged Roman military dagger continued in use after the third century. Short, single-edged knives are commonly found in fourth-century graves in association with military belt-fittings. Examples from northern Spain have been found with their copper alloy openwork sheaths, which may represent a local, Iberian variant.[15]

Archery equipment and slings (Fig. 119)

Units of *sagittarii* in the *Notitia Dignitatum* were predominantly located in the eastern theatre. Vegetius advocated the arming of rear ranks in legionary battle formations with bows, presumably continuing a third-century practice.[16]

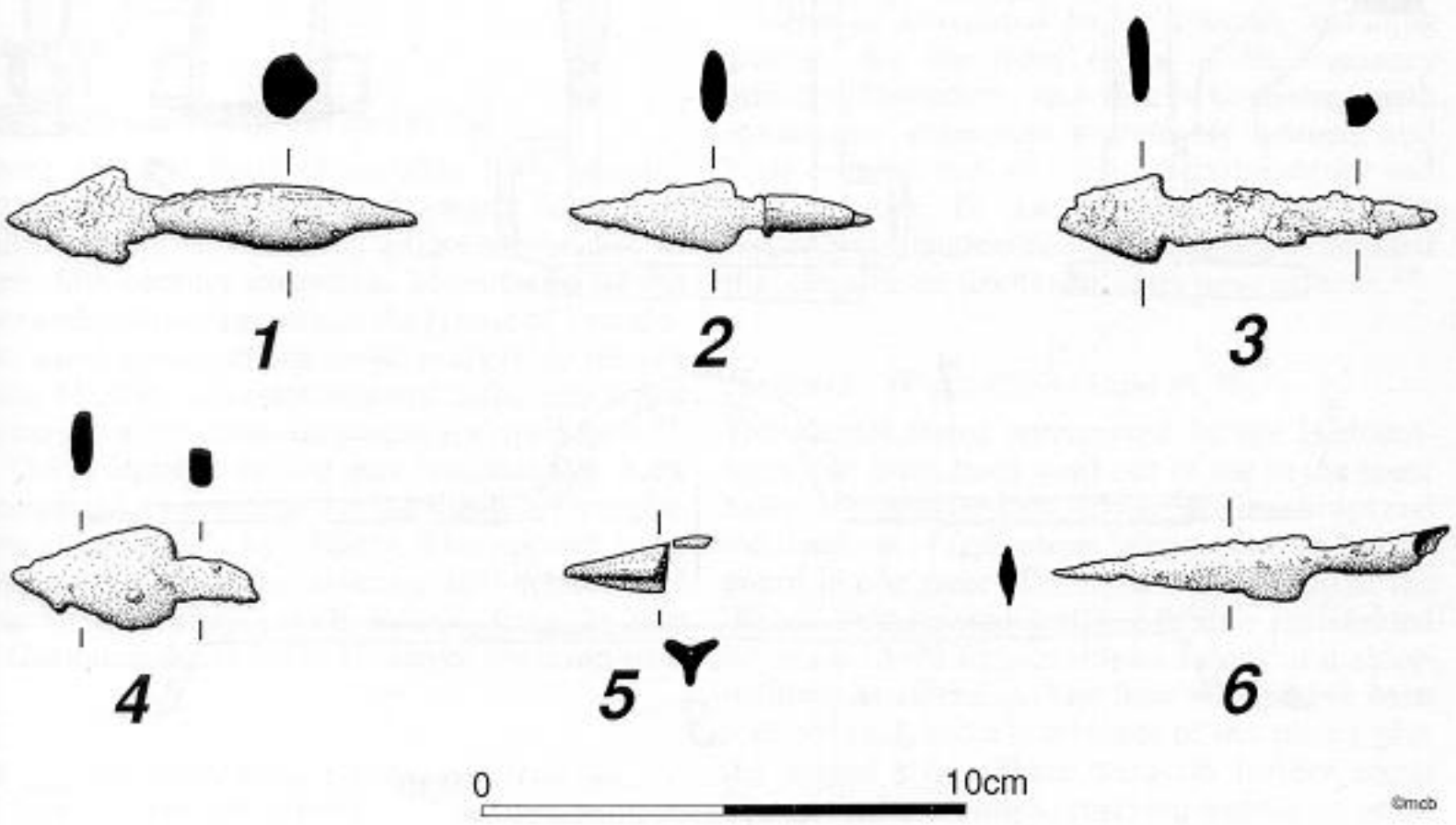
There are few securely dated fourth-century bow laths, although some of the Intercisa examples may belong to the very end of site occupation. Sarmatian bows now had laths as a result of Hunnic contacts, and burials of steppe nomads along and within the Roman frontiers complicate the picture. Early Medieval scholars have been quick to claim laths on Roman sites as evidence for nomad presence, but conflict with such peoples also necessitated Roman adoption of steppe archery equipment. Hunnic bows had pairs of ear-laths, and three laths on the grip.[17]

Vegetius also mentioned the '*arcuballista*' which may have been a crossbow using a composite bow-stave attached to a tiller, as shown on the third-century Gallic reliefs (see Chapter 7).[18]

Arrowheads from Gundremmingen and Gornea are socketed with flat, narrow triangular blades. Some 800 flat, tanged, triangular heads were found in the *principia* at Housesteads, where they were being manufactured and stored. They date to the abandonment of the fort in the late fourth or early fifth century. Tanged, lobate forms continued in use by Roman and nomad archers. One was found lodged in a man's spine in the fourth-century cemetery at Klosterneuberg. It is not clear when the 'hour-glass' steppe form of quiver came into Roman use, but it was possibly derived from the Huns during the fourth century.[19]

A group of lead sling-bullets apparently came from a fourth-century context at Vindolanda.

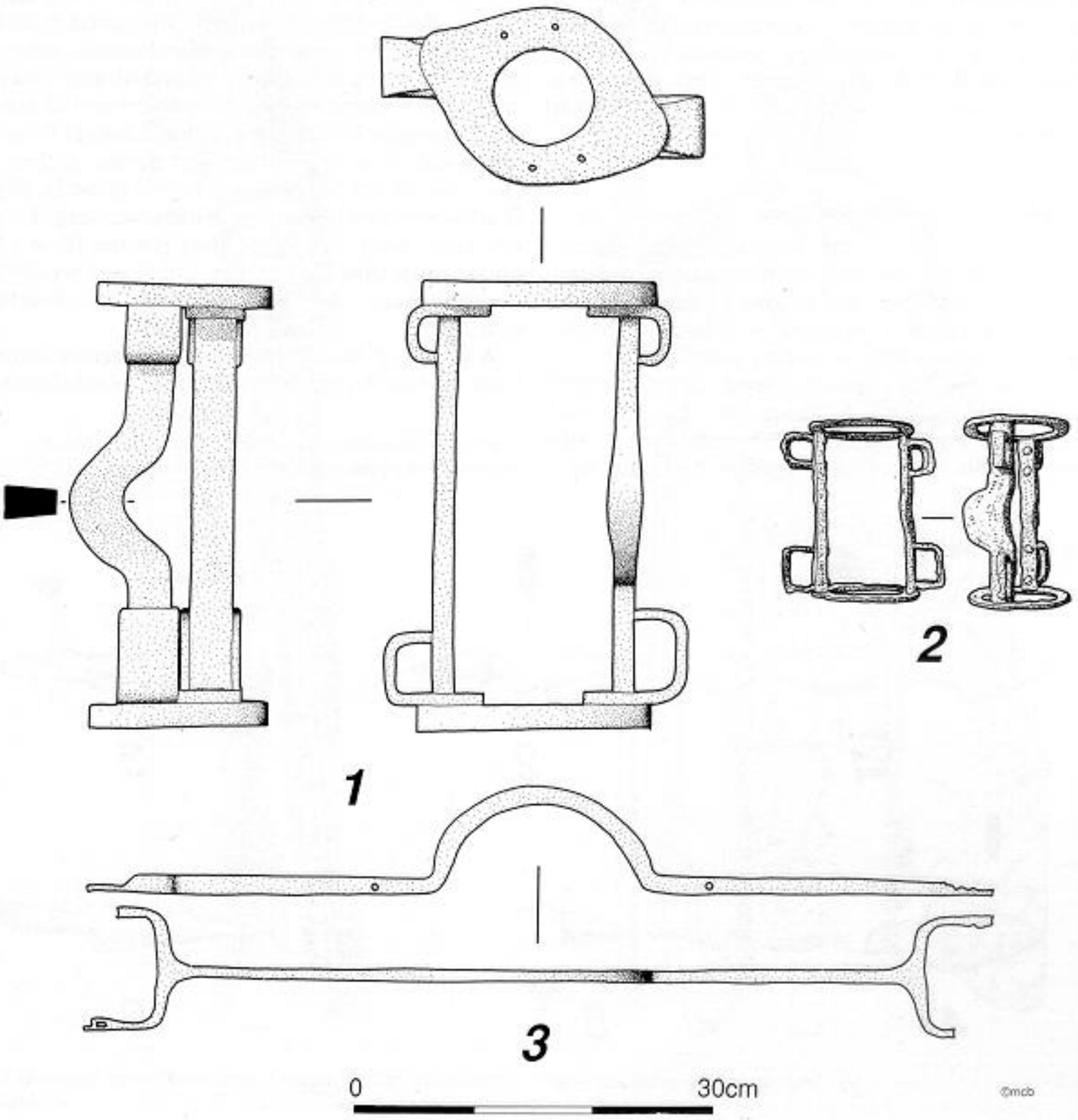
119 Dominate archery equipment. *1–6* Arrowheads (*1–4* Housesteads; *5* Klosterneuberg; *6* Gundremmingen).



Some 6000 baked clay and *c.*300 stone sling-bullets remained in the legionary *principia* at Lambaesis after Tetrarchic abandonment. Otherwise finds of late Roman sling-missiles are rare. Vegetius advocated the use of the sling and staff-sling (*fundibulus*), a sling on the end of a wooden staff measuring 4 Rft (1.18 m (3¾ ft)), within legionary formations. Slingers were present in the eastern battles described by Ammianus and Julian, and one specialist unit of *funditores* is recorded in the eastern *Notitia*. Their missiles would have been especially effective against Persian heavy armour and elephants.[20]

Artillery (Fig. 120)

Fittings from artillery-pieces found at Orşova and Gornea date to site abandonments in the late fourth century. At Orşova a field frame (*kambestrion*; Ht. 360 mm (14 in)) and an arched strut (*kamerion*; L. 1.45 m (4¾ ft)) were located in a corner-tower. They belonged to a small bolt-shooting *ballista* of the type represented on Trajan's Column. At Gornea three *kambestria* (Ht. 133, 144, 147 mm (5,5½ and 5¾ in)) were found in two corner-towers. These were from smaller weapons corresponding to the *cheiroballistra* described and illustrated by Heron and the



'*manuballista*' of Vegetius. Like Heron's belly-bow (*gastraphetes*), the *cheiroballistra* was cocked by pushing down with the stomach on a curving butt, forcing back the slider and string. The *gastraphetes* and, presumably, Vegetius' *arcuballista* were composite crossbows, whilst the Gornea weapons and his *manuballista* were torsion crossbows. Orşova-type *ballistae* were mounted on carts (*carroballistae*) for use in battle, or on walls, as in the eastern sieges described by Ammianus, and shot with great accuracy and penetrative effect. Bolt-heads did not change from earlier periods. Ammianus and Procopius referred to bolts with wooden flights, and Ammianus also described incendiary bolts similar to the Dura example.[21]

The main stone-throwing engine according to Vegetius and Ammianus was the *onager*, sometimes referred to confusingly as a '*scorpio*'. This was a weapon for siege-warfare, not open battle, which lobbed its missile with a vertical arm action like the staff-sling.[22]

Marsden suggested that the integral legionary artillery enumerated by Vegetius was formed into the separate units of *ballistarii* listed in the *Notitia*. Units of *ballistarii* are also attested in Danubian bridgehead forts where the considerable range of crossbows and artillery could have been employed advantageously. *Ballistarii* force-marched with Julian in Gaul, perhaps implying mobility and lightness of weapons.[23]

Armour

Body armour (Fig. 121 and Pl. 7a)

There are few finds of metallic body armour artefacts dating after the third century. Mail from Independenţa is a recently recovered fourth- to early fifth-century exception. Monuments of the Tetrarchy, Constantine and the House of Theodosius show mainly unarmoured soldiers, or men in scale. Muscled cuirasses followed archaizing styles rather than reflecting contemporary equipment.[24]

The sculptural record has traditionally been interpreted as evidence for the disuse of metallic armour, especially by infantry. This appears to be supported by Vegetius' assertion that helmets and armour were rarely worn by infantry from the time of Gratianus (AD367–83). However, the sculptures cannot safely be interpreted in this way, and it is possible that Vegetius was writing about eastern forces in the aftermath of the Hadrianopolis disaster (AD378). His remarks cannot be extended to the whole Empire for the entire late Roman period, as some scholars have done.[25]

Other artworks do depict armour. A fragmentary Tetrarchic(?) relief in the Vatican Museo Chiaramonti shows two soldiers wearing long-sleeved mail and scale cuirasses. An Egyptian wood sculpture of the fourth–sixth(?) century depicts a battle around a town, with Roman infantry clad in mail or scale cuirasses. A painting of a standing soldier in the Via Latina Catacomb, Rome, depicts a mail shirt extending to wrists and knees. Metallic coifs illustrated in the *Vergilius Vaticanus* have already been mentioned (see Chapter 7), and illuminations in the *Notitia Dignitatum* and the anonymous *De Rebus Bellicis* depict helmets, cuirasses and segmental metal limb-defences. In the latter manuscript there is a rare reference to a padded garment ('*thoracomachus*') of a type which would have been worn under mail in all periods.[26]

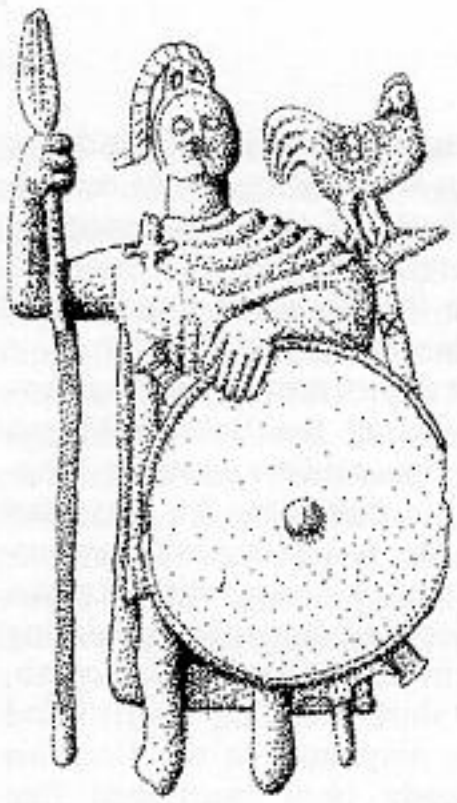
This pictorial evidence is still unsatisfactorily sparse and some of it may be relevant to cavalry as well as to infantry. Epigraphic and literary evidence indicate important reliance on especially heavily-armoured cavalry. The terms '*catafractarii*' and '*clibanarii*' used for these troops were employed interchangeably. Predictably, they were more numerous in the East than in the West.[27]

Vegetius advocated heavy armour, including greaves, for the front ranks of his legionary infantry formation, and this is consistent with Ammianus' references to infantry helmets and body armour, and with known sixth-century and later practice. In the late third to early fifth centuries the tactical climate continued to demand that close-order Roman infantry wear armour.[28]

Helmets (Figs. 122–124 and Pl. 7b)

The helmet forms represented by the Heddernheim and Buch finds went out of use in the latter half of the third century, bringing to an abrupt end the tradition of fashioning helmet-bowl and neck-guard in one piece. The most simple form of the 'Ridge' helmets that replaced them is represented by some 15–20 iron examples found in a store-building at Intercisa. The four which have been restored each had a bowl made of two pieces, plus the ridged strip. There were no further metal fittings such as hinges, carrying-handle or peak.

120 Dominate artillery fittings. *1–2 Kambestria* (*1* Gornea; *2* Orşova); *3* arched strut (Orşova).



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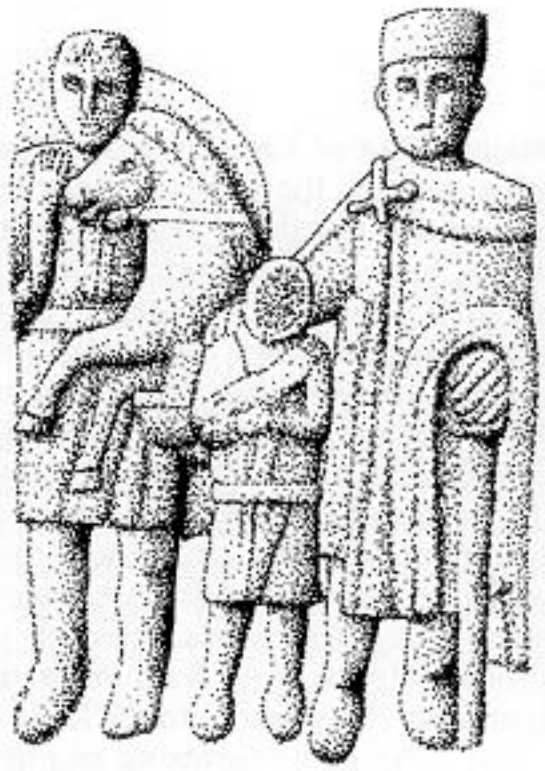

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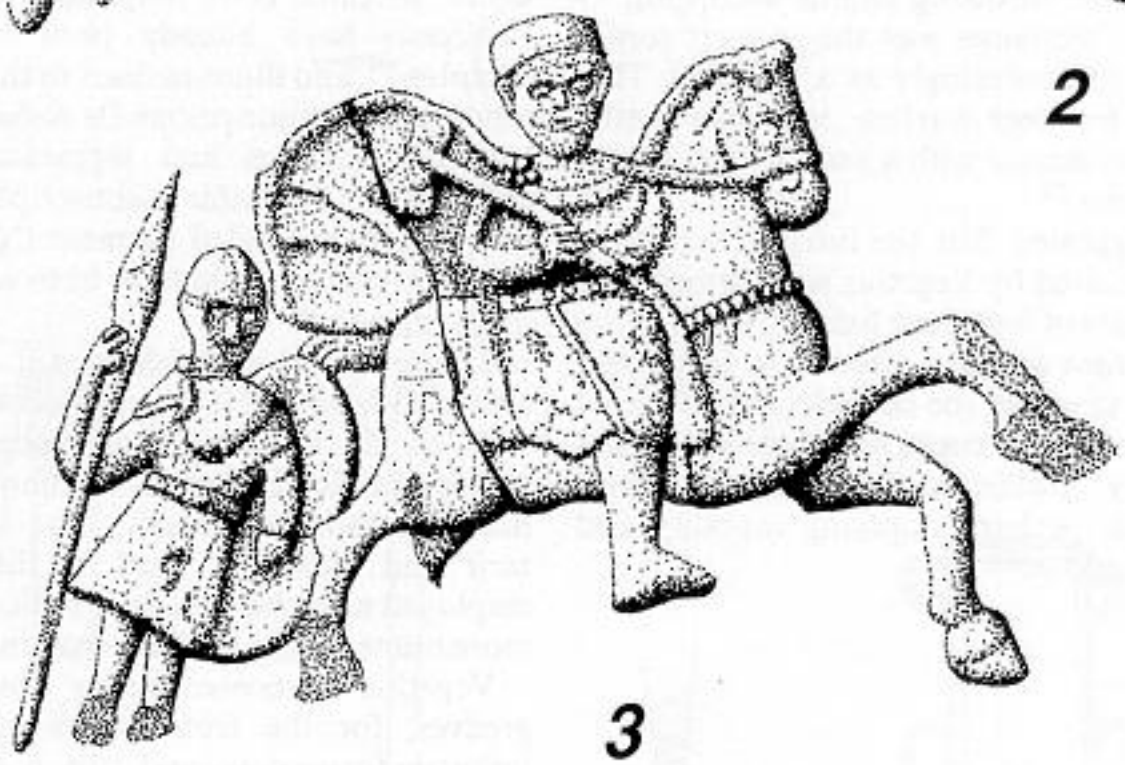

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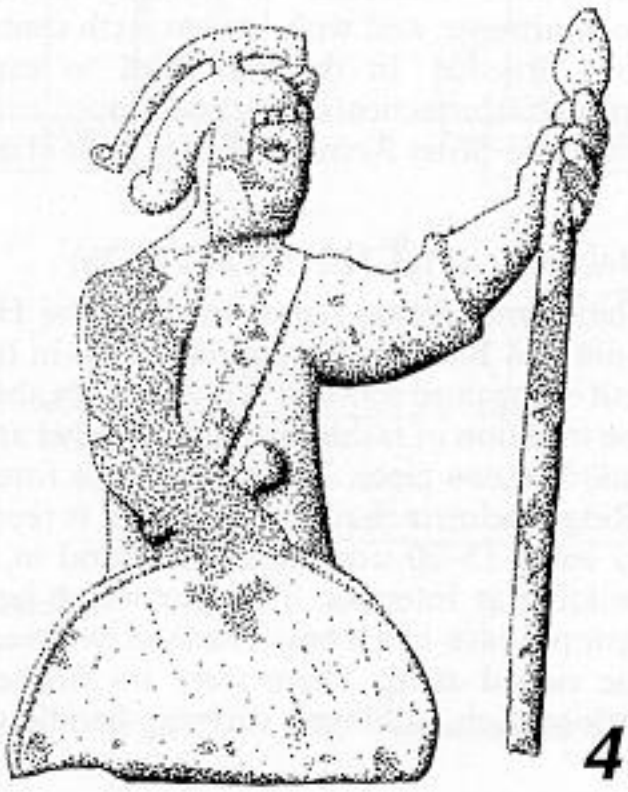

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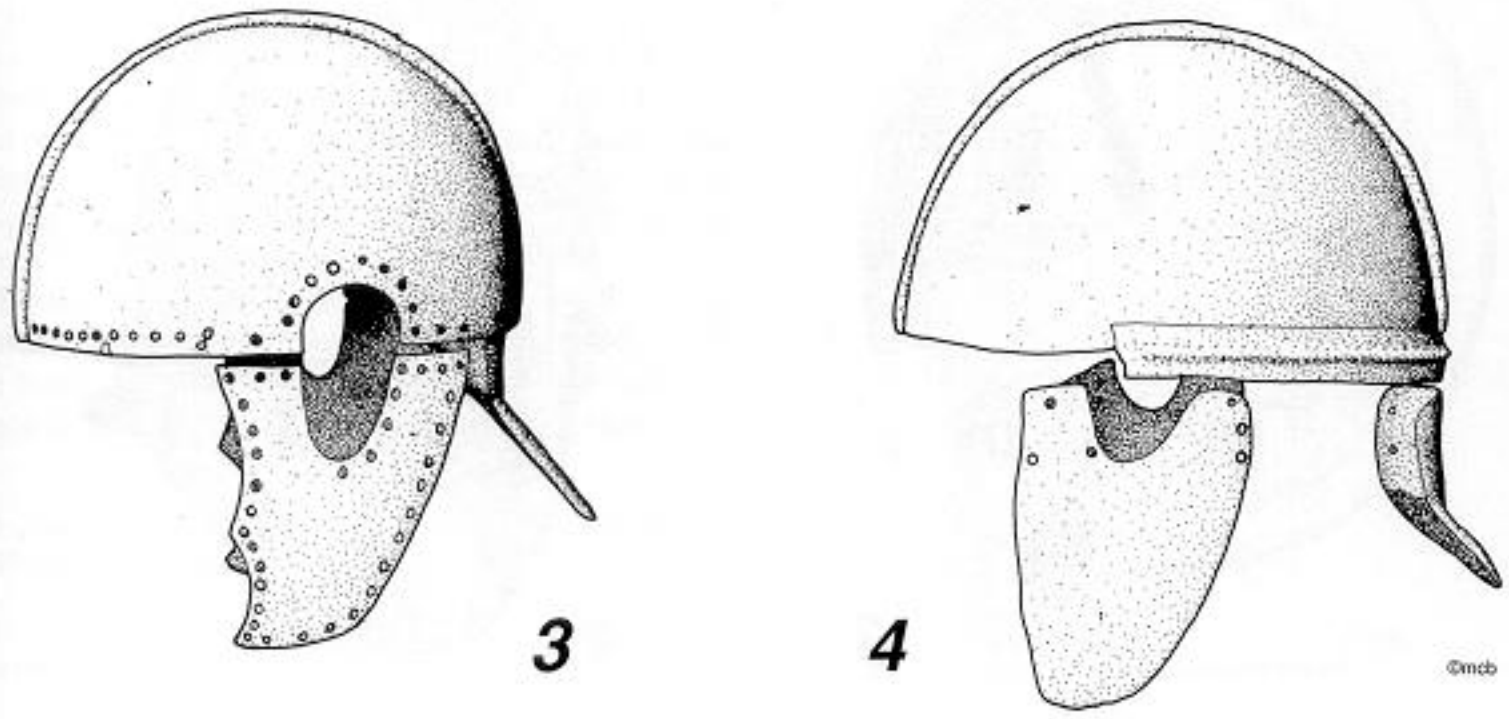
121 (*Left*) Dominate tombstones. *1* Lepontius (Strasbourg); *2* Flavius Augustalis (Aquileia); *3* unknown (Gamzigrad); *4* unknown (Linz); *5* unknown (Aquileia). (Not to scale.)

Cheek-pieces and neck-guard (W. 93–125 mm (3½–5 in)) were not directly attached to the bowl, but had holes around their edges for stitching to a leather or textile lining, itself stitched to the bowl-rim. Cuttings in the sides of each bowl and in the tops of the cheek-pieces indicate that the latter were worn over, not in front of, the ears.[29]

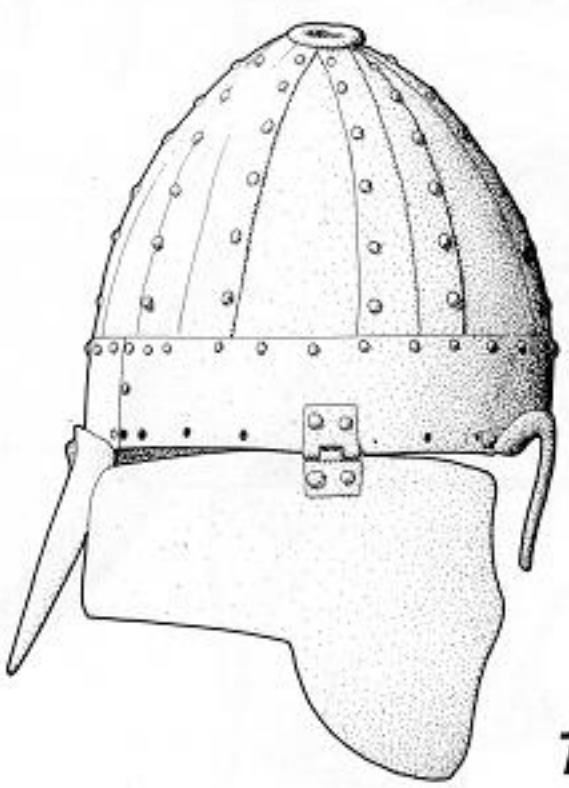
Helmets from Augst and Worms were also of the 'Intercisa' type. The Worms example had cheek-pieces with ear-cuttings, but had an additional metal strip riveted all around the outside of the bowl-rim. Slots in the neck-guard suggest attachment to the bowl by means of a pair of straps. Similar slots also occured on a neck-guard from Carnuntum.[30]

122 (*Below*) Dominate helmets. *1–2* Intercisa; *3* Augst; *4* Worms. (Not to scale.)



The traces of silver on and around the rivets of Worms and Intercisa examples, suggest that the iron components may have been concealed beneath a decorated silver sheathing like that on two bipartite bowls from Augsburg-Pfersee.[31]

Two helmets from Berkasovo represent a more complex constructional form. In each case the gilded silver sheathing survived to reproduce the structure of the lost iron helmet beneath. Helmet No. 2 had a two-part bowl, whilst No. 1 was divided up into four quarters. Each bowl had an additional band riveted around the inside of the rim. This band curved over each eye and a 'T'-shaped nasal plate was riveted to the front for additional protection. The cheek-pieces were a completely different shape from those on 'Intercisa' helmets. Each one covered almost the whole side of the wearer's head and neck (W. 160 mm ($6\frac{1}{4}$ in)), coming right forward to the cheek-bone and extending back almost to touch the narrow neck-guard (W. 150 mm (6 in)). Additional metal bands, decorated with inscribed *ansae*, were riveted to the sides of the rim-band to mask the joints between rim and cheek-pieces. Each neck-guard exhibited a pair of buckles for strap attachment to the inside rear of the bowl. Rim-band, cheek-pieces and neck-guard have rows of stitch-holes along their edges.[32]



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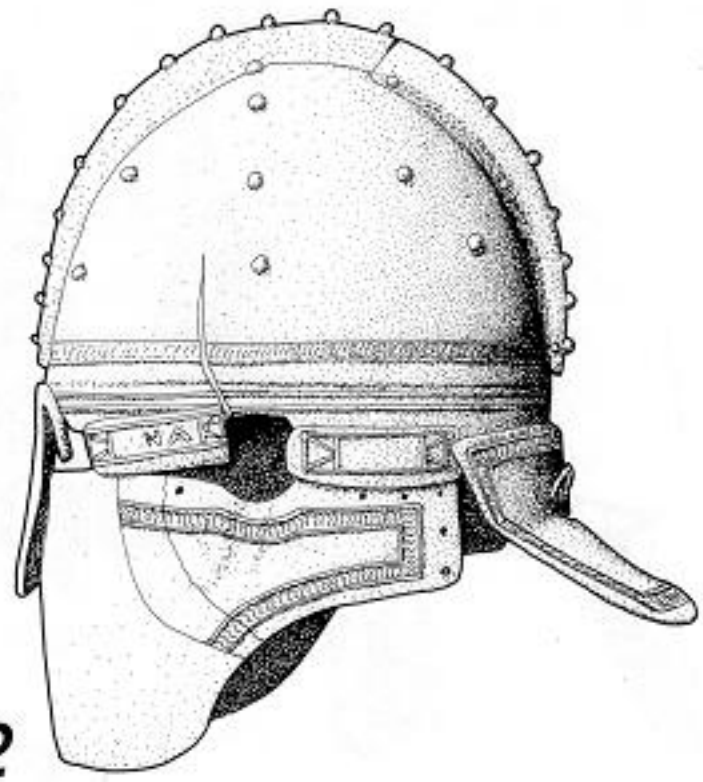

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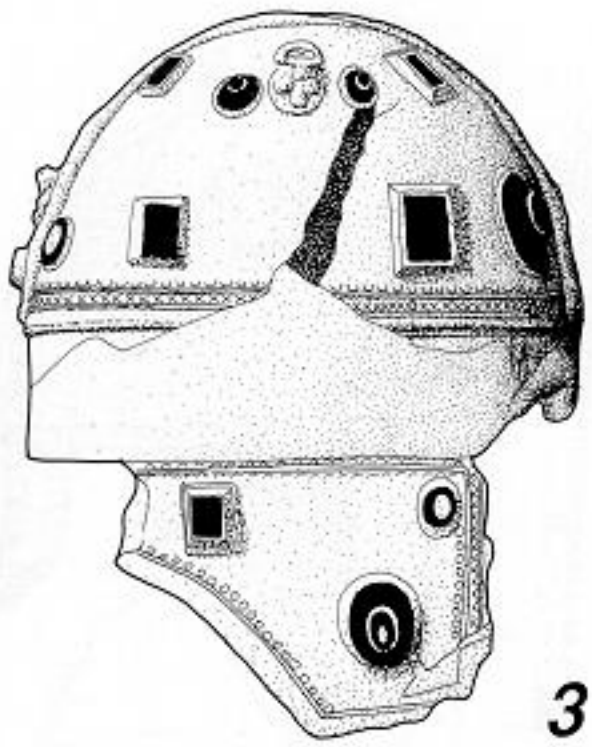

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Four-piece bowls also occurred at Burgh Castle and Conceşti. The former example survived as an undecorated iron bowl with an axial ridge-band. Each half consisted of two non-touching plates riveted together by a wide, tapering band. The same arrangement on the Conceşti helmet was accomplished in silver with the addition of a riveted rim-band and 'Berkasovo'-type cheek-pieces. A gilded silver helmet sheath from Deurne (Pl. 2d) had a four-piece bowl, but the connecting bands were so wide that it may be said to have six segments. The rim-band curved over the eyes and had a riveted nasal-piece. The cheek-pieces and buckled neck-guard had stitch-holes around their edges.[33]

A helmet recently discovered at Independenţa is apparently similar to the Conceşti find. Isolated finds of cheek-pieces and neck-guards all had stitch-hole edging. A second-century copper alloy 'Imperial'-series helmet, now at Florence, has had its neck-guard cut away and the resulting horizontal rim pierced with a series of holes. This suggests continuous use for at least a century, possibly much longer.[34]

With few exceptions, 'Ridge' helmets were highly decorated. Even the Intercisa bowls, without sheathings, all had decorative motifs chiselled or embossed on their bowls (one had crosses, another crescents, and all had a pair of lentoid 'eyes' at the front). Other sheathings had decorative domed or spherical rivet-heads and all shared in a common repertoire of circle, 'S'-shaped *strigil*, crescent, cross and dot motifs embossed in rows. The Deurne helmet had an embossed anchor on each of its six segments.

A gilded, silver-sheathed iron 'Berkasovo'-type helmet with a two-part bowl from Budapest had its rim-band embossed with *cantherus*, lion, Victoria and Jupiter figures. Like Berkasovo 1, it had glass-paste settings imitating onyx, chalcedony and emerald. They were positioned along the ridge, on the bowl, and cheek-pieces, and both helmets had large settings forming 'eyes' at the front.[35]

Berkasovo 1 had high-profile side-to-side bowl-bands delineating its four-part construction, but the main ridge axis was maintained by the attachment of a second ridge-band standing up on long-shafted rivets forming a crest. Ridge, crest, side-bands and rim-band bristled with paired globular rivet-heads. The Augst helmet had three axial slots on its ridge strip, presumably for the attachment of a crest. The crescent-decorated Intercisa helmet had a solid iron crest on its ridge.

The dating of 'Ridge' helmets depends on only a few examples. The Intercisa helmets were most likely deposited in the late fourth or early fifth century. An inscription on Berkasovo 2 has been tentatively restored as [LIC]INIANA, in reference to the emperor Licinius, dating the helmet to the period AD314–25. Figures on the Budapest helmet are closely paralleled by ingot-stamps of AD367–75, whilst the Conceşti helmet was found in an early fifth-century Hunnic grave. More conclusive is the hoard of 39 coins accompanying the Deurne helmet and containing nine pieces of AD315–17, and 30 of AD319.[36]

Crestless 'Ridge' helmets are depicted on a Tetrarchic gravestone from Gamzigrad and on heads broken off fourth-century porphyry sarcophagi. Fourth- to sixth-century coin portraits represent emperors wearing crested four-part 'Ridge' helmets with jewel decoration. Constantine I and Valentinian I certainly owned jewel-encrusted gold helmets, as would, presumably, all Dominate emperors. A coin of Constantine I exactly reproduces the riveted ridge and metal crest-band of Berkasovo 1. 'Ridge' helmets with frontal 'eyes' are seen on a *stela* from Aquileia (AD352), and on a fourth-century fresco in the Villa Maria catacomb at Syracuse, painted yellow

123 (*Left*) Dominate helmets. *1* Der el-Medineh; *2* Berkasova 2; *3* Budapest; *4* Berkasovo 1 (Not to scale.)

124 (*Right*) Coin of Constantine showing stylized Berkasovo-type helmet.

to suggest copper alloy or gilding. The general shape of crested 'Intercisa' helmets is shown on the Via Latina soldier fresco and on a Valentinianic silver dish at Geneva.[37]

Crest representations correspond with the solid iron Intercisa example and, presumably, with the crest originally attached to the Augst helmet, and Ammianus mentioned *cristae* in the second half of the fourth century. Helmets with small pairs of horns attached to the front of the bowl on the Arch of Constantine may allude to the *Cornuti*, a regiment raised by Constantine. Christian helmet badges are also recorded.[38]

Discussion about the origins, decoration and development of 'Ridge' helmets has been dominated by attempts to relate them to early medieval segmental helmets (*Spangenhelme*) of the 'Baldenheim' type. However, there was no straightforward progression in 'Ridge' helmets from simple two-part construction to four- or six-piece precursors of the *Spangenhelme*. The latter had cheek-pieces and neck-guard attached to a lining, not directly to the bowl, but they did not have an axial ridge.[39]

However, comparison of 'Ridge' helmets with Mesopotamian-Iranian helmet traditions is more productive. A true 'Ridge' helmet, with a 'T' nasal and mail aventail, was found in the mine by Dura Tower 19 and it probably belonged to a Sassanid Persian. It provides a chronological link between Parthian bowls and 'Ridge' helmet representations on Arsacid coins on one hand, and fourth-century Roman helmets on the other. James convincingly suggested that a technically undemanding oriental 'Ridge' helmet model was adopted by Roman armourers faced with supplying a greatly expanded Diocletianic army.[40]

The helmets' intrinsic value led to some surviving as bullion hoards; the Berkasovo find included silver belt-fittings. In contrast, the Intercisa helmets survived through site abandonment, probably because they had been stored for scrap after having had their silver sheathings removed. 'Ridge' helmets have been termed '*Gardehelme*'. but silver-sheathed helmets may have been widely worn by field-army soldiers, and given to individuals as a form of pay or reward, the decoration merely enriching a practical battle helmet. The Deurne helmet was inscribed STABLESIA VI, so the owner belonged to a cavalry unit of *equites Stablesiani*. Thus, helmets of the 'Berkasovo' type may have been designed for cavalry, with 'Intercisa' helmets being used by infantry.[41]

Two undated helmets from Egypt do not come within the 'Ridge' classification. One, now at Leiden, had four plates joined together by four broad strips. The second is from Der el-Medineh and had six plates. Both bowls were conical and had a circular plate riveted to the apex over the junction of the bowl strips. A broad band riveted over the rim had a line of stitch-holes near its bottom edge. A pair of narrow cheek-pieces with stitch-holes was hinged to the rim of the Leiden helmet, whilst 'Berkasovo' cheek-pieces (W. 192 mm (7½ in)) without holes were hinged to the Der el-Medineh rim. The latter curved over the eyes and had a 'T'-shaped nasal-protector. A hinged neck-guard (W. 148 mm (6 in)) was riveted to the back. Both helmets may be classed as *Spangenhelme*.[42]

Banded segmental bowls were first represented near the Roman frontiers on first-century AD Crimean frescoes. On Trajan's Column they occur amongst captured barbarian equipment with the nasals or pointed rims seen on third-century Roman helmets. Cavalry on the Arch of Galerius are the first Roman troops to be shown wearing *Spangenhelme*, and one appears on a porphyry sarcophagus head.[43]

Spangenhelme represent a constructional tradition parallel to 'Ridge' helmets, perhaps being adopted by Roman troops under trans-Danubian barbarian influence. The Egyptian artefacts have been dated to the fifth or sixth centuries AD to form a typological link between 'Ridge' and 'Baldenheim' helmets. However, their hinges link them with earlier techiques, and they may be Tetrarchic, bridging the gap between second-century *Spangenhelme* depictions and early medieval artefacts. Sixth-century 'Baldenheim' helmets in Roman use in the Balkans suggest that *Spangenhelme* alone were used after the fourth century.[44]

Vegetius referred to the '*pilleus Pannonicus*', a leather or fur cap worn under the helmet. This was the round, flat-topped cap worn by Tetrarchic emperors, by soldiers on the Arch of Constantine, and on fourth-century gravestones, sarcophagi, paintings and mosaics. Ammianus described the desperate expedient of such a cap being lowered down a desert well to soak up water in the absence of a bucket.[45]

Shields

There are few fourth-century shield-fittings from Roman sites, but fragmentary bosses from Vindolanda and Gundremmingen, for example, had circular flanges. Domed bosses continued to be

used in Free Germany alongside pointed, conical bosses, like that which occurred in a grave at Misery (Dia.150 mm (6 in)). Made of silvered iron, it had four rivets for attachment to the shield-board, and an imperial(?) figure stamped on the flange with the inscription *MAR(tenses seniores?)*, clearly identifying it as Roman. Another example from Vermand (Dia.200 mm (8 in)) had a gilded silver sheath and stone settings in the style of helmets (see above, p. 171). Both may have belonged to members of field-army units. A pointed boss is depicted on the Stilicho diptych at Monza.[46]

Other troops on the Arch of Constantine, on catacomb frescoes and on gravestones bear oval shields of size and proportions comparable to third-century use. Imperial bodyguards carry very large, broad oval shields. Circular boards are depicted with cavalry and infantry on the Arches of Galerius and Constantine on Theodosian monuments and on funerary *stelae*, perhaps signifying the adoption of the circular German shield-form (see Chapter 7).[47]

Considerable evidence for fourth-century shield-blazons is provided by the *Notitia Dignitatum* manuscript illuminations (a shield for each regiment). These have been viewed as an invaluable guide to unit emblems, and the types of blazons (Pl. 8) with imperial busts, Victories, totemic animals, confronting animal-heads and geometric shapes certainly find late parallels.[48]

There are similarities with the Dura rectangular shield motifs. Eagle and Hercules blazons (and one lion) on the Arch of Galerius may identify guard units accompanying Diocletianus Iovius and Maximinus Herculius, or may merely be Tetrarchic propaganda symbolism. Confronting wolf- or goat-heads are seen on the Valentinianic Geneva dish (see Fig. 7) and on a pedestal relief of the Arch of Constantine. The goat-blazons may identify the *Cornuti*. Moreover, Ammianus stated that barbarians recognized units by their blazons (*insignia*) before the Battle of Argentorate (Strasbourg).[49]

Unfortunately for this neat picture, Grigg's detailed analysis of the *Notitia* manuscripts concluded that the original scribe/illustrator mixed known badges with reasonable suppositions based on unit titles, and pure invention. As he progressed, his inventiveness declined and blazons became increasingly stereotyped and plain. The Christian *chi-rho* motifs of Theodosian and later monuments are missing from the *Notitia*, which included the type of blazons current in the fourth century, but these cannot be related to specific listed units.[50]

Belts (Figs. 125–131)

Funerary contexts provide most evidence for belt-types, but they have serious limitations. Few graves are numismatically dated, the remainder depend upon even less secure means. Moreover, the geographical spread of fitting-types reflects the distribution of burial practices, not necessarily the whole area of artefact-use. Thus the evidence is biased towards southern Britain, northern France, the Rhineland and the Upper Danube. Considerably less is known about fourth-century belts used in other regions. Belts were often laid beside or at the feet of the corpse, not worn. Examples from Augst have surviving traces of goatskin leather.[51]

Broad belts continued to be worn throughout the period and belt-stiffening appliqués continue to be depicted. Ring-buckles do not appear in Tetrarchic representational sources, although some individual items of third-century equipment had a residual life. Varying widths of belt were worn (W. 21–83 mm (1–3¼ in)), fastened by many loop- or tongue-buckle types with lancet, amphora and circular-shaped strap-ends. The motto 'VTERE FELIX' was occasionally inscribed on buckle-plates, but not applied as separately cast letters.[52]

The fourth-century military 'propeller' belt-stiffener had a central roundel and two opposing triangular projections (L. 22–37; 40–56 mm (1–1½; 1½–2 in)). These first appear decorating a woman's belt on a second-century gravestone from Intercisa, suggesting a Danubian origin, and are next seen in military use on the Arch of Constantine and on the Piazza Armerina animal-gathering mosaic.

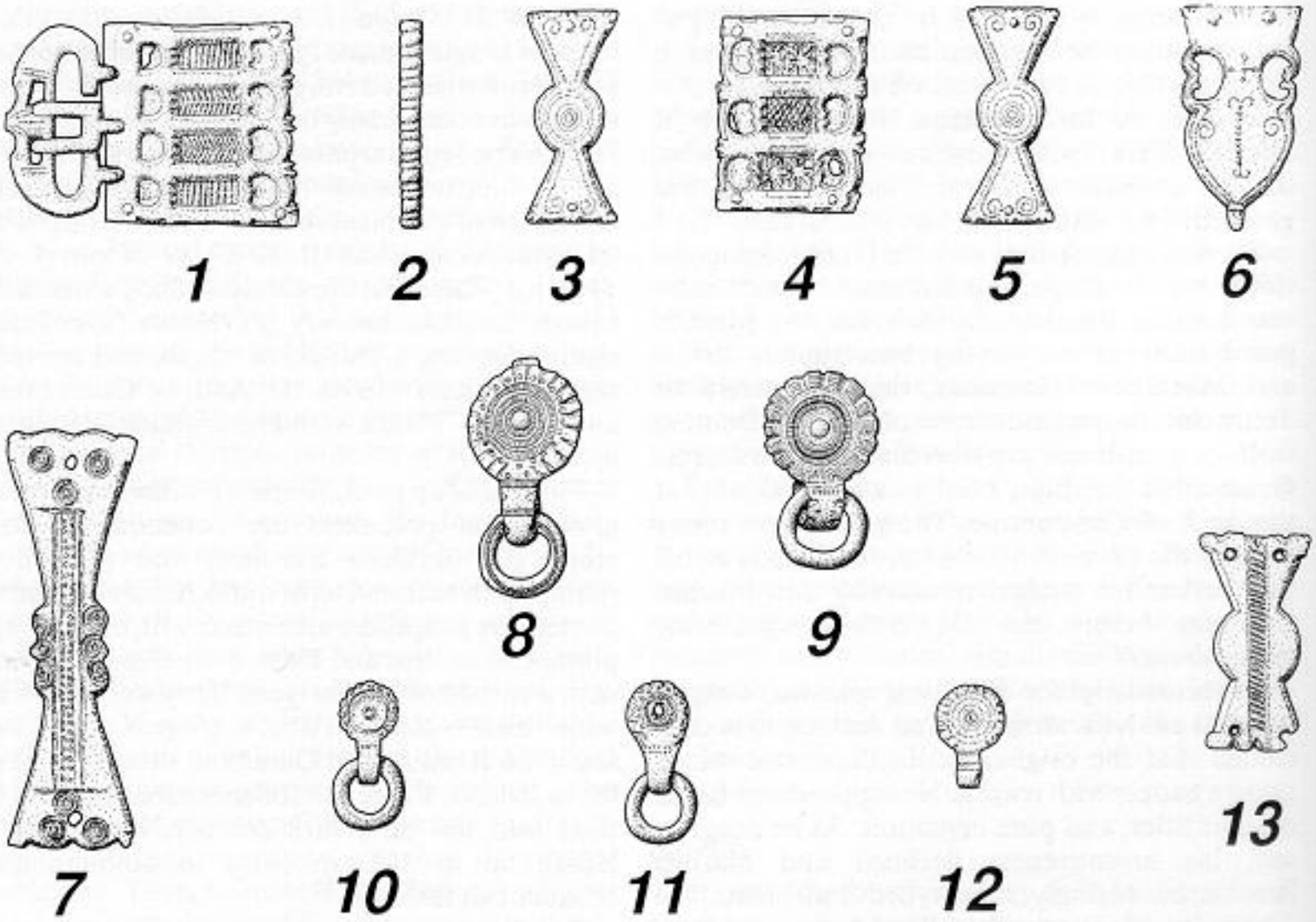
Full sets of up to ten propeller-stiffeners occur in graves: odd propellers are common site-finds along the northern frontiers, and two silver examples were found with the Berkasovo helmets. Sometimes propellers alternated with circular appliqués, as at Pecs and Köln. Propellers are found with a variety of buckle types. They were also cast with buckle-plates (W. *c.*40–50 mm (1½–2 in)) found on Rhenish and Danubian sites, but not so far in Britain. Propeller-stiffeners continued to be used into the early fifth century, increasing in length up to 105 mm (4 in) to accommodate broader belt fashions.[53]

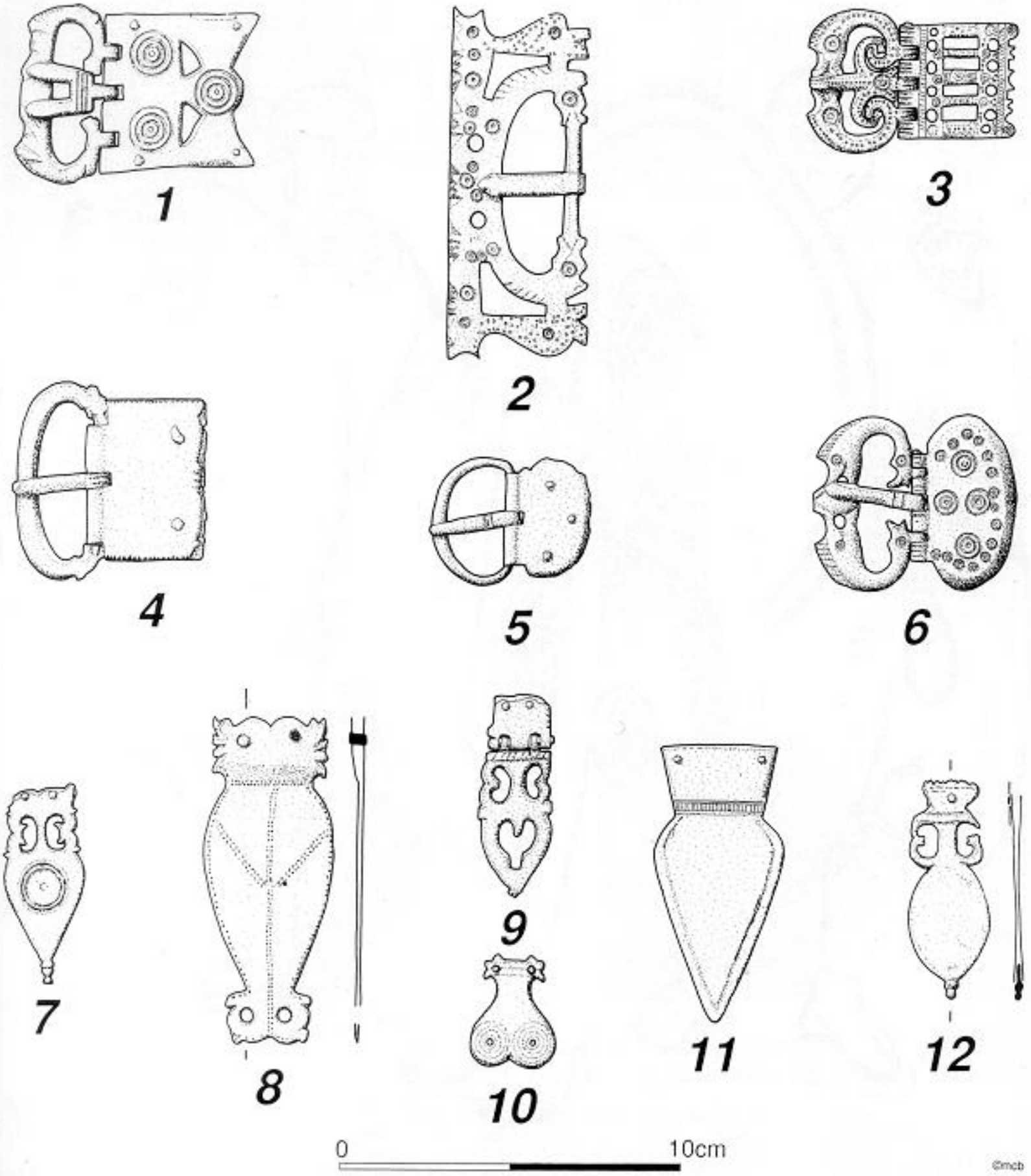
Another type of buckle associated with propeller-stiffeners had a rectangular openwork frame-plate (W. 38–66 mm (1½–2½ in)) with a

hinged tongue-and-buckle-loop. Finds from Britain, the Rhineland and northern France had loops which were curved and plain, or curved with confronting, head-to-head dolphin decoration. In the Danubian region the loops were normally rectangular. The same distribution of loop-types applies for propeller-buckles.[54]

During the second half of the fourth century, very broad, highly-decorated belts were worn (W. 50–100 mm (2–4 in)), with rectangular and pentagonal copper alloy plates on both ends, some of which had tubular edging. The latter were fastened by a narrow strap attached behind one plate and running through a buckle on the other. The buckle-loop had ornamental dolphins facing towards the hinge, not head-to-head. Variously-shaped additional plates stiffened and decorated the body of the belt, some also having tubular edging. All the plates and the strap-end were covered with 'chip-carved' geometric decoration. An undisturbed full set came from a grave at Oudenburg, for example, and another was recently found in London. Odd pieces occurred on fort sites such as Alzey, Carnuntum and Lambaesis. They are mainly distributed in south-east England, across northern France, along the Rhine and Upper Danube, in north-eastern Italy and northern Yugoslavia, but with odd finds from Spain and North Africa. Comparatively few occur beyond the Roman frontiers.[55]

A less ornate wide belt-type, up to 140 mm (5½ in) wide, and lacking the large chip-carved plates, is represented by relatively undisturbed grave finds from Winchester, Oudenburg and Galdenberg bei Cuxhaven. Some belts had long, narrow stiffeners vertically applied around the wearer's waist. The belt-ends butted together with narrow tubular-edged plates. A narrow strap bearing a dolphin-loop buckle with a small plate was stitched or riveted to the face of the belt near one end, whilst a second narrow strap was attached to the other end. After the latter was locked by the buckle it passed through a vertical slide, before hanging down loosely with a tongue, lancet or circular terminal. Some belts had rings attached to their lower edges by rivets with small circular,



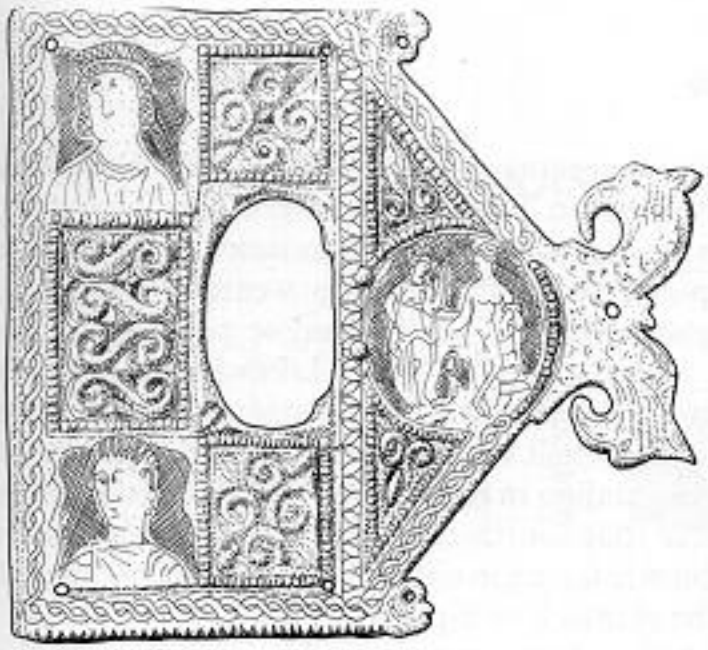


125 (*Left*) Dominate belt-fittings. *1–6* Zenkövárkony (*1* buckle and plate; *2* stiffener; *3, 5* propeller-stiffeners; *4* plate; *6* strap-terminal); *7* propeller-stiffener (Neuss); *8–9* rings (Vermand); *10–12* rings (Richborough); *13* propeller-stiffener (Richborough).

126 (*Above*) Dominate buckles (*1–6*) and strap-ends (*7–12*). *1* Niederbreisig, Germany; *2* Catterick; *3* Colchester; *4–6* Winchester; *7* Aquileia; *8* Winchester; *9* Ságvár; *10–11* Carnuntum; *12* Winchester.

127 (*Above*) Piazza Armerina mosaic figures.

128 (*Right*) Dominate chip-carved fittings. *1–2* Buckle-plates (*1* 'Italy'; *2* Lambaesis); *3* strap-terminal (Trier); *4–6* belt mounts (*4* Alzey; *5* Orşova; *6* Carnuntum); *7–8* buckle-plates (*7* Alzey; *8* Bad Kreuznach); *9–14* set of fittings (Oudenburg).



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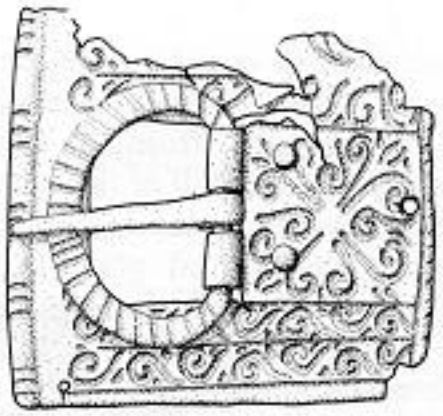

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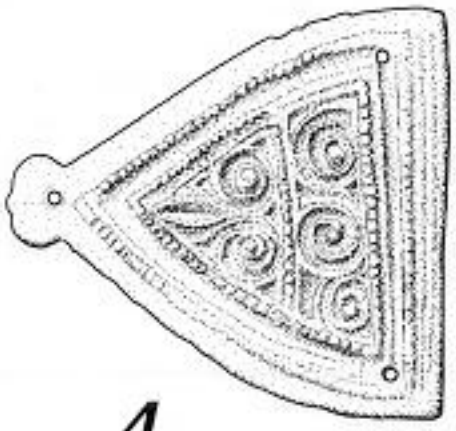

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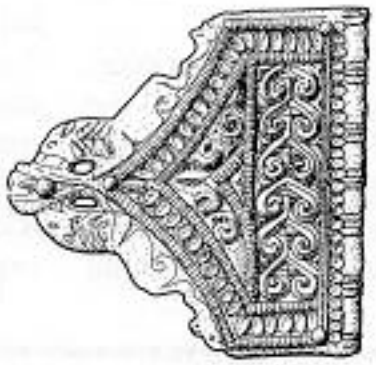

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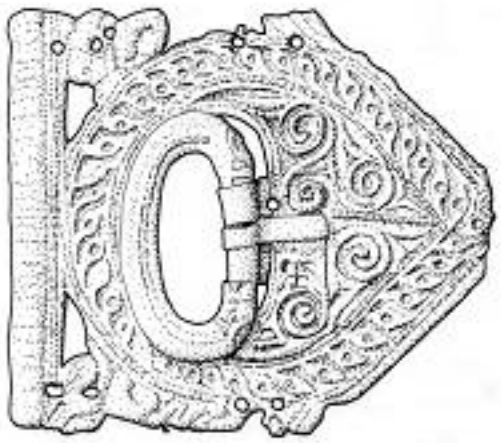

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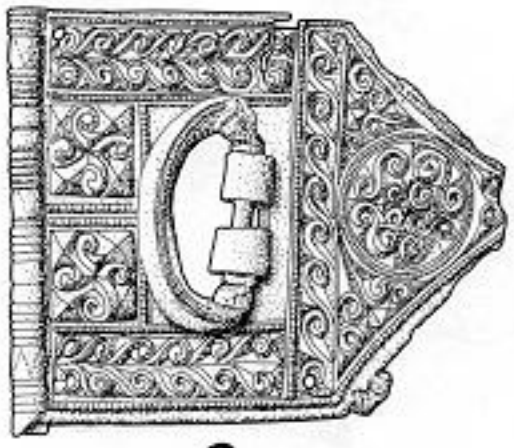

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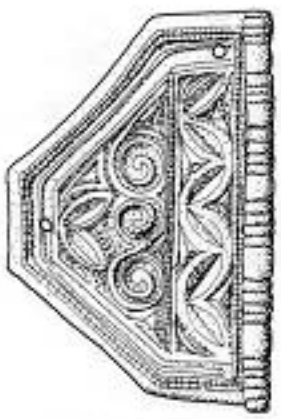

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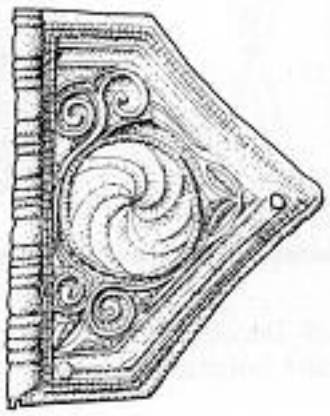

13

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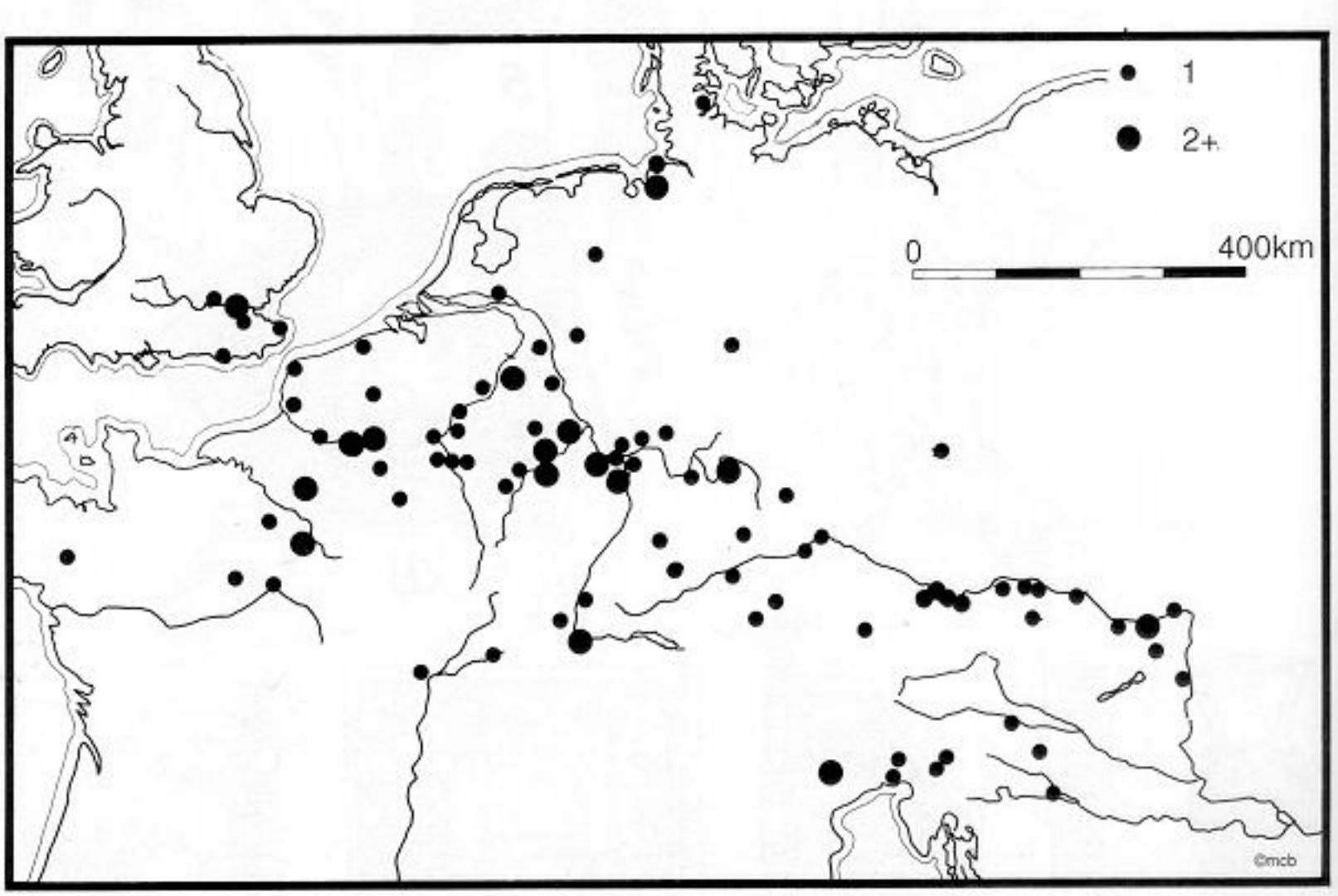
rosette plates. These fittings occur in southern England, and across northern France to north-western Germany beyond the frontier. Most scholars date them to the second half of the fourth and first two decades of the fifth centuries, contemporary with the large chip-carved plate belts. Böhme ascribed them to the first half of the fifth century.[56]

Bullinger interpreted the rings-with-rosettes on belt edges as attachment-points for a narrow shoulder-belt. However, the waist-belt was probably not weighed down by a sword on one side, so shoulder-support was unnecessary. These rings were more likely for the attachment of a knife, pouch or utensils. A similar provision may be observed below some 'E' letters on third-century VTERE FELIX belts.[57]

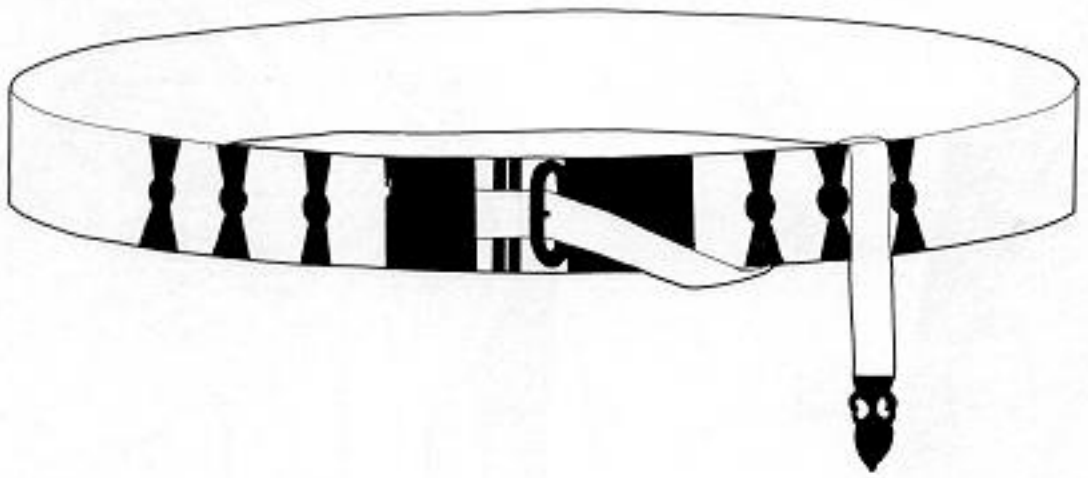
Buckles on a propeller-belt in Zengövarkóny Grave 10, and a belt with narrow stiffeners in the Winchester Lankhills Grave 376, were both worn with the buckle-tongue pointing to the wearer's right and the narrow strap passing through from right to left. A porphyry imperial statue at Vienna shows the same alignment, but the buckle is positioned on the wearer's right hip. However, belts in the Piazza Armerina mosaics clearly have a strap-end tucked up on the wearers' right hip, suggesting both a buckle-tongue pointing to the left, and a very long strap. Likewise a porphyry statue at Ravenna has a long strap wrapped twice around the belt before hanging down at the right hip and ending in a hinged terminal. It would thus appear that fourth-century belts were worn with the buckle facing in either direction and positioned on the stomach or hip.[58]

Scholars have associated chip-carving with the recruitment of Germans into Roman armies. However, some plates incorporate Classical motifs within the geometric scheme; chip-carved fittings are not usually found in the so-called *Laetengräber*; and few occur in Free Germany, suggesting development and use by regular Roman troops. These belts were worn by Roman soldiers, militarized late Roman government officials, and, doubtless, by Germans equipped by the regular army.[59]

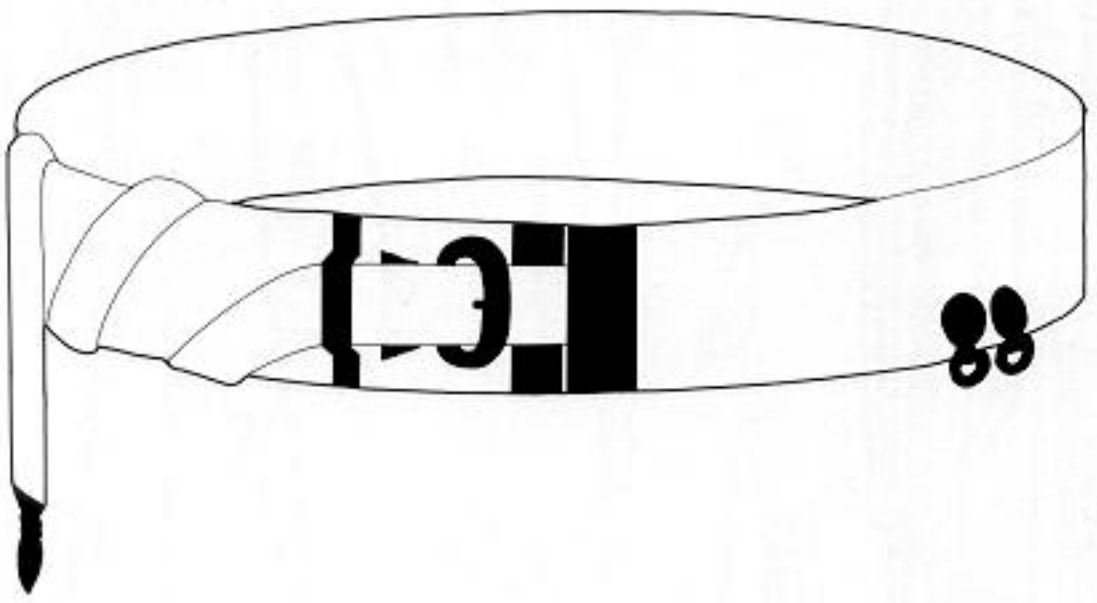


129 Distribution map of chip-carved fittings. (After Sommer 1984; Böhme 1986.)

ZENGOVARKARHONY



GALDENBURG BEI CUXHAVEN



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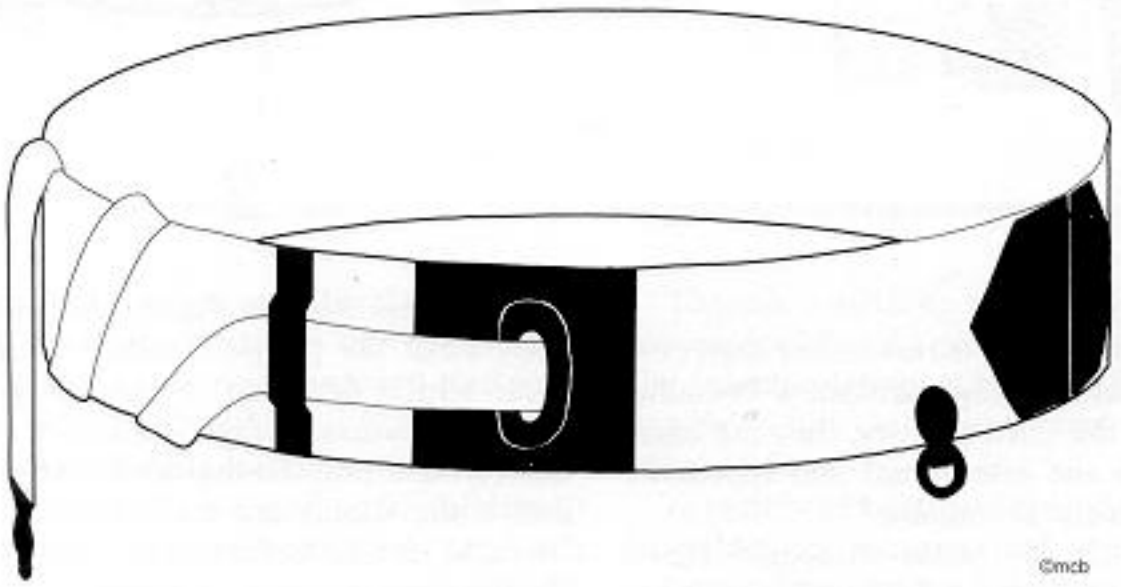

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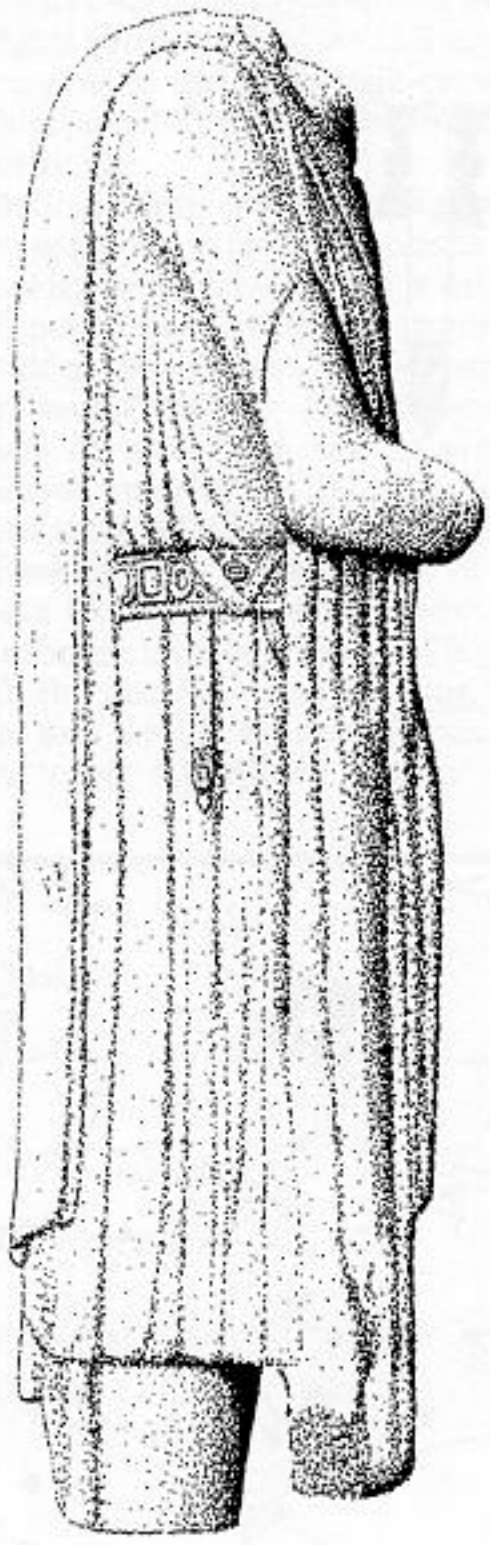
130 Dominate belt reconstructions. (Not to scale.)

131 (*Below*) Belts on *chlamys* statues from Ravenna (*1*) and Vienna (*2*). (Not to scale.)



1

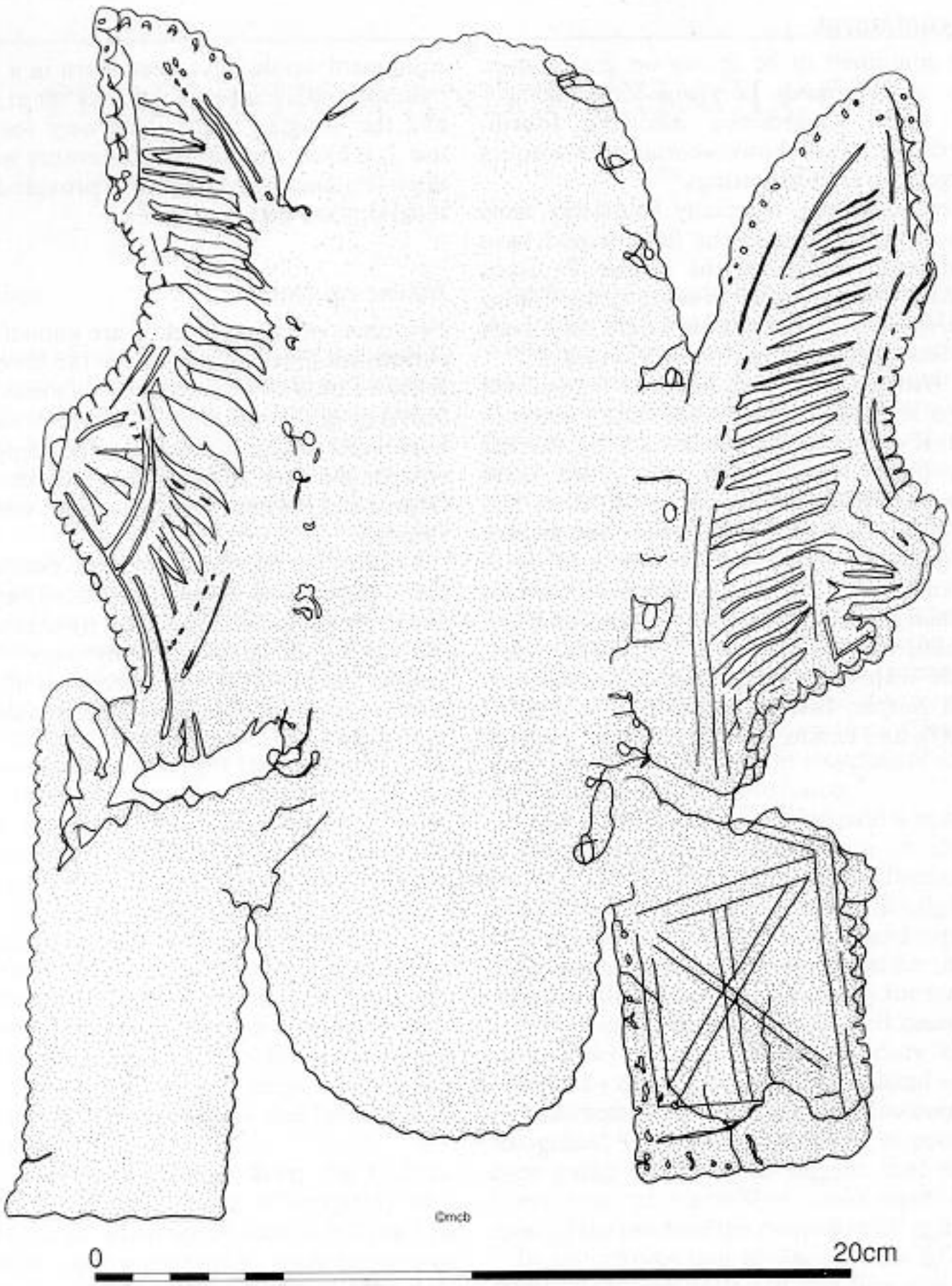
2

132 (*Right*) Dominate footwear. Decorated shoe from Deurne.

Clothing (Fig. 132)

Long-sleeved tunics, tight trousers and *saga* continued to be worn. Although crossbow brooches were used during the third century, they are much more common in the artefactual and representational sources for the Dominate.[60]

Exceptionally, the Syracuse catacomb fresco depicts a red tunic (Pl. 7b). White tunics continue to be shown on the Luxor and Via Latina frescoes (Pl. 7a), and on the Piazza Armerina mosaics. They have the purple bands on cuffs, hem and chest which are seen on earlier garments, but exhibit additional large, patterned, purple roundels (*orbiculi*) on the shoulders and skirt. Both red and white tunics are mentioned in the *Historia Augusta*, details perhaps based on fourth-century clothing (see below, p. 182). Cloaks are brown and also have *orbiculi*.[61]



Contemporary bleached or natural wool tunics found in Egypt were woven in one piece from sleeve to sleeve, with a slit neck-opening, and sewn up the sides. Purple decoration was woven into the fabric, or tapestry panels were sewn on. 'Purple' shades vary from dark red and reddish-blue to brown; true purple obtained from *Murex* shell-fish was too costly for general use, indigo and madder or kermes dyes being substituted.[62]

There is a striking similarity between tapestry-woven motifs and chip-carved metalwork, with the former perhaps directly influencing the latter in a deliberate matching of decoration on different items of dress.[63]

A variety of open and closed shoes are depicted in paintings, mosaics and sculpture, and three non-matching leather shoes were found associated with the Deurne helmet.[64]

Other equipment

Officers continued to be shown on gravestones, frescoes and mosaics carrying long, domed-headed staffs. Guardsmen escorting fourth-century emperors are shown wearing neck-torques with large central jewel-settings.[65]

Soldiers in transit, especially field-army units away from towns and in the field, would have required tents. In AD296 the soldier Paniskos wrote to his wife asking her to bring fittings for his tent (*papilionos*). Digging tools would have been used by troops engaged in construction work.[66]

The *Historia Augusta* itemized equipment issued on imperial orders to the future emperor Claudius II when he was a tribune in Syria: two red military tunics; two cloaks; two gilded silver brooches; one gold brooch; one gilded silver belt (*balteus*); one ring with gem-stones; one armlet, one torque; one gilded helmet; two gold-inlaid shields; one *lorica*; two javelins or spears (*lanceas Herculianas*); two more shafted weapons (*aclides*); two sickles; two scythes for hay; one white part-silk tunic with Girbitan purple; one tunic with Moorish purple; two white tunics; one pair of leggings(?); and two togas. Clothing and pieces of equipment would have been worn in a variety of military and social contexts, not all at one time, and the foraging implements were for servants' use. It is likely that the fourth-century writer drew upon contemporary practice to provide detail for a third-century personality.[67]

Equine equipment

Few items of riding harness are known from this period, but the continued use of the horned saddle is shown on a silver dish from Yugoslavia and on the Arch of Constantine. This type of saddle may have been finally replaced by the steppe arched type in the fifth century. Bits are known from Orşova and Berkasovo, whilst a spur was found at Deurne.[68]

None of the fourth-century gravestones of western *catafractarii* depict horse-armour, perhaps due to artistic convention. Heavily-armoured *Notitia* cavalry units undoubtedly wore the horse-armour necessitated by archery in the eastern theatre, as they certainly continued to do after the fourth century.[69]

9

PRODUCTION AND TECHNOLOGY

Production

The question of how Rome produced matériel to equip her armies is central both for an understanding of military equipment at the artefactual level, and for an appreciation of the wider relevance of the whole subject to the study of Roman society and culture. Older, simplistic views – that there were vast factories in Rome churning out equipment to supply the frontier armies – will no longer suffice. More recently, it has become generally accepted that arms were privately manufactured, perhaps with some sort of state control. However, this view may now also be modified and refined.[1]

From the time of the Punic Wars, Republican armies depended heavily (but not exclusively) upon Classical cities to supply their material needs when in the field. In this, they were merely following the traditions established by earlier military powers; in 399BC, Dionysius I hired the best craftsmen from around the Mediterranean to equip his forces. He supplied them with examples of the equipment his men already used and set them to work wherever there was space in Syracuse; Diodorus Siculus mentioned porticoes, back rooms in temples, gymnasia, colonnades in the market place and even in houses. Offering financial incentives, he got them to produce 140,000 sets of shields, daggers and helmets, and 14,000 cuirasses.[2]

During the Second Punic War, the Carthaginians used Carthago Nova (Cartagena) as a huge arsenal and, when Scipio took it in 210BC, he put the 2000 captive artisans to work to provide munitions for him in '*officina publica*'. The production potential of the Classical city was spectacularly demonstrated during the Third Punic War when the people of Carthage, having been persuaded to give up their weapons (enough armour for 200,000 men) to Rome, changed their minds and started rearming. Using everybody in the city, working day and night, a daily production figure was achieved of 100 shields, 300 swords, 1000 artillery missiles, and 500 darts and javelins, as well as catapults.[3]

In Spain, Sertorius replaced the equipment of his troops with the help of his allies, and set up a workshop (*officina publica*) staffed with smiths, for whom he produced a production schedule. Cicero mentions that Calpurnius Piso ran an arms factory (*officina armorum*) in Macedonia and that his father had been responsible for arms supply during the Social War. Some needs were also met by contracts: in 209BC, money was allotted for contracts to supply clothing to the army in Spain. In Africa, Scipio Africanus was sent clothing, grain and weapons from Sicily for his troops.[4]

The army was capable of producing its own weaponry, however, as greave presses from Cáceres demonstrate. Likewise, the very fact of military equipment surviving from Cáceres and the Numantine sites hints at recycling of scrap and some involvement in production.[5]

Production during the Principate is much more problematical than manufacture in the other periods. The predominant view was formulated by MacMullen in 1960, based upon inscriptions on armour. He saw the Praetorian Guard supplied by the *armamentarium* at Rome, whilst for the rest of the army 'the main source of supply for arms in the earlier Empire was small shops and dealers. Fine armor [*sic*] beyond the call of duty could be ordered by the military swell from local artists, or was hawked about in the camps.' However, he also recognized the role of the army in production, even going so far as to suggest that the West Compound at Corbridge could have supplied most of the needs of the entire British garrison.[6]

In his introduction to *The Armour of Imperial Rome*, Robinson followed this line, seeing army workshops as normally serving just to repair equipment and only actually producing material in emergencies. However, Oldenstein used the evidence of scrap and half-finished items to show that the second- and third-century army was producing equipment along the German and Raetian frontiers. He subsequently outlined a process which moved away from long-distance hinterland supply towards manufacture by the army, dependent upon the Romanization of the

frontier zone. Other commentators have sought to involve civilian Celtic metalworkers, perhaps even in slave-labour camps.[7]

However, it is not necessary to insist that production was either the preserve of some centralized authority, or farmed out to vast numbers of civilian craftsmen, and it is a mistake in equipment studies to treat the Empire as a single, culturally homogeneous entity. The movement of Rome's armies away from the Mediterranean littoral and regions of Classical urbanization meant that one of the main means of re-equipping armies under the Republic – relying on the *poleis* – was no longer available, especially in the Celto-German north-west. As a result, armies in this region developed self-sufficiency in equipment manufacture, seen in Vegetius' discussion of legionary production.[8]

As we saw in Chapter 2, one of the main forms in which military equipment entered the archaeological record during the first century AD was as scrap awaiting recycling. This implies that the army was directly involved in reworking metal, possibly even in the production of finished items. This is convincing evidence when considered alongside traces of actual production activities on military sites (ingots, crucibles, moulds, unfinished items, tools).[9]

A collection of copper alloy offcuts, together with crucibles, came from the first-century AD fort at Rheingönheim, whilst the base at Colchester Sheepen produced crucibles and an ingot of *orichalcum* with a very high zinc content. Smithing is more difficult to identify, not least because the hearths used for this were in all probability raised to a comfortable working height. Part of an iron cavalry 'sports' helmet mask was found at the Augustan base of Haltern corroded to an anvil, and whilst this is not proof, it suggests manufacturing activity at the site.[10]

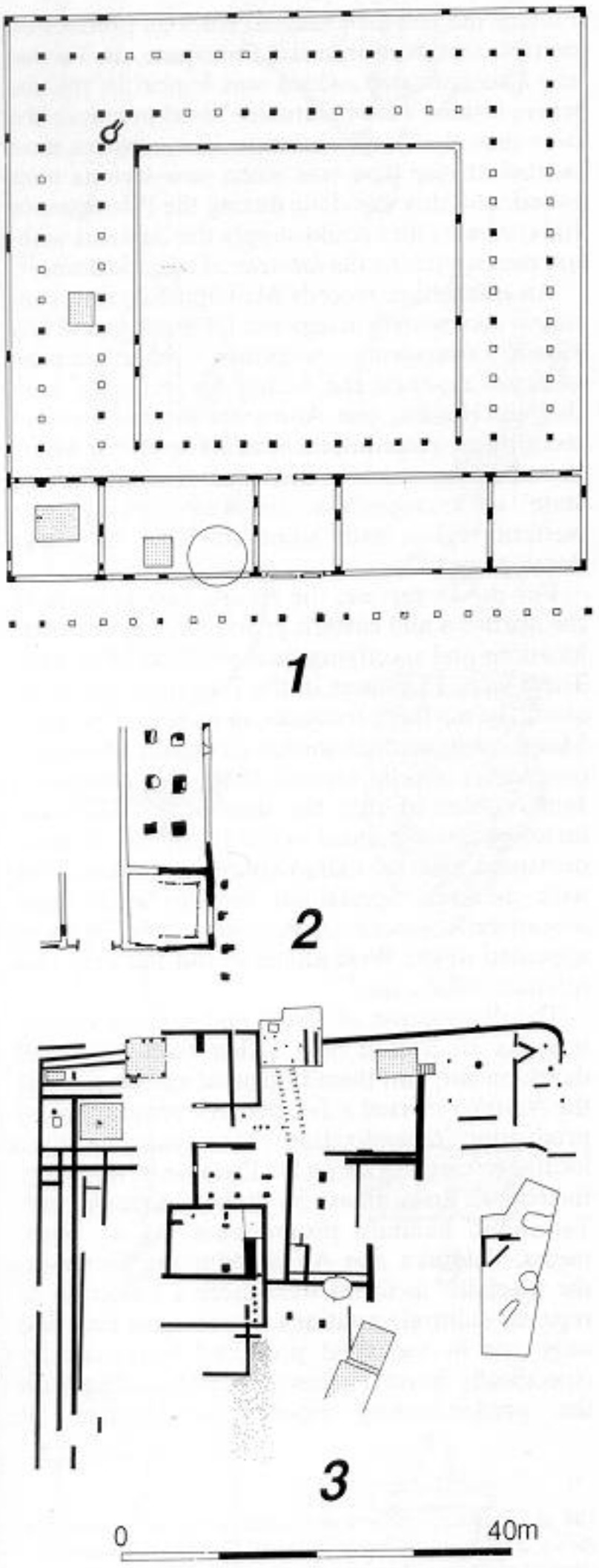
Fabricae have not often been clearly identified in the archaeological record, perhaps because attention has been diverted by metalworking in other excavated structures, probably last-minute activity prior to demolition. One class of courtyard building, typified by examples at Oberstimm and Valkenburg, has long been thought to represent *fabricae*, but this view is unfounded. More convincing are structures at Inchtuthil, Exeter and Hofheim, which were closely associated with substantial industrial processes (Fig. 133).[11]

The large courtyard building at Inchtuthil produced little in the way of evidence of production, although it did contain the famous pit with the nails and wheel tyres, suggesting (as has already been mentioned), the deliberate concealment of valuable scrap iron upon abandonment of the base. On its eastern side was a range of four rooms with an entrance hall, evidently designed to be large enough to permit the entry of wheeled vehicles. The remaining three sides were taken up by one large, aisled hall, which contained traces of partitions or work-benches in places. The hall contained one isolated hearth with a tile-lined flue, the purpose of which was unclear.[12]

One corner of a similar building was excavated within the legionary base at Exeter, complete with part of the aisled hall, whilst the corner room seemed to have a work-bench running around three of its walls. A series of shallow troughs in the floor of the hall appear to have been designed to catch waste from industrial processes, notably copper alloy working. Finds included the usual range of offcuts and half-finished artefacts so familiar amongst the waste of Roman military sites of the Principate.[13]

The most convincing example of a *fabrica*, however, was excavated by Ritterling in the timber fort at Hofheim. Although the internal plan of this base is confused by the interpolation and amalgamation of several phases, the fact of the industrial functions associated with this complex is undeniable. To the north of his building U (itself associated with metalworking), a large clay hearth (E1) was burnt red-brown to a depth of 10 cm (4 in), and here were found thick deposits of coal interspersed with iron and copper alloy slag. This immediate area also produced tools, weapons and iron fittings, as well as wire, bars and round and flat pieces of iron discovered in the form of large lumps. Elsewhere, large, rectangular pits like D and F (which was timber-lined and accessible by a flight of steps) were involved in leather production. Pit Y contained large amounts of animal bone, pieces of antler, horn plugs, and both complete and smashed skulls. In fact, there is considerable evidence in this complex for hide-processing and apparently random post-holes mark the setting-out to dry of fresh skins on raised frames.[14]

Elsewhere, the evidence for production within military bases is more fragmentary, but persistent. Smelting ovens for copper alloy were located within the Augustan and Tiberian bases at Neuss, whilst metalworking debris associated with military equipment, including an unfinished cavalry helmet cheek-piece, was found in the base at Kingsholm. At Sheepen, west of Colchester, excavation recovered large amounts of equipment



133 *Fabricae* plans. *1* Inchtuthil; *2* Exeter; *3* Hofheim.

from a furnace in Region 3, along with smith's tongs, metal offcuts, lumps of iron and copper alloy, and crucibles. Recent excavation recovered a stamped brass ingot with a very high zinc content. Commentators have fancifully suggested production by veterans in the face of the Boudican rebel advance, or by slave-labour in a concentration camp supplying the Colchester fortress. Army production offers a more realistic explanation.[15]

Literary, sub-literary, and epigraphic evidence demonstrates that the legionary rank-structure provided all the expertise and manpower necessary for production. A second- or third-century AD Egyptian papyrus (*P. Berlin* inv. 6765) documented the activities in a legionary *fabrica* on two successive days (see Fig. 15). Introduced by the date and the phrase '*operati sunt in fabricam legionis*' ('these are worked upon in the legionary workshop'), it mentions legionary soldiers, *immunes, cohortales* (presumably auxiliary soldiers), *galliarii* (camp servants) and even civilians (with guards) as working within the establishment, with at least 100 personnel (probably legionaries) in one entry. Evidently, on the first day ten swords had been made ('*spathar[u]m fabricatae X*'), six of something else ('*fabricatae VI*'), and 125 of something had been completed ('*peractae CXXV*'). Other items listed include *lamnae levisatares* ('light strips'? – ten of these), weapons (*[t]elaria*), and nails for carts. The next day saw shields of two different types, *planata* (flat) and *talaria* (wicker?), more *lamnae levisatares*, some bows completed, and *capitula ballistaria* (artillery frames).[16]

An early second-century tablet from Vindolanda recorded the number of men working for the *fabrica* on a given day: 343 in total. Most were engaged on construction tasks, but 12 men were appointed as cobblers (*sutores*).[17]

These documents do suggest that soldiers of a unit were assigned to the *fabrica* when specific tasks required work. They would have required guidance and co-ordination, both perhaps provided by the *immunes* listed by Tarrutienus Paternus in the *Digest*, copper-workers (*aerarii*), smiths (*ferrarii*), sword cutlers (*gladiatores*), arrow- (*sagittarii*) and bow- (*arcuarii*) makers, who possessed the requisite skills for supervising equipment manufacture. He also mentions an *optio fabricae*, who presumably ran the workshop. Vegetius mentions legionary 'workshops for shields, cuirasses and bows,' where 'arrows, missiles, helmets and all sorts of weapons' were made.[18]

Independent references to shieldmakers (*scuta-*

rii) occur on writing tablets from Vindolanda and Vindonissa, whilst *gladiarii* are recorded at the latter base on a plaque dedicated to Mars and on the same Vindolanda tablet.[19]

Production of composite bows demanded specialist skills, preferably learnt from childhood. For a really good bow, the construction phases were timed with the seasons to pace the rate of glue-setting. It thus took a minimum of one year to complete, and long-term maturation at different stages could extend this to three, five or even ten years. An established workshop would make batches for staggered future completion. Unfinished laths have been found at Caerleon, Corbridge and Micia, and construction probably continued at Intercisa until site abandonment. Expertise would have been provided by eastern personnel during the Principate, but there may have been problems in procuring skilled bowyers in the Dominate West, leading to the centralization of some bow production in a *fabrica* at Turin. In the East, the cities would have had indigenous artisans and long-established workshops, and thus no need for such organization.[20]

Insistence by Vegetius on the self-sufficiency of the army does not appear to leave much room for the putative private arms industry under the Principate. A few items do hint at it: inscriptions on sword scabbards from Vindonissa and Strasbourg, and on a dagger sheath from Oberammergau, name Roman citizens as the producers of the individual pieces. The first two actually name the place of production (LVGV and AD ARA) which could be Lugdunum in both cases. However, the fact that these men were citizens means we cannot rule out the possibility of military production or, perhaps more likely, manufacture by veterans.[21]

Finds of unfinished second- and third-century equipment (Fig. 134), crucibles and industrial waste have been made along the northern frontiers, both within forts and in the extramural settlements. Often exact findspots would have been dictated by site abandonment, and thus do not necessarily indicate the location of manufacture. Moreover, 'military' buildings were not confined to the area enclosed by walls, thus finds in *vici* say little about the military or civilian identity of the artisans.[22]

In reality, the mode of manufacture varied across the Empire according to regional and cultural traditions and developing urbanization. Egyptian papyri show the army buying in such items as hospital blankets, cloaks, tunics and spear-shafts from civilian suppliers. In the eastern Empire the role of Classical cities as production centres continued into the Principate, as Tacitus and Dio indicated, which was logical in regions where legions were habitually based in cities. The only time that large amounts of equipment were needed at one time was when new legions were raised, and this was done during the Principate in Italy, where cities could supply the demand without overstretching the *fabricae* of other legions.[23]

An inscription records M. Ulpius Avitus, centurion successively in *legiones III Augusta* and *IIII Flavia*, overseeing workmen manufacturing cuirasses amongst the Aedui. According to another inscription, one Annianus was overseer of recruitment and equipment manufacture at Milan in AD242, in order to deal with 'enemies of the state' in Transpadana. He was working in a western region with some tradition of urban development.[24]

For the Dominate, the *Notitia* lists *fabricae* in the northern and eastern provinces, naming their locations and specifying their products (Fig. 135). There were 15 centres in the East and 20 mainly along the northern frontiers, in Italy and in Gaul. Many manufactured shields (*scutaria*) or swords (*spatharia*) and/or armour (*loricaria, armorum*). James observed that the distribution of shield factories corresponded with European frontier provinces, and that paired armour producers went with dioceses. Specialized *fabricae* were more eccentrically placed. Arrow and bow factories appeared in the West alone, as did the only two *fabricae ballistariae*.[25]

The distribution of shield and armour centres suggests an overall plan rather than piecemeal development, and there is general agreement that the *Notitia* reflected a Diocletianic programme of production centralization. Most *fabricae* were located in cities or, along the Danube, at legionary fortresses. Some may be linked directly with Tetrarchic building programmes, as at Nicomedia, Salonika and Augustodunum. However, the specialist factories were more a reflection of regional cultural variations. Three in the East and only one in the West produced heavy-cavalry (specifically horse?) armour, corresponding with the predominantly oriental deployment of

134 Moulds, crucibles, and unfinished items. *1–4* moulds (*1–2* Alesia; *3* Tibiscum; *4* Emmerich-Praest, Germany); *5* lead trial piece of cart fitting (Brigetio); *6* failed casting of chape (Corbridge); *7* crucible (Colchester Sheepen); *8–12* unfinished items (*8* Bonn; *9* Brigetio; *10–11* Rheingönheim; *12* Eining).

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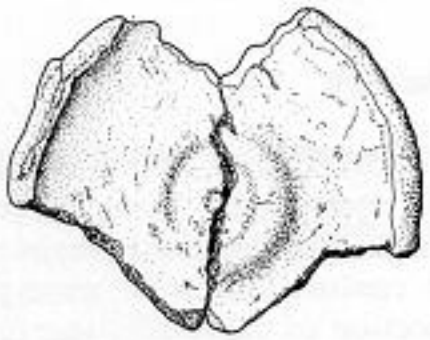

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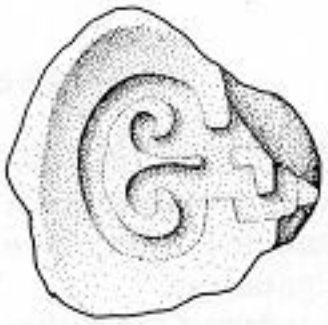

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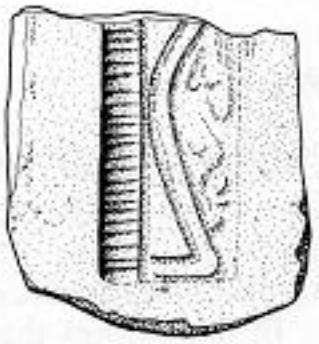

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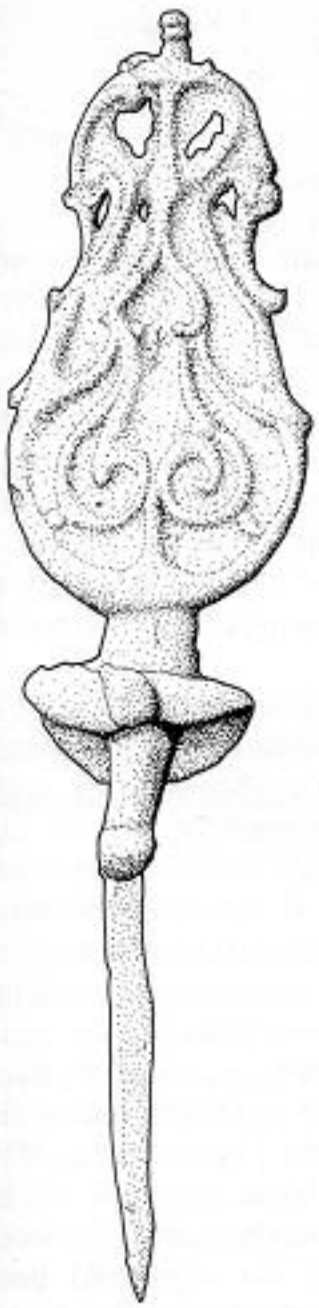

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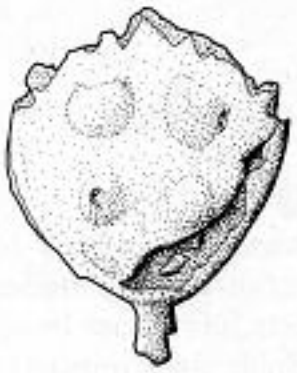

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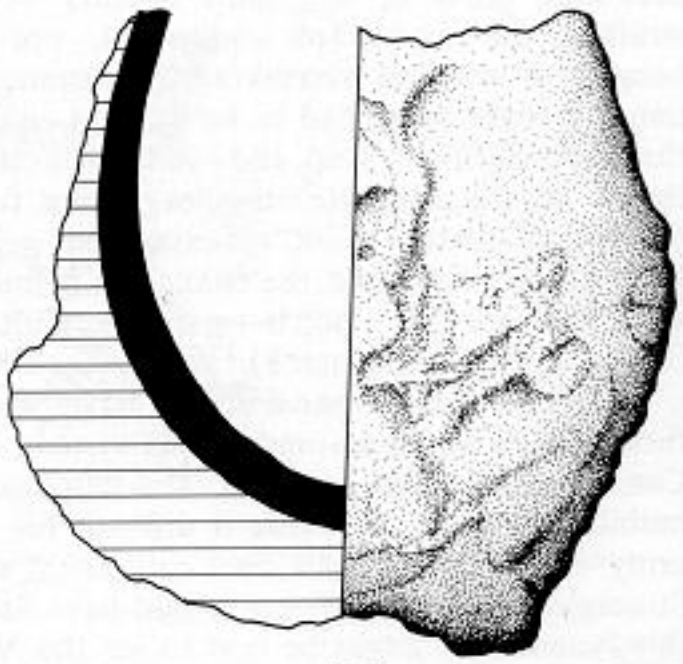

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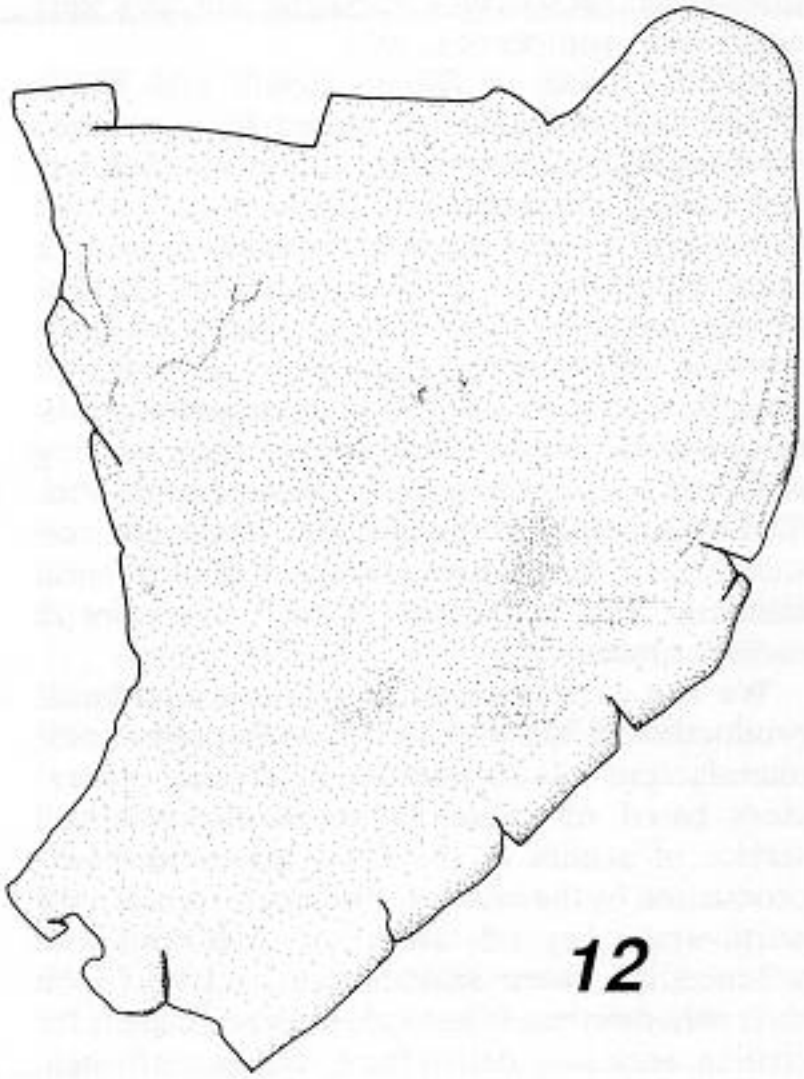

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0 20cm

catafractarii and *clibanarii*. In contrast, the bow, arrow and artillery factories were presumably not necessary in the East because the cities there traditionally produced such equipment.[26]

In this respect the *fabricae* reflected the earlier production situation. However, sub-literary and epigraphic evidence suggests that the artisans (*fabricenses*) who worked them formed one of the tied, hereditary late Roman professions. The economic crisis of the third century severely strained the supply of equipment, not least because of inflation overtaking the currency system. Thus the army had to be fed and equipped through taxation in kind, and production controlled to ensure adequate supplies. James further suggested that mass, centralized quota-production occasioned the change in helmet design from one-piece bowls to simple, multi-part construction (see Chapter 8).[27]

Tetrarchic army expansion may have provided further need for an assured supply-system. From Constantine's reign onwards, the emphasis on mobility would have made it difficult for field-army units to meet their own equipment needs. Strategically-placed *fabricae* would have fulfilled this function. It might be best to see the *Notitia fabricae* as mass-producing material for these troops, and for specific campaigns, but they were not the only sources of supply.

Indeed, forces in Britain, Spain and North Africa were probably not served by centralized *fabricae*. As the eastern cities continued manufacture from the Principate, so the fortress, fort and extramural *fabricae* supplied the needs of frontier units. Moulds and unfinished fourth-century belt-fittings, including a cast belt-terminal from Bonn awaiting chip-carving, come from a variety of sites. Bow construction at Intercisa, arrow manufacture at Housesteads and copper alloy working at Novae continued until site abandonment. Production activities in the *principia* of the last two sites relate to the changing functions of intramural buildings, not to the use of such structures in earlier centuries.[28]

We can now summarize military equipment production as follows. During the Republic, most manufacture was carried out by civilian contractors based on cities. However, the extended service of armies in the West led to increased production by the military. Principate forces in the north-west, beyond areas of Mediterranean urbanization, were self-sufficient, relying upon their own *fabricae*. What little evidence there is for civilian work may derive from veteran craftsmen. On the other hand, armies in the East were based in or near cities, many of which had long-established equipment industries. From the later third century onwards, mass-production for a proportion of the armies was centralized at state factories based on major cities and legionary fortresses, whilst the frontier bases continued manufacture alongside this system.

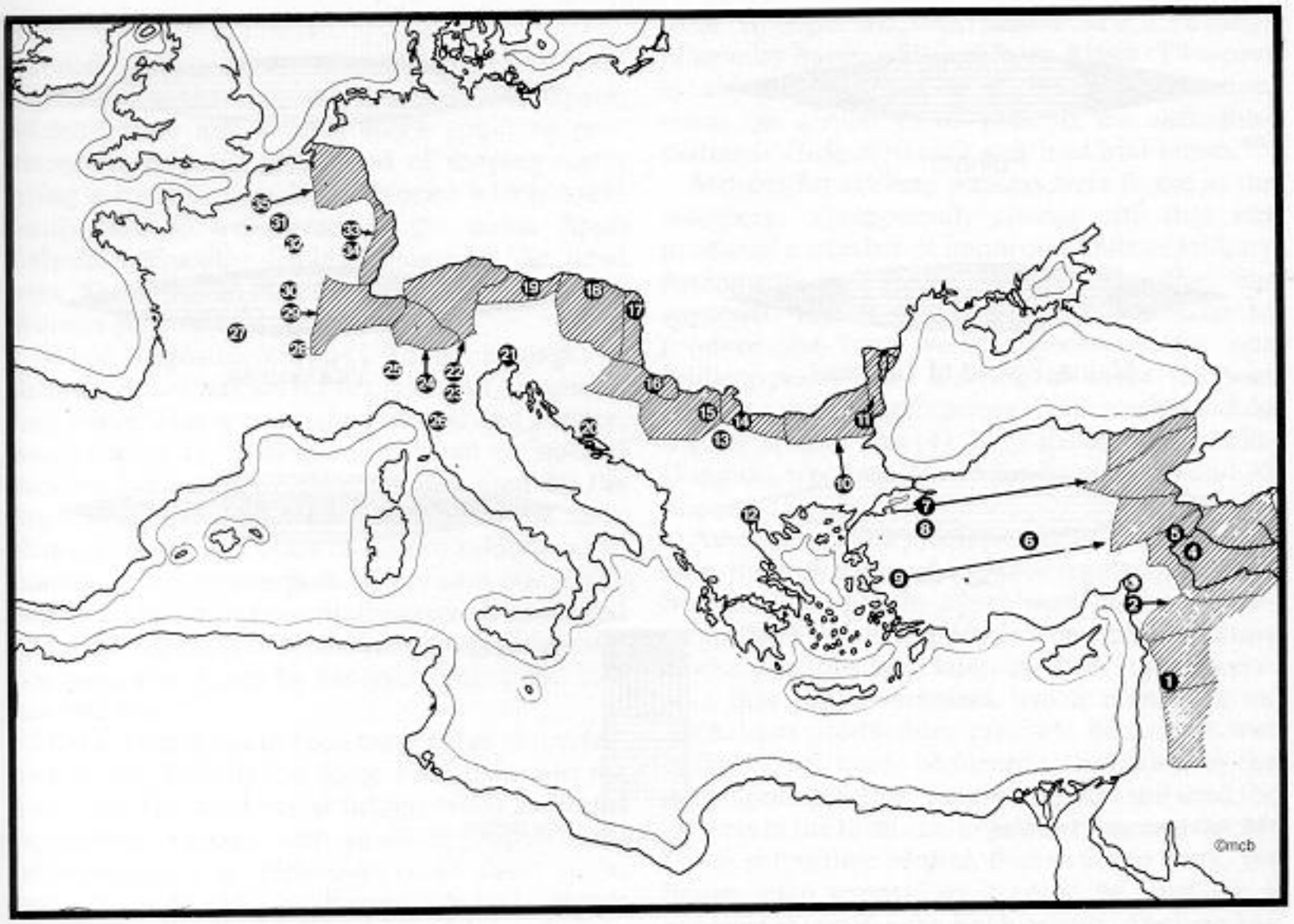
Technology

Iron and steel

Scientific analysis of Roman weapons has only recently been undertaken (Fig. 136). However, tests have now been conducted on sword blades which shed important light on Roman technical capabilities. Although numerous references exist to the inadequacy of the edged weapons of Rome's enemies, there are a few hints of technical superiority amongst at least some of them. Philon, a writer on artillery, described the manufacture of Celtic and Spanish swords and Suidas confirmed Spanish mastery.[29]

The weapons of the early Principate were not at all complex in their construction, yet Roman sword smiths were able to carburize iron, weld different metals together, quench for hardening, and (possibly) temper. Lang's work showed that three Mainz-type weapons (Chichester, Fulham and Mainz – the 'Sword of Tiberius') had all been quenched and were of generally better quality than three others she examined (two from London, one from Hod Hill) which she took to be later in date, suggesting that the change in quality matched the change from Mainz to Pompeii type swords. The 'Sword of Tiberius' had been constructed by sandwiching a softer, low carbon iron between two carburized steel strips. Its edge had been formed by grinding, as had that of the Chichester sword, whereas the Fulham example showed no sign of this.[30]

The examination of a Pompeii-type sword blade from Bonn revealed even simpler construction than that of the three Mainz-type examples, with little sign of the use of several pieces of metal or of quenching. Conversely, a piece from Vindonissa had apparently been tempered, so perhaps it is a matter of the individual preferences of smiths, rather than any great change brought about by the transition from Mainz to Pompeii type. Similarly, the Vindonissa sword was made up from three different pieces of metal, harder on the



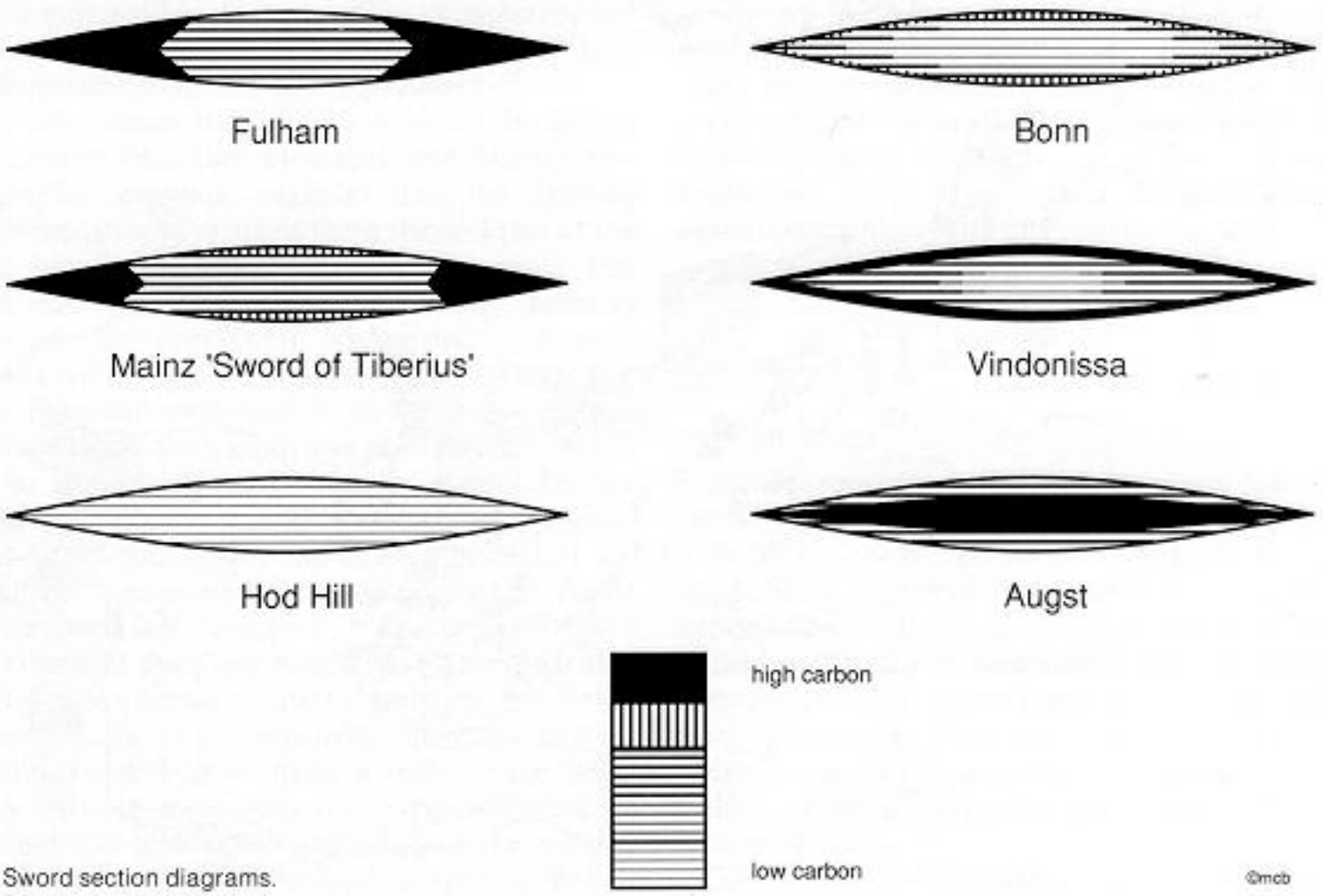
Oriens

1	Damascus	*scutaria et armorum*
2	Antiochia	*scutaria et armorum*
3	Antiochia	*clibanaria*
4	Edessa	*scutaria et armorum*
5	Irenopolis	*hastaria*
6	Caesarea	*clibanaria*
7	Nicomedia	*scutaria et armorum*
8	Nicomedia	*clibanaria*
9	Sardis	*scutaria et armorum*
10	Hadrianopolis	*scutaria et armorum*
11	Marcianopolis	*scutaria et armorum*
12	Thessalonice	?
13	Naissus	?
14	Ratiaria	?
15	Horreum Margi	*scutaria*

Occidens

16	Sirmium	*scutorum, scordiscorum et armorum*
17	Aquincum	*scutaria*
18	Carnuntum	*scutaria*
19	Lauriacum	*scutaria*
20	Salona	*armorum*
21	Concordia	*sagittaria*
22	Verona	*scutaria et armorum*
23	Mantua	*loricaria*
24	Cremona	*scutaria*
25	Ticinum	*arcuaria*
26	Luca	*spatharia*
27	Argentorate	*armorum omnium*
28	Matisco	*sagittaria*
29	Augustodunum	*loricaria, ballistaria et clibanaria*
30	Augustodunum	*scutaria*
31	Suessiones	?
32	Remi	*spatharia*
33	Treberi	*scutaria*
34	Treberi	*ballistaria*
35	Ambianum	*spatharia et scutaria*

135 Distribution of Dominate *fabricae* (after James 1988). List of *fabricae* in the *Notitia Dignitatum* (*N.D.Or.* ix, 18–39; *OC.* xi, 16–39.



136 Sword section diagrams.

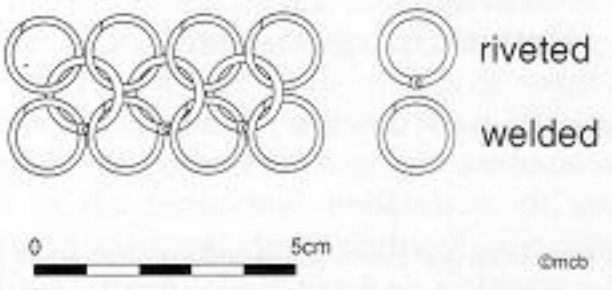
outside. A *spatha* from Augst had likewise been quenched and tempered, giving the blade both flexibility and strength.[31]

However, the blades of some first-century daggers, and of third- to fourth-century *spathae*, were not manufactured from single bars of iron as they had been earlier. Rods were twisted together, hammered, cut up and recombined to make a composite blade by the 'pattern-welding' or 'damascening' method. This is seen in swords from Augst and Nydam, for example, and the Canterbury swords with simpler 'piled cores' show its development from the second century.[32]

Williams' analysis of '*lorica segmentata*' showed that the iron plates had not been hardened in any way, although the Romans certainly knew how to do this. Williams suggested that they had deliberately intended to produce a 'soft' armour that would absorb the energy of a blow, which would fit in with what we know about the design of '*lorica segmentata*'.[33]

It is often stated that the rings in Roman mail (Fig. 137) were alternately riveted and stamped. Although this method has indeed been suggested for mail of the medieval period, that on the neck-guard of the Coppergate (York) Anglian helmet proved to be of riveted and welded rings. Curle commented that riveted and welded rings appeared to have been used on mail from Newstead. Likewise, mail from the Danish bog deposits, some at least of which may be Roman in origin, used welded and not stamped rings, which tend to have a rectangular, rather than circular, section. One possible example of Roman stamped-ring mail came from Carlingwark Loch.[34]

Iron helmets had to be forged, since there were too many impurities in Roman iron to permit spinning. Also, the first iron helmets in regular Roman use had oval, not hemispherical bowls and thus were not suited to this process.[35]



137 The arrangement of ring mail. Each ring interlocks with four others.

Copper alloys

Bronze helmets of the Republican period were regularly forged, but by the early Principate, Montefortino and Coolus bowls could be produced by spinning (a method of shaping metal using a rotating former), a process which could easily lead to weaknesses in the metal. Spun helmets frequently display damage in the bowl area. Shield bosses were also spun throughout the Roman period.[36]

When Augustus reformed Roman coinage, he introduced *orichalcum* for the *sestertius, dupondius* and *semis*. This was an alloy of zinc and copper, much closer to 'gilding metal' than to normal modern brass. This metal was also used by the army for most copper alloy objects in the early Principate. Roman brass could not achieve a zinc content much greater than 26 per cent due to the process, known as cementation, which produced the alloy. An ingot of *orichalcum*, from Colchester Sheepen, was shown by analysis to have had 26.8 per cent zinc.[37]

There seem to have been three types of *orichalcum* in use, broadly speaking. First there was the sort used for sheet metal fittings, such as '*lorica segmentata*' fittings, with an 80/20 (copper/zinc) composition. The rivets used to fix these to the armour, on the other hand, generally had a higher copper content (85/15 to 90/10) which meant they were not only softer (and thus better as rivets) but also a different colour (more coppery than the 'golden' sheet fittings). This is best seen on fittings preserved in anaerobic conditions. The third alloy of this kind, used for producing cast items, included a proportion of lead, which improved the flow of the alloy into the mould.[38]

These variations were deliberate on the part of the Roman smiths, but variation in compositions confirms the element of guesswork involved. Mixing of alloys through the widespread reuse of scrap makes it almost impossible to source ores from the study of trace elements.[39]

Cast equipment could be produced either by the lost-wax ('*cire-perdue*') process, or by using a two-part mould. The former probably required less finishing, but had the major disadvantage that the mould could only be used once, as it had to be broken to remove the object. Two-part moulds, on the other hand, were reusable and could be tested with a (lead) trial-casting. They would be prone to deterioration through frequent use and the product required more finishing, due to the inevitable presence of casting flash. Ceramic lost-wax moulds are known for a cavalry junction loop from Nijmegen and, on a massive scale, for a range of cavalry harness fittings from Alesia. Two-part moulds, which could be of either clay or stone, occur on a number of sites, as do unfinished castings ('*Halbfabrikate*'), and lead trial-pieces.[40]

Moulds for artillery washers were found at the Auerberg, a supposedly civilian site that has produced a number of important finds of military equipment, and recent work by Drescher has suggested that it would take two man-days to produce the four washers necessary for one artillery-piece, from starting to make the wax model to the finished casting. Each washer would require around 2 kg (4½ lb) of metal in three 2 lb-(Roman) crucibles heated for between 30 and 45 minutes.[41]

Amongst military equipment of the first century, the only items which were regularly made of bronze (a copper/tin alloy) were *paterae*. However, these were imported from private firms working in Italy and, later, in Gaul. It is conceivable that the government had a monopoly on *orichalcum* production, precisely because it was bullion which could be turned into coinage by the unscrupulous forger. *Orichalcum* was still used for helmets in the third century (Worthing and Buch). It was softer than bronze, thus easier to work, yet harder than copper, so it could be used for a complex shape like the Buch helmet. Analysis has shown the recently discovered fourth-century London belt-fittings to have been cast in *orichalcum*; then the chip-carved design was cold-worked with a chisel.[42]

However, the thin copper alloy components on '*lorica segmentata*' were not only vulnerable to damage, but also fostered electrochemical corrosion at points of contact with the iron plate.[43]

Plating and inlay

Copper alloy artefacts were frequently tinned or silvered, a technique which Pliny the Elder said the Gauls developed at Alesia. Tinning simply requires the object to be dipped in molten tin (which has a lower melting point than copper alloy). Silvering is more complex and requires greater skills. Silver foil was beaten out by hand and attached to the object with a lead/tin solder. This process is sometimes difficult to distinguish analytically from genuine tinning. In the early Principate, tinning was used for helmets, scabbard- and belt-fittings, cavalry harness and even armour (brass scales from Ham Hill were alternately tinned). Silvering was used on cavalry equipment,

particularly from the Claudian period onwards, and on other items that were normally tinned, such as belt-plates. The Mainz-type sword from Rheingönheim, dated to the Augustan period, had a silvered handle and an inscription recording the fact: *L(ucius) Valerivs fec(it) p(ondo) £(semuncia) (sicilicus) VII* ('Lucius Valerius made it, seven halves and one quarter of an ounce by weight': $3\frac{3}{4}$ Roman ounces, or 102 g ($3\frac{1}{2}$ oz)).[44]

Artefacts could also be sheathed in another metal purely for decoration. Early Imperial cavalry helmets, although made of iron, often had a sheathing of copper alloy over the bowl, embossed with hair and crown or circlet motifs. More substantial than foil, this was nevertheless a decorative, rather than protective, measure. Later Roman helmets were sheathed in gilded-silver, as were some shield bosses (see Chapter 8). The fourth-century London belt-fittings were tinned.[45]

In the early Imperial period, niello inlay was used on belt- and cavalry harness fittings, whilst metals (silver, brass and gold) were used for inlaying dagger sheaths. From the second century onwards, enamel inlay became very popular in the Roman army and is found employed on a wide range of fittings. It had earlier only really been popular for inlay on decorated dagger scabbards of the first half of the first century AD.[46]

Embossing

Decoration that was not cast into copper alloys could be wrought, frequently using embossing (or 'raising') techniques. This is well illustrated by first-century AD belt-plates, which were placed face down on a pitch bed and worked from the rear (probably stamped); this technique was also employed for the copper Kingsholm cheek-piece sheath. Comparatively thin sheet metal was used in most cases and, rather than each piece being meticulously produced by a craftsman, there is some evidence for a degree of mass-production employed by the army. More substantial items, like embossed helmets, might be raised from the rear initially, but the fine detail was applied from the front with gravers, chisels and punches, again using a pitch backing.[47]

Finished and unfinished items provide many clues to the methods of the craftsmen, and the discovery at Colchester Sheepen of a belt-plate stamp (Fig. 138) is especially instructive. The stamp was a cast rectangle of leaded gunmetal (copper alloyed with tin, zinc and lead) with a short, stubby shank projecting from its rear and four low lugs at each corner of its rear face. The front bore a series of hunt animals in high relief, processing around a central boss, whilst both the short sides were raised at the edge. The shank may have originally fitted into a wooden handle. Although it has been interpreted as a leather stamp, this object exactly matches the size and form of embossed belt-plates employing a hunt motif, found in Upper Germany, Noricum (especially Magdalensburg) and southern Britain.[48]

Robinson suggested that the stamp may have been used with a female former. Several rough plates could be stamped into one piece of metal sheet at one time, cut out and finished off. A complete example of a similar plate from Chichester with additional light pouncing shows the sort of finishing touches that might be made.[49]

Modern scholars have been all too willing to elevate what must have been common items to the status of 'works of art', a good example of this tendency being the 'Sword of Tiberius', although the technology required to produce its embossed scabbard-plates was not particularly complex.[50]

Wood

Wood found many uses in the Roman world, and it is not surprising that the differing properties of various woods were understood and appreciated. The Elder Pliny records which woods were preferred for which tasks, but scientific analysis provides more reliable information.[51]

Part of the technology of wood lies not only in knowing how to use it, but also how to manage the raw material. Spear-shafts, for example, had to be grown from coppiced stands of the favoured woods, usually ash, although hazel was also frequently employed. Poles were cut when they had reached the correct age for the desired diameter. Poles produced in this way benefited from the natural strength and flexibility of the tree, whereas a dowel cut from timber lacked these qualities and would have required more work to shape it. A *pilum* shaft had to be shaped, on the other hand, because it was manufactured in one piece, and the piece of wood had to be of the diameter of the broadest point, the expansion where the shank met the shaft.[52]

Plywood was used in the construction of Roman shields. Both the Kasr el-Harit (birch) and Dura-Europos (plane) curved shields were made of three layers of wooden strips, laid at 90° to each other. This increased the strength of the shield-board, because whichever way it was struck, the

138 Belt-plate manufacture. *1* Stamp (Sheepen); *2* belt-plate of similar 'hunt' type (Magdalensburg).

grain would always be running in two different directions, thereby reducing splitting. The inner and outer layers were horizontal, so the emphasis was on the effects of vertical blows. Structural integrity was further enhanced by the use of binding and covering materials. Certain types of woods were recommended by the Elder Pliny for shield construction, and examination of the Doncaster board has suggested that alder was used for the outer, vertical strips, and oak for the inner, horizontal ones.[53]

Some of the Dura oval shields were constructed of plane wood planks glued edge-to-edge. No attempt at tongue-and-groove jointing was made, so the shields had to rely upon strengthening bars, rawhide binding and the strength and elasticity of the glue. Plank shields occur in northern European bog finds of the same period.[54]

Wood was also used for sword handles, sword and dagger sheaths, tool handles, arrows and practice weapons. Composite bows required a spliced, multi-part core, maple, mulberry and cornel being favoured in later periods. Timber was also required for the construction of siege-engines and artillery-pieces.[55]

Shields made of reeds bound with rawhide were found at Dura and may either have been used by the Roman defenders or, perhaps more likely, by attacking Persian infantry. Wickerwork was utilized for the construction of practice shields. These were designed to be double the weight of the normal battle shield, so probably had weighted frames. Vegetius discusses *scuta viminea* (made of osiers or wicker), whilst *scuta talaris* are mentioned on an Egyptian papyrus, *talaria* being a (Greek loan) word for basketry.[56]

Bone and horn

Bone was used for sword handles (formed of three elements – pommel, grip and handguard – riveted on to the tang). Grips were carved from cattle metapodia and were characteristically hexagonal in section during the Principate. Scabbard-chapes and slides were made of bone from the late second century onwards (see Chapter 7).[57]

Composite bow laths were carved from antler and bone, keratin strips sawn from long, straight horns being glued to the wooden bow core. Caraboa and mouflon horn was used in later periods, and the unsuitability of European cattle horn may have presented supply problems in the Roman west. Horn was also used as a lamination in the construction of dagger handles.[58]

Ivory was occasionally used for sword handles (there are literary references to this), scabbard-slides and chapes. The Khisfine sword scabbard was made entirely from it.[59]

Leather and sinew

Apart from tentage, leather was used for footwear, belts, baldrics, horse-harness, shield covers, shield covering (actually attached to the face of the shield), sword and dagger sheaths, as ties for helmets and '*lorica segmentata*' (and internal straps for the latter), as backing for armour, and for items of personal equipment such as bags and purses. The evidence for leather clothing is minimal and Robinson demonstrated that leather armour was not shown on sculptural monuments. To be protective, it had to be hard rawhide and when Pliny the Elder discusses hippopotamus-skin armour, he says that it was useless when wet – a practical reason why leather armour was not used in the Roman army. Two fourth-century belts from Augst were made of goat leather, whilst a scabbard of goatskin was found at Deurne (see Chapter 8).[60]

Particular types of leather seem to have been used for specific purposes. Recent detailed work has confirmed that, as with their metalwork, the Roman army frequently repaired and recycled its leatherwork.[61]

The discovery of intact portions of tents at Vindolanda has shown how carefully panels of goat leather were joined together with a range of ingenious seams which ensured water run-off, not penetration. The size of panels was dictated by the available individual goat-hides.[62]

Although the excavation of waterlogged sites has greatly added to our knowledge of Roman military leatherwork, it seems fairly certain that it cannot tell us the whole story. The leather from such sites is usually prepared by vegetable tanning, but this is not the only technique available. Oiled or alum-tawed leather could have been used for belts and horse-harness, items which have not yet been identified in the archaeological record (a fragment of horse-harness survives only as a corrosion product on the rear face of a cavalry *phalera* from Xanten). Where straps have been identified, as with the Xanten *phalera* or on the apron strap from Mainz, stitching ran along either edge to help prevent undue stretching of the leather.[63]

One of the Vindolanda tablets mentions a transaction involving 100 (Roman) pounds of sinew, which was the recommended material for artillery torsion coils. Under siege conditions, however, resort might be made to women's hair. The sinew had to be made into sinew-cord and then stretched on a special machine before it could be fitted to a catapult frame.[64]

Strips of glue-impregnated sinew were attached to composite bow cores on the opposite side to the horn. Analogy with later practices and modern reconstruction work suggests that cattle and deer leg tendons were most suitable. Neck tendons were used to bind the bow-stave overall, and covered with bark and paint for further weatherproofing. Sinew whipping was used to attach arrowheads to stele. Sinews and fish products were also boiled down to make glue, being necessary for shield and composite bow construction. Oozed, solidified glue survives on a completely preserved Roman(?) bow ear from Egypt.[65]

Techno-borrowings

One of the great strengths of the Roman army was its willingness and ability to learn from contacts with enemies who possessed some sort of technological superiority. Thus, by the first century AD, much of the soldier's equipment was derived from enemies of earlier days.

The Montefortino-type helmets of the Republican period were descended from Iron Age models current in central Europe. Likewise, the Coolus and Imperial-Gallic types came from Celtic ancestry, but developed comparatively rapidly once in Roman use. 'Native' helmets were made with a brim that went around the entire lower edge and sometimes had neck-guards riveted on to the back of the helmet; the Romans forged the helmet bowl and neck-guard in one piece (difficult to accomplish competently with an iron helmet). Further modifications seem to have been made to meet particular shortcomings – the brow-guard added to protect against downward blows to the face; guards to protect the ears; neck-guards enlarged and angled to protect the back of the soldier's neck. When the large state *fabricae* centralized production of equipment from the late third century, the new easily-manufactured, simple multi-part helmets they made were probably modelled on types used in Mesopotamia (see Chapter 8).[66]

Body armour forms were borrowed, particularly ring mail from the Celts (who probably invented it), and scale armour, which had a long history in Greece and the East. The origins of segmental armour, on the other hand, are far more

obscure. Gladiatorial equipment included segmental arm-guards, and similar armour is shown in Hellenistic sculpture, but nobody before the Principate appears to have made a complete segmental cuirass. In fact, even that may have come to the Roman army from the arena, thanks to the revolt of Florus and Sacrovir (see Chapter 5).[67]

Flat shields of the type associated with auxiliaries and shown on tombstones and propaganda monuments were probably brought into the army by Celtic and Germanic auxiliaries, but the origins of the curved legionary body shield are more complex. Whilst the Etruscans used the circular Greek hoplite shield, they also appear to have had oval and rectangular shields which, it has been argued, were ancestors of the Republican curved shield.[68]

Both the short infantry sword and the long cavalry *spatha* had foreign origins. The *gladius Hispaniensis* seems to have been descended from Spanish prototypes as classical authors insist. Likewise, the *spatha* closely resembles Celtic slashing swords, and commentators attribute its origin to this quarter.[69]

The question of the origin of the *pilum* has long been disputed. Links with both Iberian *soliferrea* and Etruscan antecedents have been suggested.[70]

Artillery was one of the few pieces of equipment which the Romans took over (and retained) from Hellenistic Greek military science, and they were heavily dependent on the Greeks in the sphere of military theory and siege technology.[71]

Finds of ear- and grip-laths on Roman military sites throughout the Imperial period demonstrate the use of composite bows of Asiatic and Levantine type. The literary and epigraphic evidence points to the Roman employment of Levantine archers, and thus eastern variations of composite bow construction (see Chapter 10). When new bow designs were brought in from Asia during the fourth century by the Huns, they were adopted by Roman forces as a matter of urgency.[72]

Composite bows had a thin core of wood to give the basic proportions, a layer of sawn horn strips on the surface facing the archer (the belly) and glue-impregnated sinew on that facing the target (the back). When such a bow was drawn, the string pulled back the ears, the horn belly was compressed and the sinew back was stretched. When the string was released the constituents returned to equilibrium with tremendous force and projected the arrow towards the point of aim. Grip-laths served to prevent the handle bending when the bow was drawn, and thus 'kicking' when the stave came to rest, causing inaccurate shooting. On the ends (ears) of the bow they functioned mechanically as rigid levers bending back the flexible sections of each limb. A purely wooden stave would have been snapped by this action.[73]

All of these examples illustrate processes whereby Roman forces borrowed the technology of other peoples. Once adopted, the equipment continued to evolve within a cultural and institutional framework which allows the umbrella term 'Roman' to be applied to it.

10
THE STUDY OF MILITARY EQUIPMENT

The study of military equipment is not just about the development of weaponry and ever more efficient means of inflicting slaughter. In fact, we would argue that that is its least important aspect, for it is a valuable window on to the cultural influences and interactions, personal tastes and abilities of the ordinary Roman soldier. When all is said and done, it is not the weapons themselves, whether they be *pila*, Brown Bess muskets, or 'smart bombs', but what is done with them that determines the course of history and affects the lives of the many: the hardware is always just a means to an end and should be studied in precisely that context.

The identity of Roman soldiers

In a real sense, the ownership of military equipment and the legal right to bear weapons, beyond the narrow bounds allowed to civilians, defined the soldier in Roman society. Clothing worn by military men in Europe up to the second half of the seventeenth century AD was part of general contemporary dress fashion, and thus usually distinguishable from civilian attire only perhaps by its quality. There is no evidence to suggest that textile colours, or any form of 'uniform' in the modern sense, were used to identify the Roman soldier. Rather it was the military equipment which visually proclaimed his identity.

The soldier enjoyed a privileged, well-paid position in Roman society, one which, if the literary and sub-literary sources are to be believed, was generally abused at the expense of civilians! Soldiers probably spent only a small proportion of their time actually wearing armour and carrying shields and shafted weapons. Thus the 'unarmoured' convention in the representational sources, especially on gravestones, is readily understandable. Wearing only tunic, cloak and trousers (depending on region and period) the soldier could most obviously advertise his status by carrying a sword suspended from the variety of belt-types dealt with in earlier chapters. The lavish decoration and multiplicity of belt-fittings may thus be accounted for in terms of display. Moreover, the importance of the characteristic metallic noises made by such equipment should not be underestimated. Hob-nailed *caligae* were remarked upon by Roman writers for, as with the rowel-spurs, jingling scabbard-fittings and crunching jack-boots of later periods, they may have contributed audibly to the soldier's 'presence'.[1]

First- to second-century 'aprons' served no significant protective function, and indeed could have been a liability to the running soldier. Similarly, the strap-ends of third- to fourth-century belts were lengthened for display, not practical purposes. Paired third-century terminals would have clinked together and contemporary representations often show the wearer nonchalantly holding (and perhaps twirling?) the strap-ends by his side. In the fourth century the militarization of government service naturally involved an extension of military belt use. Belts were employed as badges of office which could be conferred or confiscated with changing imperial favour.[2]

Soldiers of all periods have used equipment, attire and jargon to form their own society, separated from the wider civilian context. Within the Roman version of this military sub-culture the regional differences in equipment detail may have provided a subtle language of unit- or army-group identification and personal status (not necessarily synonymous with rank). More overtly, rank would have been signalled by differing staffs, crests and shafted weapons. Whilst auxiliary cavalry had 'sports' armour, other troops did not have duplicate 'parade' equipment, as such. For special events, such as Titus' pay parade during the siege of Jerusalem, the soldiers removed the protective covers from their armour and the cavalry led their mounts decorated in all their trappings.[3]

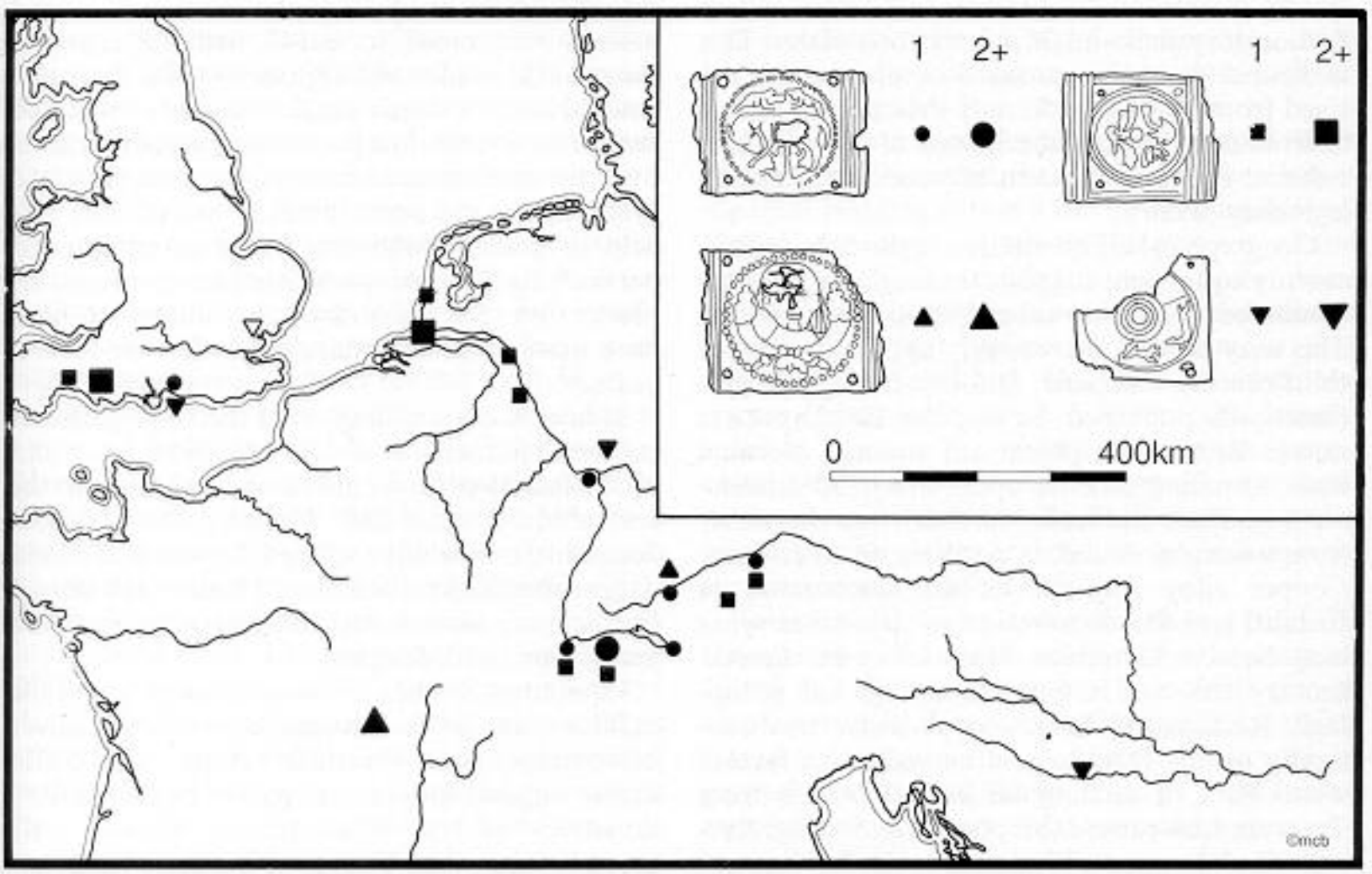
The topic of legionary and auxiliary differentiation will be dealt with in the separate Appendix, but the ability of modern scholars to identify specific units of the Roman army from their equipment is only now beginning to reveal something of its potential.

It has long been known that cavalry equipment could be distinguished amongst the finds from Roman sites, and comparison of funerary sculpture has helped in the interpretation of this material. However, the possibility that particular cavalry units might have identifiable traits in their equipment is of immense importance to students of the disposition and movements of the army. The same is true of infantry units and, whilst the initial work is only now being carried out, some examples might be quoted to demonstrate the specificity of equipment to units. There are many caveats here, however, given the small number of items with which the scholar is usually dealing and the unreliability of the archaeological record.[4]

The known distribution of embossed belt-plates of the first century AD reveals a marked emphasis on material from Upper Germany (although this is partly a product of the unusually high archaeological activity in that area in recent years), with a few examples from Lower Germany (Fig. 139). When we come to examine Britain, however, it is soon apparent that the distribution is limited to southern (and south-western) England, more or less corresponding to the area covered by *legio II Augusta*, especially during the initial phases of the conquest. The sites at Chichester, Waddon Hill and Hod Hill have all produced them, whilst the belt-plate stamp from Sheepen belongs in the same tradition; interestingly, there are other items seemingly characteristic of *II Augusta* from Sheepen. The dating of these belt-plates is well known from examples found in the *Schutthügel* of *legio XIII Gemina* at Vindonissa, which it left *c.*AD45, so they were in use at the time of the invasion of Britain.[5]

Large, bird-headed 'winged' pendants are now known from a number of pre-Flavian sites in the north-western regions of the Empire, but their distribution in Britain is quite interesting. Examples are known from London, Colchester, Cirencester, Kingsholm and Wroxeter, all of which (with the exception of London) have produced evidence for the presence of mounted Thracian units. The body of data is hardly a

139 Distribution map of early Principate embossed belt-plates.



statistically viable sample, but it is perhaps sufficient to at least indicate some lines of research for the future.[6]

When *legio XXI Rapax* was finally transferred from Vindonissa after the events of AD69, it campaigned under Cerialis against Civilis, together with *legio II Adiutrix*. It was based in Bonn in 71, with *II Adiutrix* not far away at Nijmegen, before being transferred to Britain. It is probably no coincidence, therefore, that dagger scabbards from Chester, the base of *II Adiutrix*, show very similar designs to examples from the *Schutthügel* at Vindonissa. Significantly, a cheek-piece from Chester is closely similar to a piece from Aquincum, the new base of *II Adiutrix* after leaving Britain.[7]

Cavalry equipment has been thought to present problems for unit identity, scholars usually noting the possible presence of draft and baggage animals, officers' mounts and the legion's mounted contingent. In fact, it seems likely that such equipment did belong to troopers of either *alae* or *cohortes equitatae*. Draft and baggage animals required completely different types of harness to that used for riding, but the number of mounts for officers was very small by comparison. One group of 'cavalry' equipment stands out from the whole assemblage because its decoration closely resembled the grammar of ornament on first-century niello-inlaid infantry belt-plates. This is distinct from the standard cavalry motifs derived from viticulture. It may thus be possible to differentiate between the horses of the *alae* and *cohortes equitatae*, or even between auxiliary and legionary cavalry.[8]

Geographical differentiation in third- to fourth-century equipment suggests that regional variants continued to develop according to army groups. This may become increasingly apparent as more third-century scabbard- and belt-fittings are systematically published. So far, circular chapes are rare in Britain, but prominent amongst German finds. Ornate geometric openwork baldric *phalerae* from Dura and some North African sites differ from examples found at northern frontier forts. Copper alloy ring-buckles are uncommon in Britain, and the distribution of decorated types may have a Danubian bias. Likewise, fourth-century belt-buckle types form regional groupings. Rectangular buckle-loops occur predominantly on the Danube and curved loops further west. Thus, a rectangular-looped buckle from Traprain Law (where there is also an Ostrogothic-style fibula) suggests Illyrian contacts.[9]

The ownership and storage of equipment

There are basically two ways for an army to manage the distribution of equipment to its men. First, it can hold the material in central stores, only distributing it when necessary. Second, it can issue equipment to the men and make them personally responsible for it, obviating the need for stocks. The former provides close control over the material and avoids the danger of rebellious troops causing problems, whereas the latter method means arms do not have to be distributed whenever they are needed, and by introducing personal responsibility, the individual is more respectful of and careful with them. Moreover, forcing the soldier to pay a small amount towards their 'purchase' can reinforce this bond between the man and his equipment.[10]

When describing the mutinies after the death of Augustus, Tacitus puts a famous speech into the mouth of one of the mutineers' leaders:

> Body and soul are reckoned at ten *asses* [16 *asses* = 1 *denarius*] a day: this covers clothing, weapons, a share of a tent, a brutal centurion and immunity from chores.[11]

These deductions are also found in papyri: *P. Gen. Lat.* 1 recto i records deductions for weapons, clothing and boots, while *P. Columbia inv.* 325, a record of refunds made to the mother of a dead soldier, Ammonius, in AD143, includes amounts for arms (21 *denarii* and 27½ obols) and a share of a tent (20 *denarii*, which suggests a total cost of 160 *denarii* for a tent). The process of purchasing arms from the army thus seems to have been standard practice, but the sums involved are of little real help in assessing the true value of equipment, particularly if the army was itself involved in arms production. Such amounts may therefore have been nominal and perhaps paid off over several years.[12]

Men were quite willing to use their equipment as collateral in loans. *P. Fouad* I,45 mentions a sum of 50 *denarii* lent '*in pretium armorum*' ('against the cost of equipment'). In *P. Vindob.* L135, Caecilius Secundus uses a silver-plated helmet and inlaid dagger sheath as collateral on a loan of 100 *denarii* (incidentally hinting that some cavalrymen could be equipped with daggers).[13]

Equipment might also be given as gifts and the bullion value of fourth-century brooches, silver belt-fittings, silver-sheathed helmets and shield bosses suggests they formed part of pay or military donatives to high-status troops. In the early second century, the Younger Pliny gave his fellow

townsman Metilius Crispus 10,000 *denarii* '*ad instruendum se ornandumque*' ('for equipping and embellishing himself') when he took up a post as a centurion, although it is possible this was in the Praetorian Guard at Rome. Hadrian presented men called up for military service with horses, mules, clothing, expenses and all their equipment, while Caesar equipped whole legions at his own expense, most notably the *legio V Alaudae*. Suetonius specifically mentions that they were provided with inlaid equipment to improve their appearance and make them less inclined to lose it in battle. Claudius Terentianus (*fl.* AD138) received much of his equipment from his father Tiberianus, a *speculator* with a legion, although Terentianus apparently sent various other items in exchange.[14]

Technically, his military equipment, whether purchased or given to him by a benefactor, formed part of a soldier's *castrense peculium*. This was a special military privilege which meant that anything pertaining to a man's military service belonged to him rather than to his guardian (normally his father), and that the soldier could dispose of it in his will as he saw fit. This concept lies behind the will of Ammonius, who left 15 *denarii* to one executor, 10 to the other, and 210 *denarii* 14½ obols to his mother (including the sum *in armis*).[15]

Closely related to questions of ownership and storage is the identification of the *armamentarium*. The term is found on a number of inscriptions and some archaeologists have suggested that *armamentaria* are to be associated with the rooms around the courtyards of headquarters buildings in forts and fortresses. An inscription from Lanchester, for example, records *principia et armamentaria conlapsa restituit* ('restored the derelict *principia* and *armamentaria*'), and dedications by *custodes armorum* in headquarters buildings have been cited as additional evidence for this location.[16]

Equipment has been found in or around *principia* at Lambaesis, and at smaller sites, such as Housesteads and Künzing. Well deposits from the headquarters yards at Bar Hill and Newstead provide the most important clues to the archaeological processes involved in such deposition.[17]

MacMullen suggested that some fragmentary inscriptions from Lambaesis (*arma antesignana XXX* and *postsignana XIV*) had belonged over the doors into the *armamentaria*, showing the soldiers whence they could collect their equipment when it was needed. However, the inscribed blocks were in fact reused (one of them was even found near the east gate of the fortress) and the lettering was second century AD in style: in other words they could have come from anywhere within the fortress.[18]

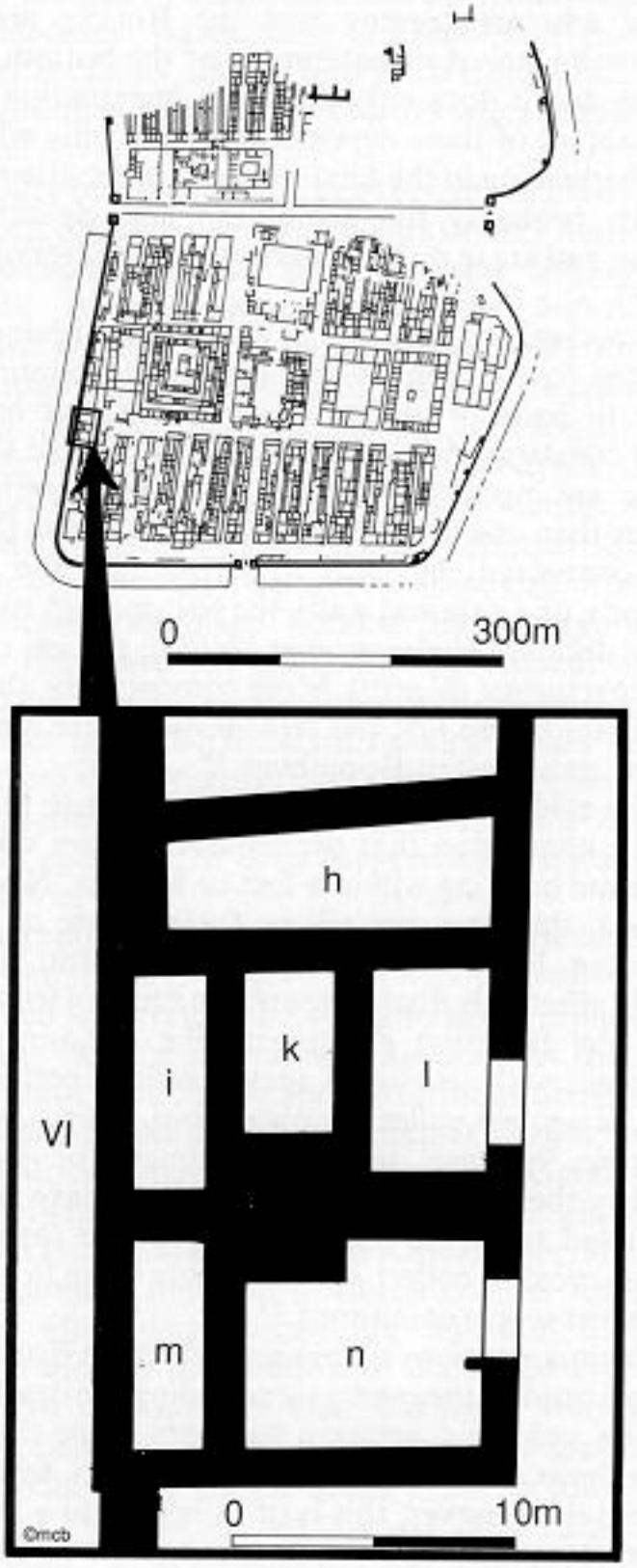
The assumption is generally made that the finds are characteristic of normal use of the rooms concerned, but the archaeology of Roman military sites is always heavily event-orientated: that is, a major event, such as the abandonment of the fort, will effectively mask the everyday deposition of objects (if such deposition indeed took place). Material from the Newstead and Bar Hill wells is clearly suggestive of abandonment (we do not find many scholars arguing that the Roman army habitually stored its equipment at the bottom of wells), and it does not take much imagination to see that all of these deposits represent only what was happening in the final stages of occupation of a site, probably the demolition and clearance phase, and are in no way characteristic of everyday use.[19]

However, the logic of the epigraphic argument is open to question. Where building inscriptions refer to pairs or groups of structures that have been constructed or repaired, it is noticeable that these are usually separate, if related, entities, rather than one being part of another. Where they are connected, as with a bath-house and its basilica, or a gate and walls, the phraseology tends to be different (*balneum cum basilica*; *portam cum muris vetustate dilapsis*). More convincingly, there are cases where just the *armamentaria* are mentioned, as at Leiden-Roomburg.[20]

The evidence is confused, but it seems to point to the conclusion that the *armamentarium* was a separate building within a fort or fortress. Nevertheless, this does not tell us the purpose of the building. Robinson doubted that a central store could effectively distribute arms in times of trouble and the fact that equipment like armour was marked with personal identification certainly argues against collective ownership. This is only sensible, because items like helmets, or particularly the '*lorica segmentata*', would have been designed to fit the individual. It would thus be impractical to collect and distribute these in even the most serene conditions.[21]

Tacitus mentions an *armamentarium* at Rome in his account of the events surrounding the death of Galba and the suggestion has been made that it may have manufactured equipment, as well as stored it. However, this is of little help to a more general enquiry into the function of these buildings, because of the special circumstances pertaining in Rome.[22]

Perhaps the *armamentaria* of provincial bases were stores for those things which were in general ownership. *Cheveux-de-frise* stakes from Oberaden were marked with the names of the centuries to which they belonged, but not attributed to individual soldiers, so perhaps items like these would be kept here. However, it would make sense if a unit had some sort of reserve of matériel that could be called upon in time of need, in particular spare missiles, which would be rapidly expended in a conflict. Likewise scrap that was to be reprocessed would have to be stored somewhere (although the *fabrica* may have been more appropriate for this). Speidel has shown that a wax writing tablet from Vindonissa was addressed to the *armamentarium* of Agilis, coincidentally the name of a man who appears on a votive tablet (dedicated to Mars) described as a *gladiarius*. So whilst it seems probable that *fabricae* produced equipment and *armamentaria* were used for storing it, it is conceivable that these roles were occasionally reversed.[23]



140 Plan of the '*Waffenmagazin*' (*armamentaria*?) at Carnuntum.

There are two possible candidates for *armamentaria* known from the archaeological record, and both of these are rampart-back buildings. The so-called *Waffenmagazin* excavated by von Groller at Carnuntum is perhaps the strongest candidate (Fig. 140). Within four stone-built rooms of Building VI, beneath the east rampart of the legionary base, he found an astounding collection of over 1000 pieces of arms and armour protected by a layer of corrosion products. These included fragments of 38 spearheads, 11 *pila*, 209 arrowheads, 121 pieces of scale armour, 302 of segmental armour, 16 pieces of mail and 10 of armguard, together with 62 pieces of shield and 58 of helmet. This remains one of the most dramatic discoveries of military equipment of the Roman period, not least because it led to one of the major (albeit incorrect) attempts at reconstructing the '*lorica segmentata*'. Von Groller found traces of shelving or racks (0.45 m (1½ ft) wide) around the walls, upon which the equipment had evidently been stored, noting that the distribution of equipment was highly localized: room *i* contained arrowheads and shield bosses, *l* spearheads, *m* helmets and '*lorica segmentata*', everything else coming from room *k*. As this important material was not excavated stratigraphically, it is impossible to be certain about the date of deposition, but the bulk of the material is pre-Antonine in character.[24]

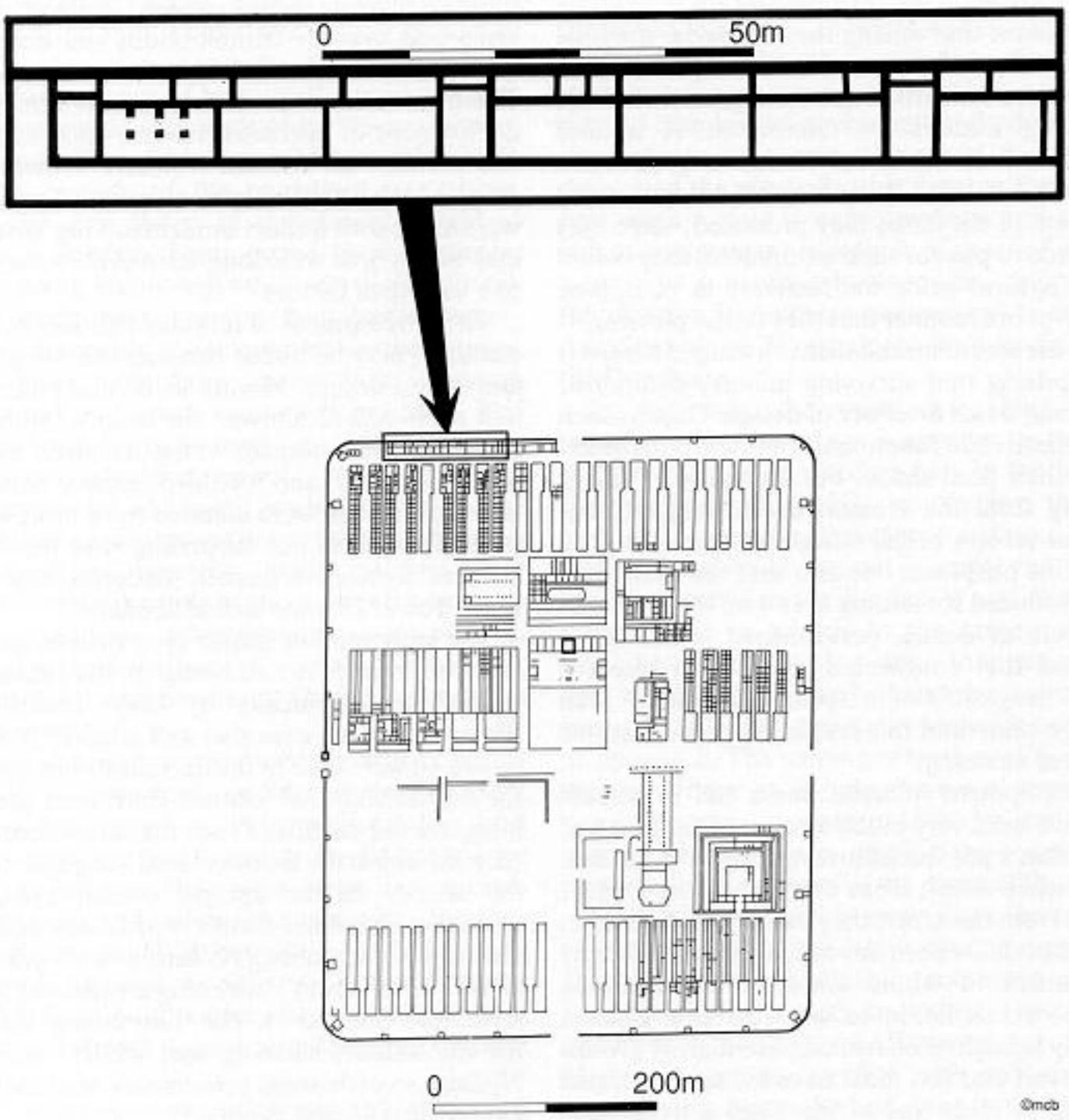
The second possible *armamentarium* lies within the legionary base at Caerleon, behind the north-west defences (Fig. 141). A massive third-century stone building contained a similar range of material to that from Carnuntum. The projecting rooms of the latest rampart-back building here included finds of artillery bolts, *pilum* heads, spearheads, caltrops, mail, and bone scabbard and bow elements, all of which appear to date to the late third century. Some areas of the building may also have been used as a workshop.[25]

One final point for consideration is the role of the *custos armorum*. He has been seen by some as an appropriately titled figure to go with the 'central store' theory of equipment management.

Since every *centuria* or *turma* seems to have had such a post, it might be argued that it was he who was responsible for distributing equipment to, and collecting it from, the men of his unit. In this context, an inscription from Durostorum records a *custos armorum* dedicating an altar to Mars and the *genius armamentarii*, whilst a tombstone from Bergamo depicts a man of this rank standing in front of a range of weaponry (Frontispiece).[26]

Against this, however, there might be proffered a more complex scenario, whereby the *custos armorum* would be responsible for ensuring that the men of his unit owned all of the required equipment, sold kit to new recruits, bought it back from those retiring and supervised the repair or scrapping of damaged items. Vegetius says it was the responsibility of the *centurio* or *decurio* to monitor the state of his men's armaments and it is possible that this duty could have been delegated to the *custos*.[27]

Finally, it is likely that most cities had their own *armamentaria*. These may have been used by troops or local militia based there, and to store materials in times of trouble. Vegetius recommends that a besieged city should have laid in supplies of iron and coal for weapons manufacture and wood for spear- and arrow-shafts.[28]



141 Plan of the Caerleon rampart-back building of the third century AD

Individual taste and decoration

What determined the appearance of Roman military equipment? There are no surviving records of pattern books (and analogies with more recent armies can be misleading here), whilst the communications infrastructure simply did not exist to permit central control and dissemination of equipment design. Nor do models requiring central manufacture appear to work, not least because of the horrendous transport and distribution problems inherent. Instead, as we have seen, the army of the Principate evolved its own manufacturing capability, using its own manpower. Even when the large *fabricae* of the Dominate were established, they were still regional, rather than Empire-wide.[29]

This meant that during the Principate the final product was, to an extraordinary degree seldom seen in more modern armies, designed and made by serving soldiers for themselves. A natural consequence of this involvement in production would be for the soldiers' tastes to find rapid expression in the items they produced; since they were made to pay for their equipment, they would have a natural pride and interest in equipping themselves in a manner that they found pleasing.[30]

With the sort of mechanisms envisaged here, it is not surprising that surviving military equipment shows such a rich diversity of design. Objects such as spearheads had functional considerations determining their final shape, but the range of forms surviving from the Roman period suggests not only that certain broad categories were designed for specific purposes, but also that the individual smith produced something that was, in a way that is difficult to define, personalized – making a spearhead that conformed to his own idea (or 'mental template') of a spearhead, rather than copying a plan (and this is essentially the Platonic concept of *mimesis*).[31]

The equipment of units under the Principate must have been very much a result of fashion and taste within a provincial army group or even unit. Hence, when a unit from one end of the Empire met one from the other, they must have differed in many respects. Movement of the armies, either by reassignment of whole units, or the common practice of vexillation to assist in emergencies, naturally brought men from different army groups into contact and this must have led to the mutual exchange of ideas and tastes. Such a hypothesis explains why equipment design may have had more to do with loose imitation than it did with slavish copying.[32]

Innovation and change

Scholars have seen the Roman army as a 'regular', almost 'modern', institution, and have considered the development of military equipment as a consciously directed process. Indeed, the senatorial historians very occasionally credit an emperor with personal interest in equipment improvement, but such panegyric cannot necessarily be taken at face value. There is a tendency in modern writing to say 'such-and-such was introduced by Hadrian', for example, rather than 'under Hadrian' or 'during Hadrian's reign'. The distinction is much more than merely semantic, and the tacit assumptions involved may prove to be quite misleading.[33]

Some developments undeniably did depend upon practical considerations. Indeed, certain arms and armour combinations did develop to serve particular battlefield roles (see Appendix). There certainly was deliberate recruitment and deployment of specialist troops, such as lancers and archers, on selected frontiers. However, the point at issue is whether equipment innovations were made over a short time (involving 'invention' and 'policy'), or were long-term evolutions subject to a variety of factors.[34]

The development of infantry fighting styles, for example, may be traced through changing helmet and sword design. Montefortino and Coolus helmet neck-guards allowed the head to angle back for a crouched stance, whilst the deep necks of most 'Imperial' and all third-century forms dictated (or, rather, were dictated by) a more upright pose. Thus, it is not surprising that the Roman soldiers fighting crouched underground in the Dura Tower 19 mine lacked helmets.

The long point of Mainz-type swords may have been best suited to stabbing in the manner described so graphically by Livy. Parallel-sided 'Pompeii' blades were also well adapted to cutting blows, so were used in the upright stance shown by the representational sources. Both were used with long, curved shields. From the later second century AD onwards, infantry used long *spathae* and flat shields in the upright stance, even more restricted by helmet-form. Swords were both long and slim ('Straubing/Nydam'), and wide and heavy ('Lauriacum'), denoting a variety of fencing styles (see Chapter 7). The 'Lauriacum' form was for (mounted?) slashing use, whilst 'Straubing/Nydam' swords were presumably wielded to deliver thrusts as well as cuts.[35]

First-century short-sword evolution may have been caused by changing tactical circumstances. In the northern theatres, Celtic adversaries with long

swords were replaced predominantly by Germans using spears rather than swords. The Roman adoption of infantry long swords could be seen as part of a very long-term trend away from thrusting to slashing, rather than a result of radical changes in German tactics (for which there is no evidence in this period). On the other hand, an additional part may have been played by warfare against the Danubian Sarmatians and the Partho-Sassanid empires in the East. In both these areas the enemies were mounted lancers with long swords, perhaps making the long reach of *spathae* desirable for Roman infantry. However, Roman armies fought the Parthians from the first century BC onwards, and Sarmatians from the second half of the first century AD, so, whatever factors were at work, change took place over a long period of time.[36]

Another instance of 'practical' innovation may be the Roman development of the '*lorica segmentata*'. Regardless of whether it had anything to do with the episode of the *crupellarii* (see above, p. 85), the very design of the cuirass sought to counter a specific threat posed by a particular enemy, using technology that was readily available in both the military and civilian spheres – laminated armour articulated on leather straps. There may have been many links between gladiatorial and army equipment practices, and the use of armguards by legionary infantry may be another interrelated example.[37]

Adoption of additional limb-defences in the face of Dacian scythe-weapons (*falces*), as seen on the Adamklissi metopes, would at first sight provide a clear example of short-term innovation. However, greaves and armguards were in use on other frontiers, earlier or contemporaneously, without the involvement of Dacian adversaries (see Chapter 5).

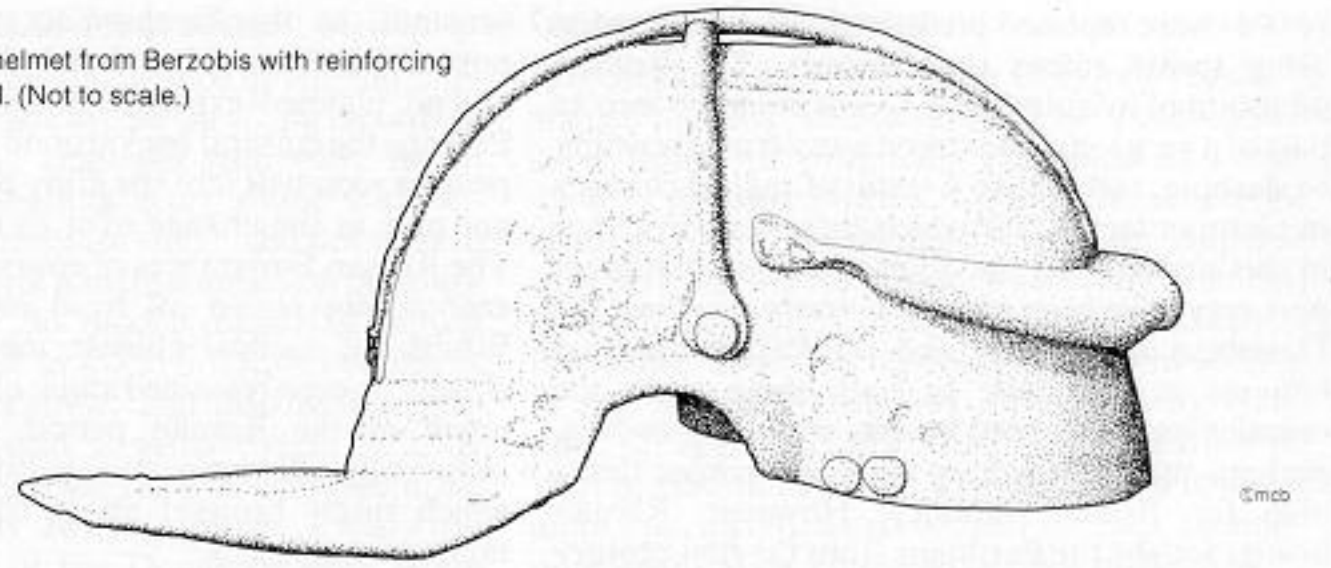
Many changes were probably not dictated primarily by 'practical' considerations. The exact shape of legionary shields in use from the third century BC to the third century AD did not matter much, as long as they were large and curved. Similarly, methods of sword-suspension, by rings or by slides, made little practical difference, as both could be used on either side of the wearer, and with both baldric and waist-belt. These features changed with fashion and dominant cultural influences.

Thus equipment evolution was subject to two main impulses: technical determinism and culture change. In many categories the former was a constant, so the development was part of the normal processes of material change over time, and no 'planned' explanation need be entertained. Perhaps the cultural background of western Celtic peoples recruited into the army played an important part in the change over to infantry *spathae*. The Roman Empire was of course neither homogeneous, nor sealed off from outside influences. Whilst the tactical climate may have changed slowly, or even remained static on some fronts for much of the Roman period, there were less technically deterministic cultural interactions which surely brought about change in Roman military equipment.

In answer to the question 'how well did Rome respond to the changing nature of the threat to her continued existence?', it might well be argued that, in the early days, the very dynamism of her military response was a key factor in her rise: never slow to dismiss old equipment and adopt proven pieces from an enemy, she could quickly have developed the most effective fighting force. However, such a view is over-simplistic and runs the risk of compressing hundreds of years of development into a comparatively quick, smooth evolution: from Republican contractors, to the army foundries of the Principate, to the later *fabricae* of the Dominate.

In the end, the most compelling picture (whether it is true or not is another matter) is of soldiers riveting reinforcing bars to the bowls of their helmets (Fig. 142), or copying the plate armour of renegade gladiators – not least because it is so evocative of the sort of improvisation that saw tank crews in the Second World War fixing spare tracks or wheels to the armour of their machines at vulnerable points. Innovation in the field was the key to survival and the Roman army seems to have been peculiarly well adapted to such an approach. The naming of the *lancea Lucullanea* may have been an ill-judged piece of conceit by a politically-naive governor, but his only crime seems to have been in naming the weapon after himself: development was the name of the game.[38]

Only when we break away from the image of emperors dictating the details of equipment design can we begin to appreciate the manner in which the Roman army operated. Indeed, it was cause for comment in the *Scriptores Historiae Augustae* that Hadrian chose to interfere with military equipment design, just as he had done in camp layout, hinting that other emperors saw fit to leave well alone. Overall cultural development and influence



142 Imperial-Gallic helmet from Berzobis with reinforcing cross-pieces on bowl. (Not to scale.)

may be seen as a background to local technical determinism. The latter might stimulate innovations which subsequently spread widely (helmet cross-pieces), or had more restricted use ('*lorica segmentata*'), depending upon a variety of factors.[39]

Interaction with other peoples

Scholars often emphasize the impact of the Roman army upon the peoples of the ancient world, but it must not be forgotten that this was a two-way process, whereby the Romans themselves were influenced by the various cultures and technologies which they encountered.[40]

At the simplest level, this was manifested in the adoption of equipment used successfully against Roman forces, but there was a more subtle and insidious way by which the Roman army was changed. This was a natural concomitant of the manner in which the Romans had always relied heavily upon allied peoples to supply them with additional troops, frequently bringing with them arms and methods of fighting that the Romans did not themselves practise.

The Celts had been enemies of Rome from very early on in her history, but it is unfortunately too easy to see them as technically and sociologically inferior to the Romans. This was not always true; Rome herself was once a small hilltop Iron Age settlement not unlike those of the Celtic world. It is more helpful if the Celts are considered as rivals in Rome's struggle for superiority in the western Mediterranean region, rather than as 'barbarian' inferiors.

Interaction with the Celts had a profound effect on Roman military equipment for a very long period – arguably until Germanic impact upon the frontiers of the Roman Empire in the third century AD. The Celts certainly seem to have been the originators of most of the forms of helmet used by the Romans during the late Republic and early Empire (Montefortino, Coolus, Imperial-Gallic, and Imperial-Italic). They also invented ring mail armour, a technology which the Romans used from the third century BC onwards, but on a far wider scale than the status-conscious Celtic warrior classes were ever to envisage. Lastly, the long sword, used by auxiliary cavalry in the first century AD, but gradually introduced throughout the army by the third century, was derived from Celtic models. Iberian influences probably lay behind the short sword and dagger, whilst the Etruscans may have been responsible for the *pilum*.

Germanic contacts seem not to have been influential until perhaps the later third century. Thereafter, some changes in equipment, such as the use of round shields, some scabbard-fittings and spearhead types may be attributed to German influence, perhaps even to the increased recruitment of Germans into the army (see Chapter 8). Traditionally, such changes have been seen as 'barbarization' of that army, but now they may be viewed as part of a process which took place continuously throughout Roman history.

Rome's eastern expansion led to conflicts with Parthian, Armenian and, later, Sassanid Persian forces. These were made up predominantly of horse-archers, the wealthier of them heavily armoured. Accordingly, Roman auxiliaries were recruited in the areas of the eastern Empire which shared in the same cultural tradition of composite archery.

In addition to the essential employment of oriental archers in the East, such troops were used against western barbarian enemies who themselves had few archers and little defensive armour.

With the *sagittarii* went their bow-case, quiver, bow and arrow types – laths and lobate tanged heads appearing in the artefactual record as a result. Heavy armour for man and horse was adopted for Roman units in the East, together with the requisite penetrative weapons (lance, axe). These cavalry, some probably both lance and bow armed in the Mesopotamian fashion, were also used in the West against comparatively lightly armoured enemies. Oriental helmet design influenced the development of fourth-century Roman 'Ridge' helmets (see Chapter 8).[41]

The North African javelin-armed light cavalry which fought so effectively for Hannibal were employed in Republican and Imperial Roman armies. They were used particularly on the Danube against Germans and Sarmatians, and in the East, presumably to catch light horse-archers. Such cavalry were usually kept in irregular units, but became more formalized from the third century onwards in regiments of *equites Mauri*. Even in the later sixth century light javelins were called 'Moorish'.[42]

The Danubian zone was another important region of interchange. First- to second-century AD 'Thracian' type burials are notable for their inclusion of Roman cavalry equipment, but assemblages at Čatalka in Bulgaria elucidate the Danubian cultural *mélange* remarkably. These included swords and scabbard-fittings of Chinese, Asiatic and Celtic design, a quiver of arrows, spearheads and shield bosses, a Roman full-face sports helmet, a plate-armour gorget, sections of scale and mail corselets, and full-length splint armour for the legs.[43]

Contacts with steppe peoples across the Danube, from the second half of the first century AD onwards, also led to the formation of specialist auxiliary units. Judging from their titles, some were heavily armoured, others armed with lances. The ancient literature makes it clear that Sarmatian armour and lances impressed the Romans most, and before the fourth century Danubian nomad archery was less influential than Mesopotamian practice. However, other forms of Sarmatian equipment adopted for Roman use probably included scabbard-slides, ring-pommel swords, *Spangenhelme* and *draco* standards. In the fourth century, Hunnic warfare brought a new emphasis on horse-archery which necessitated further Roman adaptations.[44]

The Roman Empire represented a rich source of military equipment for less developed societies beyond the frontiers, and this was Rome's reciprocal influence on the barbarians. Roman military equipment crossed the northern frontiers to be used in inter-Germanic wars and eventually to be ritually deposited in graves and lakes. A *negotiator gladiarius* attested at Mainz may well have been involved in cross-border arms trade, since such *negotiatores* make no sense in the context of army supply. This equipment was presumably also turned back against the Empire, and the artefactual record suggests that during the Imperial period the northern barbarians became progressively better armed.[45]

In the East, mail armour was adopted from the Romans by the Sassanids perhaps as late as the third century AD. In addition, Rome was influential in the specialized area of siege-technology. Unlike the Parthians, the Sassanids were quite capable of besieging and capturing walled cities and Roman sources ascribe this to the expertise of Roman prisoners and deserters. The latter are reported in many periods, representing an unavoidable leakage of information and technology out of the Empire. Even the Dacians in the late first century AD apparently had Roman artillery and technicians working for them. Ironically, the very existence of the Roman state and the efficiency of its army strengthened the Empire's enemies.[46]

APPENDIX
WAS THERE 'LEGIONARY' EQUIPMENT?

It has been a long-standing tacit assumption that auxiliary and legionary soldiers were differently equipped. This notion is founded on Trajan's Column, which shows several types of Roman troops, particularly two distinct classes of infantry. On the one hand there are those equipped with curved, rectangular shields, segmental armour, and practising engineering and specialist duties; on the other, there are those with flat oval shields, mail shirts and leggings. The men in segmental armour perform tasks expected of legionary troops and are associated with legionary and Praetorian standards. The other class of infantry are identical to cavalrymen with horses, so they may be identified as auxiliary infantry. But there are assumptions behind assumptions here: we have already seen that there are problems with the accuracy of the Column in its strictest sense. Might the supposed differentiation be symbolic and part of the greater scheme of the frieze? Most importantly, why should there be any attempt to differentiate?[1]

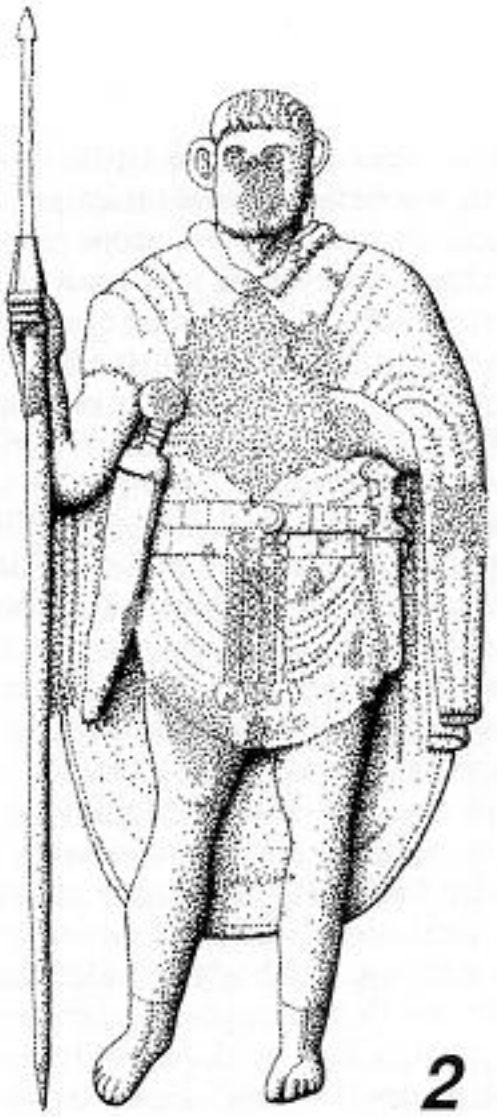
In considering the finds from Risstissen, Ulbert first voiced misgivings about the discovery of large amounts of '*lorica segmentata*', the type of cuirass usually identified with the supposed legionaries on Trajan's Column. It seemed out of place in what ought to have been an auxiliary fort. Later, in his rëport on the excavations at the so-called 'vexillation fortress' of Longthorpe, Frere again remarked upon the presence of '*lorica segmentata*' and wondered whether it could not have been a cavalry cuirass. Maxfield took these doubts even further in 1986, to the point where she questioned whether there was any real distinction between legionary and auxiliary equipment at all.[2]

Summarizing all the representational evidence, Maxfield noted that whilst legionaries and Praetorians were found in '*lorica segmentata*', no auxiliaries were shown thus, and, given the (to her mind) questionable nature of the evidence of the Column, she felt that 'the fact that the impression created by Trajan's Column is clearly erroneous, must leave open the question as to whether the auxiliary could be issued with *segmentata*'. When it came to the archaeological data, she felt that the amounts of fittings from segmental armour being recovered, particularly from the Danubian forts of Risstissen, Aislingen, Hüfingen and Oberstimm, were too great to be explained away as originating with legionary building parties, although none of these had produced conclusive epigraphic evidence of their garrisons. Frankfurt-Heddernheim, on the other hand, had produced both '*lorica segmentata*' fittings and details of the auxiliary garrison, both infantry and cavalry. Moreover, the province of Raetia, within which the Danubian sites lay, had no legion of its own based there (at least until the reign of Marcus Aurelius). The nearest legions were those in Upper Germany, with responsibilities stretching from north of the Main to south of the Hochrhein.[3]

In re-examining this issue, we shall, for the time being, avoid resorting to the 'evidence' of Trajan's Column, precisely because it is such a contentious source. It is apparent that an important key to the understanding of the legionary-auxiliary relationship lies not in the study of representational evidence for '*lorica segmentata*', which is virtually non-existent with a few possible (and debatable) exceptions before the second century AD, but rather in the depiction of the armament of the respective troop types. In instances where figured first-century tombstones record the unit concerned and preserve their weapons, there can be no dispute: legionaries (such as Flavoleius Cordus at Mainz or Valerius Crispus at Wiesbaden) carry the *pilum* and the curved body shield, whilst auxiliary infantrymen (such as Annaius Daverzus from Bingen or Firmus at Bonn) have spears (usually two) and a flat shield (Fig. 143). Now both auxiliary and legionary shields can be oval or rectangular, but the essential difference lies in their curvature.[4]

143 Tombstones of legionaries (above) and auxiliaries (below). *1* Flavoleius Cordus (Mainz); *2* Petilius Secundus (Bonn); *3* Firmus (Bonn); *4* Annaius Daverzus (Bingen). (Not to scale.)

1



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There is thus a germ of truth in equipment differentiation between legionaries and auxiliaries, and when we broaden the scope of enquiry to include other representational sources, we do not find it contradicted. The pairing of *pilum* with curved shield, spear with flat shield is everywhere evident. It is to be found on fragmentary tombstones which have lost their inscriptions, on the Mainz column bases (see Fig. 5) and on the Adamklissi metopes (see Fig. 50). Whether this was originally the case on Trajan's Column is no longer capable of proof, since the weapons on that monument were inserted separately in bronze and have long since vanished (Pl. 5). The association of curved shields with segmental armour and flat shields with mail nevertheless remains.[5]

One of the best-known Mainz column bases depicts a running infantryman who holds one spear in his hand, with two more retained behind his flat oval shield (Pl. 5a). Other bases show soldiers with curved body shields, one with his sword drawn in the approved offensive posture and a companion with a shouldered *pilum* (Fig. 5b); on another relief a marching soldier also has a shouldered *pilum* and curved shield (Fig. 5d). The Adamklissi metopes depict soldiers equipped with curved body shields, articulated armguards, and either short swords or *pila*.[6]

Amongst the archaeological evidence, the only curved shield boss to bear an inscription that betrays its unit, that from the river Tyne, belonged to Junius Dubitatus of *legio VIII Augusta* (Pl. 3a). A fragmentary twin piece, found at Vindonissa, bears the same motifs and totemic bull, and so presumably belonged to the same legion.[7]

The distinction between legionaries and auxiliaries that is apparent from the representational evidence was a functional one. The *pilum* was a short-range, armour-piercing, shock weapon, thrown shortly before physical contact was made between the Roman line and its foe; the curved shield was the defence of an infantryman who fought in close order, but who was concentrating his interest in front and to the left, effectively enabling him to ignore his right side. This would be protected by the man to his right (it was not the sort of shield for forming an overlapping shield wall). Legionaries are further associated with the *pilum* by the literary sources.[8]

The spears carried by an auxiliary infantryman (and carrying more than one is indicative of their normal use as missiles) and the flat shield were, on the other hand, dual purpose. Such a soldier could equally well skirmish in open order, hurling spears to harry an enemy, deflecting enemy missiles with his shield, as he could fight in line, either with overlapping shield and projecting spear, or with his flank covered by the shield and with his short sword for stabbing. The legionary was thus equipped as a specialist for one particular type of combat – the set-piece battle with both sides arrayed in textbook formations – whereas the auxiliary was adaptable to a variety of combat scenarios, from a role similar to that of the legionary (and here we may recall the Batavians at Mons Graupius) to skirmishing and more general policing duties.[9]

There are numerous literary references to the legions providing close order troops whilst the *auxilia* supplied screening and flanking forces, as well as missile support. Although it is always wise to be wary of Tacitus' literary flourishes, he contrasts the formations of the legionaries and auxiliaries before the battle of Placentia in AD69 as '*densum legionum agmen, sparsa auxiliorum*'. Furthermore, this is graphically illustrated in Arrian's order of battle against the invading Alani, where the enemy assault was to be countered by auxiliary missiles, then repulsed by the legionary centre, and finally cautiously pursued by auxiliary cavalry and infantry.[10]

Vegetius, in a passage which Schenk suggested derived from the first-century encyclopaedist Celsus, records that 'the *auxilia* were always connected with the legions in line of battle as light troops (*levis armatura*), so that fighting in this way, they should have been a greater support than the main reserves.'[11]

The fact of equipment differentiation is also explicitly stated by Tacitus, describing events in Rome during Otho's coup of AD69: 'He then ordered the *armamentarium* to be opened. Weapons were promptly carried off without regard for military custom and rank, which distinguished the praetorian from the legionary by their *insignia*. Helmets and shields meant for auxiliaries added to the confusion.'[12]

Thus we see that the question of who wore '*lorica segmentata*' is, in many ways, irrelevant, but we must not lose sight of the fact that there is no representational evidence that it was ever used by auxiliary infantry, something that Maxfield admits. Moreover, the function of segmental armour was highly specialized. It offered a lighter defence than mail, with special attention paid to the protection of the shoulders from downward blows, a characteristic of combat with an enemy using long swords – the Celts. In line, the soldier's

trunk was concealed behind his shield and he was only vulnerable around the head and shoulders from such blows; Roman helmets were designed to deflect these blows, so they had to be taken on the shoulders. Mail, even with shoulder-doubling and the padded shoulders which we now suspect had to be worn with it, would be inferior to curved plate armour with its energy-absorbing properties. The trunk, with its overlapping girth plates, was protected, but not nearly as well as the shoulders; in one-to-one combat or in skirmishing, the possibility of penetration by missiles or thrusts can have been little different to that of mail, although deflection was probably enhanced by the curvature of the plates. Mail offers more even protection over the whole of the body; whilst its weight handicap over segmental armour cannot be denied, this is hardly a consideration in its supply to troops. The manufacture of mail is undeniably easier and less specialized than '*lorica segmentata*', even if it was composed of a mixture of riveted and welded rings (see Chapter 5). '*Lorica segmentata*' was over-engineered and certainly prone to fall apart (see Chapter 9).[13]

All of the sites Maxfield considered when studying '*lorica segmentata*' have also produced either *pilum* heads or catapult bolts, and usually both. Now, as we have seen, there is little room for doubt that the *pilum* was a legionary weapon, and Baatz has argued that artillery (in the first century AD, at least) was exclusively legionary, so it is difficult to counter the assertion that the recovery of these two classes of artefact is indicative of a legionary presence in some form. The implications of this are profound, for as Maxfield admitted: 'To postulate a small legionary detachment for each of these sites implies the extreme fragmentation of units designed to function with an establishment strength of about 5000 men.'[14]

Accepted notions about Roman garrisoning behaviour, which can be summarized simplistically as legionaries in legionary bases, auxiliaries in forts, are in fact a stereotypical impression derived from perceived second-century and later military 'policy'. Projecting this backwards into the first century, still assuming legionaries belonged in fortresses, auxiliaries in forts, runs counter to the literary, epigraphic and archaeological evidence. The surprise engendered by the discovery in Britain of the so-called 'vexillation fortresses', seemingly designed for mixed part-units, would surely have been tempered if it was thought that it was standard practice for the Roman army to brigade infantry with cavalry, auxiliaries with legionaries, both in time of war (when it made most sense), and in post-conflict military policing of an area. The detachment of legionary units and even parts of auxiliary regiments is well attested during the Tiberian war against Tacfarinas, and later by *legio III Augusta* (also in North Africa), as well as elsewhere in the epigraphic and sub-literary sources.[15]

It is now possible to see that, on Trajan's Column, the distinction between Praetorian/legionary and auxiliary troops, or rather citizens and non-citizens, was deliberately signposted for the viewing audience by distinctions in equipment, but that also these differences reflected the true state of affairs. The technical skills of citizen forces were played up whilst the auxiliaries bore the brunt of the fighting in order to glorify Trajan and his army in traditional manner.[16]

None of this serves to prove that auxiliary infantry did not wear '*lorica segmentata*', but at the same time there is no evidence to show that they did. Whilst it would be foolish to say that auxiliary infantry *never* used segmental armour, we might venture to suggest that it was normally only found as the armour of certain legions, notably those facing enemies like the Celts whose style of fighting posed a particular threat to the head and shoulders of the line infantryman.

Ironically, our evidence suggests that matters began to change in the Antonine period and that by the early third century, differentiation between legionaries and auxiliaries had practically disappeared. The long sword was brought in as the sidearm of infantry and the flat, if slightly domed, oval shield became the normal equipment for both troop types. '*Lorica segmentata*' continued in use during the early third century, as did the *pilum*, although the latter appears to have undergone several name changes. Nevertheless, the implications seem to be that the fighting styles of legionaries and auxiliaries were coming closer together, preferring the versatility of the earlier auxiliary style of weaponry to the specialized legionary heavy infantryman of old. New light-troop types began to be incorporated within the legion, echoing the Republican practice.

ABBREVIATIONS USED IN THE NOTES AND BIBLIOGRAPHY

AA	*Archaeologia Aeliana*
AAASH	*Acta Archaeologica Academiae Scientiarum Hungaricae*
A Camb	*Archaeologia Cambrensis*
Acta A	*Acta Archaeologia* (Copenhagen)
AE	*L'Année Epigraphique*
AJ	*Archaeological Journal*
AJA	*American Journal of Archaeology*
AK	*Archäologisches Korrespondenzblatt*
Amm.	Ammianus Marcellinus
AMN	*Acta Musei Napocensis*
ANRW	*Aufstieg und Niedergang der römischen Welt*
AntJ	*Antiquaries Journal*
Apul.	Apuleius, *Metamorphoses*
ArchS	*Archäologie der Schweiz*
Arrian *Ek*	*Ektaxis kat'Alanon*
AuhV	L. Lindinschmit, *Die Altertümer unserer heidnischen Vorzeit*
AVNA	*Annalen des Vereins für nassauische Altertumskunde*
BAR	British Archaeological Reports, Oxford
BJ	*Bonner Jahrbücher*
BRGK	*Bericht der Römisch-Germanischen Kommission*
Brit	*Britannia*
BV	*Bayerische Vorgeschichtsblätter*
CA	*Current Archaeology*
CAH	*Cambridge Ancient History*
CIL	*Corpus Inscriptionum Latinarum*
CRAI	*Comptes Rendus de l'Académie des Inscriptions et Belles-Lettres*
CSIR	*Corpus Signorum Imperii Romani*
DOP	*Dumbarton Oaks Papers*
Esp.	Espérandieu, E. 1907–66: *Recueil général des bas-reliefs, statues et bustes de la Gaule romaine*, Paris
Esp. Germ.	Espérandieu, E. 1931: *Recueil général des bas-reliefs, statues et bustes de la Germanie romaine*, Paris
Gellius	*Noct. Att. Noctes Atticae*
Ger	*Germania*
GpV	*Gesellschaft pro Vindonissa. Jahresbericht*
GR	*Germania Romana, Ein Bilderatlas, III, Die Grabdenkmäler*, Bamberg, 1926
Isid.	Isidorus, *Etymologiarum*
JAK	*Jahresberichte aus Augst und Kaiseraugst*
JAS	*Journal of Archaeological Science*
JDAI	*Jahrbuch des Deutschen Archäologischen Instituts*
JKSW	*Jahrbuch der kunsthistorischen Sammlung in Wien*
JÖAI	*Jahrbuch des Österreichischen Archäologischen Instituts*
JRA	*Journal of Roman Archaeology*
JRGZM	*Jahrbuch des Römisch-Germanischen Zentralmuseums Mainz*
JRMES	*Journal of Roman Military Equipment Studies*
JRS	*Journal of Roman Studies*
MAKW	*Mitteilungen der Altertumskommission für Westfalen*
MDAI(R)	*Mitteilungen des Deutschen Archäologischen Instituts, Römische Abteilungen*
ND (Or.; Occ.)	*Notitia Dignitatum omnium tam civilium quam militarium (in partibus Orientis; in partibus Occidentis)*
OED	*Oxford English Dictionary*, Oxford, 1933
OM	*Oudheidkundige Mededelingen*
ORL	*Der obergermanisch-raetische Limes des Römerreiches*
PBA	*Proceedings of the British Academy*

Polyb.	Polybios, *Historia*
Procop.	Procopius *Wars*
PSAN	*Proceedings of the Society of Antiquaries of Newcastle upon Tyne*
PSAS	*Proceedings of the Society of Antiquaries of Scotland*
RE	*Paulys Realencyclopädie der classischen Altertumswissenschaft*, Stuttgart 1893-
RGZM	*Römisch-Germanisches Zentralmuseum Mainz*
RIB	*The Roman Inscriptions of Britain*, Oxford 1965–
RLÖ	*Die Römische Limes in Österreich*
SHA	*Scriptores Historiae Augustae*
SJ	*Saalburg-Jahrbuch*
Tac. *Ag.*	Tacitus, *Agricola*
Tac. *Ann.*	Tacitus, *Annales*
Tac. *Hist.*	Tacitus, *Historiae*
TCWAAS	*Transactions of the Cumberland and Westmorland Antiquarian and Archaeological Society*
TZ	*Trierer Zeitschrift*
UOÅ	*Universitetets Oldsaksamling Årbok (Oslo)*
Veg.	Flavius Vegetius Renatus, *Epitoma rei militaris*
VHAD	*Vjestnik Hrvatskoga Arheloskoga Drustva* (Zagreb)
ZPE	*Zeitschrift für Papyrologie und Epigraphik*

NOTES

Preface and introduction (pp. 12–13)

1. Couissin 1926; Bishop and Coulston 1989.
2. Hoffmann 1969; Connolly 1981; Maxfield 1981; Johnson 1983; Campbell 1984; Keppie 1984; Webster 1985.

1 The representational evidence (pp. 19–32)

1. Cf. Couissin 1926 and Robinson 1975; Coulston 1983.
2. E.g. full publications: Bishop 1983b; Noelke 1986; Coulston 1988b.
3. E.g. Amelung 1903; Barkóczi 1944; Benseddik 1979; Esp; Esp. Germ.; Franzoni 1987; Hofmann 1905; Kieseritzky and Watzinger 1909; de Lachenal *et al.* 1984; Pfühl and Mobius 1977; Schleiermacher 1984; Schober 1923; Seltzer 1988.
4. Hamberg 1945; Scheiper 1982; Campbell 1984, 47, 65–7, 72–84, 120–1, 142–8, 182–5; Hannestad 1986. See Koeppel 1982.
5. Robinson 1975, 7, 64–5; Waurick 1983; 1989; Coulston 1983, 24–5.
6. Ahenobarbus: Robinson 1975, Pls. 463–6. Aemilius Paulus: Kähler 1965.
7. Orange: Amy *et al.* 1962. Claudian arch: Koeppel 1983b. Cancelleria: Magi 1945; Koeppel 1984, No. 7–8. *Anaglypha*: Koeppel 1986, No. 2. Chatsworth: Koeppel 1985, No. 8. Pozzuoli: Kähler 1951. Benevento: Hassel 1966; Fittschen 1972; Andreae 1979.
8. Cichorius 1896–1900; Lehmann-Hartleben 1926; Coulston 1989; 1990b.
9. Cichorius 1896–1900, Pl. II–III; Gamber 1964.
10. Robinson 1975, 170. Figure types: Coulston 1989, 31–4.
11. Koeppel 1985, No. 9–16; Leander Touati 1987.
12. Attic helmets: Robinson 1975, 27, 64–5; Waurick 1983, 292–8; Dintsis 1986, 105–12.
13. Florescu 1965; Richmond 1982.
14. *Congeries*: Smith 1904, No. 2620; Stuart Jones 1926, Pl. 8; Spannagel 1979, Fig. 2; cf. Crous 1933. Pius Column: Vogel 1973.
15. Petersen *et al.* 1896; Becatti 1957; Birley 1987, 267.
16. Waurick 1983, 296–7; 1989, 46–58. Horse-archer: Petersen *et al.* 1896, Scene LVII. Irregulars: *ibid.* XV, XXVII, XXXIX, LXXVIII.
17. Koeppel 1986, Nos. 23, 26–31; cf. Nos. 17, 35–6.
18. Brilliant 1967. Cf. the Porta Argentariorum: Haynes and Hurst 1939.
19. Andreae 1977, Pl. 557–60.
20. Decennalia: Kähler 1964. Pedestal: Brilliant 1982. Chiaramonti: Koeppel 1986, No. 48.
21. Thessalonike: Laubscher 1975.
22. L'Orange and von Gerkan 1939.
23. Obelisk: Delbrück 1933, 185–92, Pls. 86–8. Column of Theodosius: Becatti 1960, 83–150, Pls. 48–55. Column of Arcadius: *ibid.*, 151–264, Pls. 56–63, 73–80; Freshfield 1922; Lieberschutz 1990, 273–8, Pls. 1–7.
24. Cuirassed statues: Vermeule 1959–60; Robinson 1975, 147–52. Porphyry statues: Delbrück 1932, Pls. 31–5, 47–51.
25. See Cumont 1942.
26. Officers: Keppie 1984, Pl. 5; Franzoni 1987, Pl. VII,3. Padova: *ibid.* No. 26. *Stela* types: Schober 1923; *GR* III; Gabelmann 1972; Anderson 1984; Schleiermacher 1984; Tufi 1988.
27. Verona: Franzoni 1987, No. 30. Robinson 1975, 157–9, 164–70. Wiesbaden: Esp. Germ.11; Robinson 1975, Pl. 469. Aquincum: *ibid.*, Pl. 470; Schober 1923, No. 162.
28. Schleiermacher 1984.
29. Britain: Anderson 1984. Africa: Benseddik 1979. Tombstone proportions based on Esp., Esp. Germ., and RIB.
30. Corinth: Kos 1978. Philippi: Schleiermacher 1984, No. 98. Croy Hill: Coulston 1988b. Tipasa: Benseddik, 1979, Figs. 1–3, 5; Schleiermacher 1984, Nos. 65–7.
31. Third-cent. *stelae*: Noelke 1986; Coulston 1987. Alexandria: Breccia 1914, Fig. 41; Bernand 1966, Pls. 13–15; Castiglione 1968, 114–15. Apamea: Balty 1987; 1988.
32. *Equites singulares*: Schafer 1979, Figs. 5–8. Cf. Speidel 1981–82.

33. Aquileia: Franzoni 1987, No. 22. Strasbourg: Esp. 5496. Linz: Eckhardt 1981, No. 57. Cf. Esp. 3943 (Amiens); Franzoni 1987, Nos. 12–17, 20–1, 23 (Aquileia). *Catafractarii*: Schleiermacher 1984, Nos. 49, 88, 90, 93.
34. Ephesos: Schleiermacher 1984, No. 122. Sitten: Lehner 1986. Vatican: Amelung 1903, No. 163, Pl. 30; Bandinelli 1971, Pl. 65. Terme: de Lachenal *et al.* 1984, V.20. Gaeta: Fellmann 1957. Arlon: Esp. 4021; Gabelmann 1973. Saintes: Robinson 1975, Pl. 203. St Remy: Esp. 114. Gladiators: e.g. Grant 1967, Pls. 6, 9, 12, 28–9, 31.
35. Portonaccio: Koch and Sichtermann 1982, Pl. 76; Bertinetti *et al.* 1985, No. IV.4. *Loricae*: Robinson 1975, 184. Hunt sarcophagi: Koch and Sichtermann 1982, Pls. 79–92. Ludovisi: *ibid.*, Pls. 77–8; Andreae 1977, Pl. 144. Red Sea: Strong 1980, Pl. 222.
36. Condurachi and Daicoviciu 1971, Fig. 117. *Dona*: Maxfield 1981, Pl. 5.
37. Esp. 5822; Robinson 1975, Pls. 196–9. See Büsing 1982.
38. Mavilly: Esp. 2067. Alzey: Künzl 1975, No. 6. Old Carlisle: Wright and Phillips 1975, No. 238. Aalen: Filzinger 1983, Fig. 5. Jupiter Columns etc: Esp. 4696, 5251, 8437; Cf. No. 1623. Palestrina: Bandiera 1977, No. 31. Mantova: Robinson 1975, Pls. 450–1, 472; Koeppel 1983a, No. 33. Cluj: Rumänien 1969, G191. Intercisa: Barkóczi *et al.* 1954, Pl. LXXXI,8. Eining: Wagner 1973, No. 477.
39. Coulston 1985; 1986.
40. Crimea: Kieseritzky and Watzinger 1909. Parthian: Vanden Berghe and Schippmann 1985. Sassanid: Herrmann 1980, 1983; Herrmann and Mackenzie 1989. Palmyrene: Colledge 1976; Tanabe 1986.
41. Osuna: Garcia y Bellido, 1949, No. 428. Gauls: Esp. 35–6, 2372, 7833–7, 8613, 8652–6, 9155. Numidians: Horn and Rüger 1979, Pl. 107; *Encyclopédie Berbère* I, 1984, *s.v.* 'Abizar'.
42. Esquiline: Lehmann-Hartleben 1926, Figs. 8, 12. Dura: Cumont 1926, Pls. XLIX–L; Baur *et al.* 1933, Fig. 16, Pl. XVII; Rostovtzeff 1934, Pl. XXXVI,3; Rostovtzeff *et al.* 1936, Pl. XLII,1; Kraeling 1956. Der el-Medineh: Luxor 1981, No. 290. Luxor: Kalevrezou-Maxeiner 1975. Syracuse: Wilson 1990, Pl. XII. Via Latina: Tronzo 1986, Fig. 92.
43. Piazza Armerina: Carandini *et al.* 1982; Wilson 1983. Archers: Coulston 1985, 238, Figs. 36–8. Ravenna: Volbach 1961, Pl. 234; Paolucci 1971, 46–7.
44. *Notitia*: Goodburn and Bartholemew 1976; Berger 1981. *De Rebus Bellicis*: Hassall and Ireland 1979. Treatises: Marsden 1971; Lendle 1975. *Iliad* and *Aeneid*: Vergiliana 1945; Becatti 1960, Pls. 66–8.
45. Figures: Robinson 1975, Fig. 122, Pl. 474, 501; Traiana 1981; pers. obs. Kunsthistorische Museum (Vienna), Bologna Museo Civico, Luni Museum (Italy), Colonia Sarmizegethusa Museum (Romania). Nawa: Abdul-Hak 1954–55, Pls. IV–VII. Vessel: Schafer 1989. Coffin: Murray Threipland 1953. Missoria: Delbrück 1933, Pl. 57, 79, 94–7. Coins: Brilliant 1963.
46. Ephesos: Onen 1983, 119. Wood sculpture: Alfs 1941, Fig. 9; Casey 1991, 21. Terracottas: Bandinelli and Giuliano 1973, Figs. 344, 366, 372; Eichberg 1987, Pl. 18; van Boekel 1989. Canosa: Rostovtzeff 1946. Figurines: Eichberg 1987, Pls. 4–8; Baur and Rostovtzeff 1931, Pls. XXIV–V; Gamber 1968, Fig. 40; Herrmann 1989, Pl. V.
47. *RLÖ* VI, Figs. 69,6; 70,1; IX, Fig. 44; Raddatz 1953, Fig. 1; Oldenstein 1976, Nos. 353–87, 951–2; Allason-Jones and Miket 1984, No. 3.129; Fischer and Spindler 1984, Fig. 40,1; Beal and Feugère 1987.
48. Dura: Cumont 1926, Pl. XCVIII; Baur and Rostovtzeff 1931, Pl. XLI, XLIII; Baur *et al.* 1933, Figs. 15, 22–3, Pl. XX–XXII; Rostovtzeff 1934, Pl. XXXV; Rostovtzeff *et al.* 1936, Fig. 8; 1939, Pl. LVI; 1952, Fig. 6. Africa: CIL VIII, 17978 (pers. comm. Mr Alan Rushworth). Bu Njem: Rebuffat 1989, Fig. 5.

2 The archaeological evidence (pp. 33–41)

1. Barker 1977, 181–4; Harris 1979, 92–9.
2. Newstead pits: Curle 1911, 104–39. Curle's approach: *ibid.* viii.
3. Accidental loss: Bishop 1986, 717–19; 1989a, 5–6. Helmets in rivers: Robinson 1975, 58, following Klumbach 1961, 98–100.
4. Battlefields: Bishop 1989a, 3–4. Vinnius: Florus II,24. Bayeux: Wilson 1985, Pls. 71–3. Wisby: Thordeman 1939. Krefeld: Pirling 1971; 1977; 1986. Horse burial: A. Hyland, pers. comm.
5. Rostovtzeff *et al.* 1936, 188–99.
6. Inchtuthil: Taylor and Wilson 1961, 160; Angus *et al.* 1962; Pitts and St Joseph 1985, 105–15, 289–99. Herodian: *Hist.* III,14,7. Newstead: Manning 1972, 243–6. Deliberate clearance: *ibid.* 246.
7. Demolition: Hanson 1978, 302–5. Clearance: Bishop 1986, 721–2.
8. Corbridge: Allason-Jones and Bishop 1988, 103. Over-representation: Coulston 1988b, 12–13; Bishop 1989a, 2.
9. Recycling: Bishop 1985b, 9. Zinc: Horn 1987, Fig. 90.
10. Allason-Jones and Bishop 1988, 109–10.

11. Army movements: Schönberger 1985, 355 (Voralpenland); 347–8 (*c.*AD43); 359–65 (after AD70); 423–4 (German and Raetian frontiers). Dacia: Dawson 1989, 355. Towns: MacMullen 1988, 209–17; Hodgson 1989; Bishop 1991. Cf. Veg. III,8.
12. Mauretania: Boube-Piccot 1964; Mackensen 1991.
13. Distribution: Bishop 1986, 719; Mackensen 1987, 44. Temporary camps: Bishop 1985b, 13.
14. Helmets: Oldenstein 1990, 36. Diachronic: Bradley 1982; 1990, 200–1.
15. Torbrügge 1972. Tongres: CIL XIII,3592. Durostorum: CIL III,14433. Bath: Cunliffe 1988, 8–9 with Fig. 4, Pl. V. Laws on equipment: *Digest* 49,16,3,13; Ruffus 29 and 56.
16. Bog finds: Engelhardt 1863; 1865; 1867; 1869; Ilkjaer and Lønstrup 1982.
17. Sword of Tiberius: Lippold 1952; Klumbach 1970; Walker 1981. Context: Brown 1976, 37. Imprecise language: Lippold 1952, 4. Scientific analysis: Klumbach 1970, 130.
18. Coles 1979, 47–8.
19. Ermine Street Guard: Constable 1984; Leva and Plumier 1984. Junkelmann 1986; 1989.
20. *RLÖ* II; Robinson 1974; 1975, 174–86.
21. Schramm 1980; Marsden 1969; Baatz 1978.

3 The documentary evidence (pp. 42–47)

1. Ogilvie 1980, 11–17.
2. Heron: Marsden 1971, 206–33. Vitruvius: *ibid.*, 185–205. Vitruvius as *architectus*: *ibid.*, 3–4.
3. Military manuals: Campbell 1987.
4. Vegetius' sources: Schenk 1930. Transverse crests: II,13. *Antiqua legio*: e.g. Parker 1932; Sander 1939. Apamea: Balty 1987; 1988.
5. *Notitia*: James 1988, 257–9.
6. Nervii: Caesar *De Bello Gallico* II,21.
7. Tac. *Ann.* XII,35. *Commilito*: Campbell 1984, 32–59.
8. Terentianus' demands: Youtie and Winter 1951, No. 467.
9. Further demands: *ibid.* No. 468.
10. Vindolanda: Bowman and Thomas 1983, No. 38. Paniskos: Winter 1936, Nos. 214–21.
11. Workshop papyrus: Bruckner and Marichal 1979, No. 409. Deceased son: Gilliam 1967. Vindolanda: Bowman and Thomas 1983; 1987.
12. Epigraphic habit: MacMullen 1982. Epigraphy in general: Sandys 1927.
13. *Ballistaria*: Campbell 1984; 1989; Donaldson 1990.
14. Aedui: CIL XIII, 2828. Milan: CIL XIII,6763.
15. Esp. 5835.
16. CIL XIII,3592.
17. Inscriptions: MacMullen 1960, 33–40. Eich: Oldenstein 1990, 35–6.
18. Köln helmet: Klumbach 1974, 23. Auxiliary use: Robinson 1975, 82.
19. Deurne helmet inscriptions: Klumbach 1973, 60–1.
20. Newstead: Curle 1911, 188, Pl. XXXVI,5. Gomadingen: Heiligmann 1990, Fig. 26,1. London: Webster 1958, No. 157, Pl. XI,D.
21. Pompeii-type sword: CIL XIII,10028,9. *Patera*: RIB 2415,39. Vindonissa: Ettlinger and Hartmann 1984. Strasbourg scabbard: CIL XIII,10027,197. Oberammergau: Ulbert 1971. Rheingönheim: Ulbert 1969a, Pl. 32,2–3.
22. Mainz: *AuhV* 4, Pl. 11,3. Vindonissa shield covers: Gansser-Burckhardt 1942, 73–88.

4 The Republican period (pp. 48–64)

1. Equipment before the Punic Wars: Connolly 1981, 91–112; 1989a; Adam and Rouveret 1988.
2. Numantia: Curchin 1991, 34–9. Renieblas: Keay 1988, 36. Castillejo: *ibid.* 38. Peña Redonda: *ibid.* 40. Entremont: Coutagne 1987, 64–5; Rivet 1988, 40. Cáceres el Viejo: Keay 1988, 43. The archaeological sources are Numantia and the Roman sites in its vicinity (Schulten 1927; 1929), along with Cáceres el Viejo (Ulbert 1985).
3. Alesia: Verchère de Reffye 1864. Dagger: Couissin 1926, Fig. 87; Connolly 1981, 227 Fig. 8.
4. Domitius Ahenobarbus: Coarelli 1968; Robinson 1975, Pls. 463–6. Aemilius Paullus: Kähler 1965.
5. *Pilum* action: Webster 1985, 11; 21; Connolly 1989b, 162. Medieval missiles: Edge and Paddock 1988, 35; 91. Experiments: Junkelmann 1986, 188.
6. Wooden rivet: Plutarch, *Marius* 25. Untempered shank: Keppie 1984, 102. Experiments: Ermine Street Guard, pers. comm.
7. Samnite: Reinach 1907. Spanish: Schulten 1911. Etruscan: Connolly 1981, 100. Tarquinia: *loc. cit.* Fig. 5. Two versions: Polyb. VI,23.
8. Polybios: VI,23. Cf. Schulten 1914.
9. Numantia *pila*: Schulten 1914; 1927, 249–51; 1929, 214. Cáceres el Viejo: Ulbert 1985, 105–8. Alesia: Verchère de Reffye 1864, Figs. 5–8, Pl. XXIII. Entremont: Coutagne 1987, Figs. 146, 148. Telamon: Schulten 1914, 489. Renieblas: Schulten 1929, Pl. 25,4.
10. Renieblas: Schulten 1929, Pl. 25,8. Peña Redonda: *id.* 1927, Pl. 47,1.
11. Renieblas: Schulten 1927, Pl. 25,1. Castillejo: *ibid.* Pl. 34,6.
12. Verchère de Reffye 1864, Figs. 9–13, Pls. XXII–III.
13. Polyb. VI,23.
14. Butt: Polyb. VI,25. Spearhead shape: Bishop 1987, 110–11.
15. 'Stiletto' blades: Schulten 1929, Pls. 25,5; 45,4.

16. Polyb. VI,25.
17. Suidas: '*machaira*'. *Gladius Hispaniensis*: Connolly 1991a, 361. Padova: Franzoni 1982.
18. Delos: Siebert 1987, 637, Figs. 17–19. Tombstones: Keppie 1984, Pl. 5a-d.
19. Long sword: Schulten 1929, Pls. 25,9; 26,6 (scabbard). Spanish examples: Sandars 1913, 228–31. Spanish *falcata*: *ibid.* 231–65. Cáceres: Ulbert 1985, Pl. 25,201.
20. Veg. I,12; Webster 1985, 12, 129. Cf. Polyb. III,114.
21. Native form: Sandars 1913, 265–8, Figs. 37,6–10, 39, 40; Schulten 1927, Pl. 53. Cáceres: Ulbert 1985, Pl. 25,195–9. Numantia: Schulten 1927, Pls. 34,1–3; 47,7; 1929, Pl. 45,1. Coins: Kent 1978, Pl. 27,98. Padova: Franzoni 1982.
22. Couissin 1926, 302–3, Fig. 87.
23. Perugia: Keppie 1984, 123–5, Fig. 36. Entremont: Coutagne 1987, Fig. 150.
24. Archery: Coulston 1985, 288. Slinging: Griffiths 1989, 267–9. Artillery: Marsden 1969, 174.
25. Emporion: Schramm 1980, 40–6. Cato's campaigns: Keay 1988, 31. Ephyra: Baatz 1979. Mahdia: *id.* 1985.
26. Numantia: Schulten 1927, 264–5, Pl. 53. Cáceres: Ulbert 1985, 111–14.
27. Bolts: Verchère de Reffye 1864, Pl. XXII; Schulten 1927, 251 1929, 214–5; Ulbert 1985, 105. *Pilum catapultarium*: Plautus, *Curculio* 689.
28. Baatz in Schramm 1980, ix-x.
29. *Scutum*: Eichberg 1987. Livy: VIII,8. Italian origin: Eichberg 1987, 171–5.
30. Kasr el-Harit: Kimmig 1940. Celtic: *ibid.* 109–11. Cf. Connolly 1981, 131. Ahenobarbus: Coarelli 1968. Paullus: Kähler 1965.
31. Polyb. VI,23. Cf. Celtic binding: Dionysius XIV,9; Pliny *Natural History* XVI,209.
32. Kimmig 1940, 106–9. Renieblas: Bockius 1989, 271 citing Schulten 1929, Pl. 39,6.
33. Reconstructions: Connolly 1981, 131; Junkelmann 1986, 176 (Augustan version).
34. Polyb. VI,25. Lacus Curtius relief: Robinson 1975, Pl. 305.
35. Polybios: VI,23. Earlier examples: Connolly 1981, 101 Figs. 9–14. Camp of Marcellus: Schulten 1927, Pls. 44,19; 50. Other finds: Schulten 1929, 257–9, Pl. 26,19; 22.
36. Qualification: Polyb. VI,23. Origin: Varro, *De Lingua Latina* V, 116. Celtic examples: CA 1988, 115–17; Stead 1989, 3–4; Müller 1986; Rusu 1969, 276–8, Pls. 143–6. Renieblas: Schulten 1929, Pl. 26,20. *Thoracomachus*: *De Rebus Bellicis* XV.
37. Bishop 1989a, 2. Mail repairs: cf. Rusu 1969, 278.
38. Greek doubling: Connolly 1981, 124–5. Osuna: Robinson 1975, Fig. 175.
39. 'Trasimene': Robinson 1975, 154, Pls. 434–5.
40. Greave presses: Mutz 1987. Polybios: VI,23. Gladiator's stance: Grant 1967, Pls. 4–7.
41. 'Montefortino': Robinson 1975, 13–25; Paddock 1985. Contexts: *ibid.* 143–4.
42. Origins: Connolly 1981, 133. Coolus: Robinson 1975, 26–41. Cruder forms: Paddock 1985, 145.
43. Agen/Port: Robinson 1975, 42–3. Senones: Connolly 1981, 120. Origins: Robinson 1977; Connolly 1989a.
44. Plumes: Polyb. VI,23. Ahenobarbus: Coarelli 1968. Caesar, *De Bello Gallico* II,21. *Alaudae*: Bishop 1990a.
45. Boeotian: Connolly 1981, 73 Figs. 5–6. Polyb. VI,25.
46. Experiments: Garlick 1980, 8.
47. Castillejo: Schulten 1927, Pls. 35,29; 42,2–3. Later frogs: Grew and Griffiths 1991, Figs. 15, 163, 165; 16,166–75.
48. Renieblas: Schulten 1929, Pl. 44. Cáceres: Ulbert 1985, Pl. 10,65.
49. Padova: Franzoni 1982, Fig. 1.
50. Ahenobarbus: Coarelli 1968. *RE s.v.* '*paludamentum*'. Officers: Keppie 1984, Pl. 5a-d. Emperors: Robinson 1975, Pls. 430–2. Centurions: *ibid.* Pls. 442, 465; Horn 1981, 13 Fig.
51. Padova: Franzoni 1982, Fig. 4.
52. Spurs: Schulten 1927, Pls. 35,17, 19, 21–4; 36,19; 1929, Pl. 21,23; Ulbert 1985, Pl. 10,51–3. Bits: Schulten 1927, Pls. 35,25; 36,20–1.
53. Pickaxe: Schulten 1927, Pls. 47,14 and 54,1. Tethering pegs: Schulten 1927, Pl. 39,3–5; Ulbert 1985, Pl. 26,212–24; Polybios: Schulten 1927 citing Frag. 95. Wooden pegs: e.g. Curle 1911, 310.
54. Caesar: *De Bello Gallico* VII,73. Excavated: Connolly 1981, 292 Fig. 1.

5 From Augustus to Hadrian (pp. 65–108)

1. Garzetti 1974; Wells 1972; 1984, 133–64; Frere Frere 1987, 48–125.
2. Oberaden: Albrecht 1942, Pls. 48–9. Drill bits: Manning 1985, 160. Shanks: Hübener 1973, Pl. 5,13–14 (Augsburg-Oberhausen); Manning 1985, Pl. 75,V20–1 (Hod Hill); Fingerlin 1970–71, Fig. 14,1 and 9 (Dangstetten). Collets: Manning 1985, Pl. 76,V25a-b (Hod Hill); Fingerlin 1970–71, Fig. 14,2 (Dangstetten). Cancelleria: Magi 1945, 26. Socketed *pila*: Webster 1979, Fig. 31,67 (Waddon Hill).
3. Adamklissi: Florescu 1965, Inv. Nos. 12, 28, 43. Victor: Robinson 1975, Pl. 470; Schober 1923, No. 162; pers. obs. Aquincum Museum. Throwing strap (*amentum*): Caesar, *De Bello Gallico* V,48; Cordus: Esp. 5835.

4. Scott 1980; Manning 1985, 160–70; Marchant 1990.
5. 'Leaf-shaped': Scott 1980, 333; Marchant 1990, 5. Cf. Barker 1975; Densem 1976.
6. Terminology: Gellius, *Noct. Att.* X,25. *Lancea Lucullanea*: Suetonius, *Dom.* 10. Elder Pliny: Pliny, *Letters* III,5.
7. Two spears: Esp. 6207, 6125, Germ.16. Mainz: Esp. 5819. Josephus: *History of the Jewish Wars* III,96. *Calones*: Esp. 6435, 6448, 6454, 6463. Bundles: Esp. 6465.
8. 'Mainz' and 'Pompeii': Ulbert 1969b. Fighting styles: Connolly 1991a, 362. Britain: Manning 1985, Pl. 71, V2; Webster in Down 1981, Fig. 8.28,1; Brailsford 1962, Fig. 1,A8. Handle: Fellmann 1966; Greep 1983, 20, Fig. 3. Rheingönheim: Ulbert 1969a, 44–5. Gladiator: Grant 1967, Pl. 29; pers. obs.
9. Veg. I,12; Polyb. III,114. Change: Connolly 1991a. .
10. Pompeii: Ulbert 1969b, 97–9; Maiuri 1947, Fig. 102. Herculaneum: Gore 1984, Fig. 572. Verulamium: Frere 1984, Fig. 11,71–2. Waddon Hill: Webster 1979, Fig. 29,52. Hod Hill dating: Todd 1982, 53–4. Handguard: Ulbert 1969b, 97–9.
11. Mainz sheaths: Grohne 1931; Ulbert 1969b, 128 No. 13 (Weser); *MZ* 12/13, 1917/18, Fig. 6,1; *AuhV* 4, Pl. 27,1 and 3; *Westdeutscher Zeitschrift* 23, 1904, Pl. 4,1–2 (Rhine). Dangstetten chape: Fingerlin 1970–71, Fig. 13,11. Magdalensburg: Deimel 1987, Pls. 69,1 and 3; 71,1. 'Sword of Tiberius': Lippold 1952; Klumbach 1970; Walker 1981. Colchester: Crummy 1983, Fig. 204, No. 4658. Chichester: Down 1981, Fig. 8.30,9. Fulham: Ettlinger and Hartmann 1984, 16–18. Strasbourg: Forrer 1927, Pl. LXXV,A. Wiesbaden: Ettlinger and Hartmann 1984, 18–20. Valkenburg: *ibid.*, 14–16. Vindonissa *ibid.*, 8–14. Organic remains: Manning 1985, Pl. 71, V2.
12. No guttering: Ulbert 1969b, Pls. 17–19. Guttering: Gore 1984, 572 Fig. ; Maiuri 1947, Fig. 102. Fittings: Ulbert 1969b, Pls. 17–19. Pula: Ulbert 1969b, Pl. 29.
13. Celtic origins: Manning 1985, 149. Rottweil: Planck 1975, Pl. 79,3. Newstead: Curle 1911, Pl. XXXIV,6–7.
14. 'Native' swords: Brailsford 1962, Fig. 1,A1–4; Pl. IIA; Manning 1985, Pl. 72,V3a (Hod Hill); Webster 1960, Fig. 8,38; 1981, Fig. 30,57 (Waddon Hill); Curle 1911, Pl. XXXIV,8 and 10 (Newstead); Scott in Breeze *et al.* 1976, 81–4, Fig. 3,1 (Camelon). La Tène: Manning 1985, 151. Dating: *loc. cit.*
15. Centurions: Robinson 1975, Pls. 442, 465. Herculaneum: P. Connolly pers. comm. Attachment: Nylén 1963, 224–7; Ulbert 1969b, 115–8; Hazell 1982, 73–7; Connolly 1991b. Fasteners: Bishop 1988, 103.
16. Augustan: Fingerlin 1970–71, Fig. 14,5 (Dangstetten); Albrecht 1942, Pl. 52,1–9 (Oberaden); Metzler and Weiler 1977, Fig. 31,1 (Titelberg); Hübener 1973, Pl. 8,9, 13, and 21 (Augsburg-Oberhausen). Inlay: Albrecht 1942, Pl. 52,2 and 6. Tombstones: e.g. Esp. 6209, 6213, 6125, 6255, 6207. Handle: Manning 1985, 156–7.
17. Tang types: Scott in Manning 1985, 153; cf. *id.* 1985, 162–3. Blade types: Scott in Manning 1985, 153–4; cf. *id.* 1985, 164–5. Chronological progression: Scott in Manning 1985, 155; *id.* 1985, 165.
18. Type A: Scott in Manning 1985, 154; *id.* 1985, 168–72. Type B: Scott in Manning 1985, 154–5; cf. *id.* 1985, 172–3. Velsen sheath: Morel and Bosman 1989, 177–8.
19. Scott 1985, 168–73.
20. Leeuwen: Braat 1967, 59–60, Pl. V,2. Undecorated: *AuhV* 4, Pl. 11,1; Helmig 1990, Fig. 2; Albrecht 1942, Pl. 52,1; Helmig 1990, Fig. 3b; Scott 1985, 207, No. 69. Legionaries with daggers: Esp. 6253, 5835, 5798. Auxiliaries: Esp. 6255, 6125, Germ.16. Secundus: Harrauer and Seider 1977; Gilliam 1981.
21. See Webster 1985, 128–9 fn.3.
22. Gechter and Kunow 1983, Fig. 16,8.
23. Buciumi: Chirila *et al.* 1982, Pl. LVII. Victor: Schober 1923, No. 162. Corbridge: Bishop 1990b, 11.
24. Heads: Davies 1977; Coulston 1985, 264–5. Laths: *ibid.*, 224–34.
25. Slingshot: Greep 1987; Griffiths 1989; Völling 1990. Cf. Coulston 1985, 283–5.
26. Veg.II,25; Tac. *Hist.* III,23. Elginhaugh: Miss L. Allason-Jones, pers. comm. Auerberg: Handelsbank 1989, Monatsbild Januar. Cremona: Baatz 1980.
27. Jerusalem: Schatzman 1990, 483–4; Josephus: *History of the Jewish Wars* V,268–74. Maiden Castle: Wheeler 1943, Fig. 93,13.
28. Plancus: Fellmann 1957, 31, 48. Coin: Kent 1978, Pl. 49,168. Cordus: Esp. 5835. Musius: Esp. 5790. Victor: Schober 1923, No. 162. Perspective difficulties: Coulston 1988b, 5. Pozzuoli: Kähler 1951, Pl. 28.
29. Annaius: Esp. 6125, pers. obs. Adamklissi: Florescu 1965, Inv.14, 32, 34, 36. Trajan's Column: e.g. Scenes I–II, XI, XIV, XVIII. Mainz: Esp. 5819. Cf. Esp. 6207. Covers: Groenman-van Waateringe 1967, 67–8, Fig. 17. Vonatorix: Esp. 6292. Other: Hassall in Wacher and McWhirr 1982, 69–71, Fig. 22; Esp. 6018; 5852.
30. Trajan's Column: e.g. Scenes IV–V, XXVI, XLVIII, CVI. Pozzuoli: Kähler 1951, Pl. 29. Castleford: van Driel-Murray 1989b, 18–19.

31. Structure: Kimmig 1940, 106–8 (Kasr el-Harit); Rostovtzeff *et al.* 1936, 456–7 (Dura-Europos). Doncaster: Buckland 1978, 251. Knee to shoulder: e.g. Esp. Germ.11. Binding: *RLÖ* II, Pl. XXIV,1–4. Bar: Buckland 1978, 249–51; *RLÖ* II, Pl. XXIV,19–20.

32. *Legio VIII*: Allason-Jones and Miket 1984, 3.724 (Tyne); Simonett 1935; Hartmann 1986, Fig. 99 (Vindonissa). Carnuntum: *RLÖ* II, Pl. XX,11–13. Nijmegen: Brunsting and Steures 1991, 5–6. Cf. Bonnamour 1990, No. 132, Fig. 98. Zwammerdam: Haalebos and Bogaers 1970. Mainz: Selzer 1988, No. 271. Spinning: Paddock 1985, 146–7.

33. Cover: van Driel-Murray and Gechter 1983, 30. Vindonissa: Gansser-Burckhardt 1942, 94–7. Bonner Berg: van Driel-Murray and Gechter 1983, 35–6. Caesar: *BG* II,21. Glued cover: Gansser-Burckhardt 1942, 74.

34. Valkenburg: Groenman-van Waateringe 1967, 68–70, Fig. 16; Caerleon: van Driel-Murray 1988; Bonner Berg: van Driel-Murray and Gechter 1983, 35.

35. Blazons: Esp. 5790, 5816, 5822; Schober 1923, No. 162. Painted: Veg. II,18. Scorpion: Kähler 1951, 432, Pl. 28; Robinson 1975, Pl. 238; Maxfield 1981, Pl. 12a. Trajan's Column: Coulston 1989, 33–4.

36. Robinson 1975, 164–9. Crispus: Esp. Germ.11. Adamklissi: Florescu 1965, inv. 18, 21, 22, 31, 35.

37. Fasteners: Robinson 1975, 164; Deschler-Erb *et al.* 1991, 19–20. Antecedents: *CA* 1988, 115 Fig. Slit: Robinson 1975, 164. Mainz: Esp. 5816.

38. Sertorii: Robinson 1975, Pls. 442–3. Carnuntum: *ibid.*, Pl. 445. Adamklissi: Florescu 1965, inv. 17, 33. Vonatorix: Esp. 6292. Longinus: Schleiermacher 1984, No. 76. Ham Hill: Webster 1958, No. 105, Pl. XI,c. *Plumata*: Robinson 1975, 173; Price 1983.

39. Term: Robinson 1975, 174; Harmand 1986, 197. *Crupellarii*: Tacitus, *Ann.* III,43. Gladiators: Grant 1967, Pl. 6. Versigny: Picard 1980. Carrhae: Brizzi 1981, 198.

40. Magdalensburg: Deimel 1987, Pl. 76,1–8, 10–29, 31–2. Chichester: e.g. Down 1981, Fig. 8.28,2. Colchester: e.g. Crummy 1983, Nos. 4182, 4186. Electrolytic reaction: Rollason 1961, 127–8.

41. Corbridge: Allason-Jones and Bishop 1988, 102. 'Soft' armour: Williams 1977, 77. *Thoracomachus*: *De Rebus Bellicis* XV.

42. Armguards: Simkins 1990. Valerius Severus: *AuhV* 3, Heft 6, Pl. 5,3; Selzer 1988, No. 59; pers.obs. *Falx*: Richmond 1982, 49. Carnuntum: *RLÖ* II, 115–16, Pl. XX,6–10. Newstead: Curle 1911, Pl. XXIII. Robinson 1975, 185–6. Centurions: Robinson 1975, 187. Adamklissi: Florescu 1965, Inv. Nos. 13, 18, 20, 33 and pers. obs. Alba Iulia: Gallina 1970, C63; pers. obs. Vindonissa: Gansser-Burckhardt 1948–49, 49, Fig. 17.

43. Classifications: Waurick 1988 (Continental); Robinson 1975, 13–135 (British). Ear-guards: *ibid.*, 46. Brow-guard and ribbing: Connolly pers. comm. Stance: Connolly 1991a.

44. Imperial-Gallic and -Italic helmets: Robinson 1975, 45–75. Nijmegen helmet: Brunsting and Steures 1991. Undated examples: Connolly 1989a. Introduction: Connolly pers. comm.

45. Crests and plumes: Robinson 1975, 140–3; Bishop 1990a. Transverse crest: Veg. II,13; 16.

46. Handles: Robinson 1975, 47–51. Lining: *ibid.*, 144. Brigetio: *ibid.*, Pls. 144–7; pers. obs.

47. *Auxilia*: Robinson 1975, 83. Cf. Simkins 1988, 144.

48. Bassus: Esp. 6435. Capito: Esp. 5852. Orange: Amy *et al.* 1962, Pls. 16 and 18. Kingsholm: Hurst 1985, 26, Fig. 10. Koblenz-Bubenheim: Klumbach 1974, 45–6, Pl. 32. Weiler: Fairon and Moreau-Maréchal 1983. Xanten: von Detten and Gechter 1988. Newstead: Curle 1911, Pl. XXVI,1. Northwich: Robinson 1975, 95, Pls. 247–9.

49. *Hippika Gymnasia*: Garbsch 1978, 35–42. Chassenard: Déchelette 1903. Haltern: *MAKW* 5, Pl. XXXIX,2. Čatalka: Bujukliev 1986, Pl. 8,91. Thracian: Waurick 1986.

50. Sports helmets on cavalry tombstones: Robinson 1976, 3. Standard bearers: Junkelmann 1986, 173. Esp. 5850, 5792, 5799.

51. '*Cingulum militare/militiae*': Bishop 1989b, 102–3; Varro: *De Lingua Latina* V,114. Apollonous: Youtie and Winter 1951, No. 464. Tiberianus: *ibid.*, No. 470, line 6. Tabatheus: *ibid.*, No. 474, lines 8–9. Pliny: *Natural History* XXXIII, 152. Tacitus: *Hist.* I,57. Isid. XIX,33,2.

52. 'Cowboy' fashion: e.g. Esp. 6125, 6207. Non 'cowboy': Esp. 5495, 6253. Single belt: Esp. 5790. Single belts with mail: Esp. Germ.11. Herculaneum soldier: P. Connolly, pers. comm. Trajan's Column Scene IV.

53. Velsen: Morel and Bosman 1989, 180–1, 184. Rheingönheim: Ulbert 1969a, Pl. 32,5. Casacco: Ubl 1989, Fig. 8. Herculaneum: P. Connolly, pers. comm.

54. Velsen: Morel and Bosman 1989, 180.

55. Embossed plates: von Gonzenbach 1966. Connection with *legio II*: Bishop 1987, 123. Upper Germany etc.: Böhme in Schönberger 1978, 218–22; Deschler-Erb *et al.* 1991, 25–6, 142, Fig. 16. Magdalensburg: Deimel 1987, Pl. 77,13.

56. Casacco relief: Ubl 1989, Figs. 6–8. Tekije: Mano-Zisi 1957. Herculaneum: P. Connolly, pers. comm.

57. Hinged buckles: Grew and Griffiths 1991, 49. Buckle on right: Esp. 5790, 6207. Left: Esp. 6255. Both together: Esp. 5495. Quadrilaterals: Ulbert 1985, Pl. 10,62. Later: Oldenstein 1976, Pl. 76,1010. Repaired tongues: cf. Glasbergen and Groenman-van Waateringe 1974, Pl. 13,27; Deschler-Erb *et al.* 1991, Fig. 11.
58. Grew and Griffiths 1991, 50.
59. Vachères: Esp. 35. Cf. *ibid.*6292.
60. Musius: Esp. 5790. Pula: Ulbert 1969b, Pl. 29; pers. obs. Orange: Amy *et al.* 1962, Pls. 16 and 18. Casacco: Ubl 1989, Figs. 6–8.
61. Herculaneum: P. Connolly, pers. comm. Tekije: Mano-Zisi 1957, Pl. 15.
62. Tekije: Mano-Zisi 1957, Pl. 15,25. Niello: Webster 1958, Fig. 6,151. Mis-identification: Webster 1958, 73, Fig. 3,26. Lunate: e.g. Bishop 1983b, Fig. 1. Teardrop: e.g. Deschler-Erb *et al.* 1991, Fig. 43,57.
63. Nahal Hever: Yadin 1963, 204–19. Cf. Fuentes 1987, 43–5.
64. Length: Fuentes 1987, 48.
65. Reconstruction: Fuentes 1987, 48–9. Colour: *ibid.*, 60–3.
66. Leggings: Wild 1968, 226. On tombstones: e.g. Esp. 6435 (Flavius Bassus); 5852 (Romanius); pers. obs. Adamklissi: Florescu 1965, Inv. Nos. 40, 38. Long-sleeved: Esp. 35, 5522, 6014, 6435, pers. obs. Avignon Museum; Hassall in Wacher and McWhirr 1982, 71, Pl. 23.
67. *Paludamentum*: Wilson 1938, 100–4. *Sagum*: Shaw 1982, 45–6; Wilson 1938, 104–9. *Paenula*: Kolb 1973; Wilson 1938, 87–92. Tombstone *paenula*: e.g. Esp. 6207 (Firmus); Germ.16 (Licaius). With *sagum*: Esp. 6125, 5835.
68. Shape: Junkelmann 1986, 157. London: Bishop 1983b.
69. Caelius: Esp. 6581. Sertorius: Robinson 1975, Pl. 442. Facilis: *ibid.*, Pl. 465.
70. Van Driel-Murray 1986a; 1986b. Discarded: *ibid.*, 24. Mainz: *AuhV* 4, Pl. 37; Göpfrich 1986, 16–25, Fig. 35–6. Valkenburg: Groenman-van Waateringe 1967, 129–37.
71. Lacing ridge: pers. obs. Socks: Youtie and Winter 1951, No. 468, line 25. Vindolanda: Bowman and Thomas 1983, No. 38, line 2. Cancelleria: Magi 1945, Figs. 23–5.
72. McIntyre and Richmond 1934; Groenman-van Waateringe 1967, 79–105; van Driel-Murray 1990. Pegs: Curle 1911, 310, Pl. LXXXIII,6, 13.
73. '*Pila muralia*': Beesser 1979; Bennett 1982.
74. Sheaths: *AuhV* 5, Pl. 10,166–72.
75. Marked tools: Klumbach 1961, Fig. 1.
76. *Patera*: Bennett and Young 1980. *Trulleus*: Boon 1984. Doorwerth: Holwerda 1931, Afb.12. Manufacture: Bennett and Young 1981, 38. Caerleon: Boon 1984; RIB 2415.39. Vessels: Curle 1911, Pl. LIII.
77. Centurions: Schober 1923, Nos. 54, 130; Franzoni 1987, No. 30; *RIB* 200. *Optiones*: *RIB* 492.
78. Celtic origins: Bishop 1988, 112–13. Function and decoration: *ibid.*, 116.
79. Ring: *ibid.*, 94. Pendants: *ibid.*, 96–8.
80. *Phalerae*: *ibid.*, 94–5. Augustan: Albrecht 1942, Pl. 47,5–6. Bacchus: Hutchinson 1986, 137–9, 142–3. Xanten: Jenkins 1985. Pliny: Pliny *Letters* III,5,4. Doorwerth: Holwerda 1931; Brouwer 1982.
81. Straps: Jenkins 1985, 148, Pl. X,B. Saddle leather: van Driel-Murray 1989b, 293–312, Figs. 8–15. Reconstruction: Connolly 1987. Alternatives: Junkelmann 1989, 30–2, Figs. 24–6.
82. Chamfrons: Curle 1911, Pl. XXI; 1913, Fig. 11 (Newstead); van Driel-Murray 1989b, 283–92, Figs. 2–6 (Vindolanda); Winterbottom 1989, 330–4, Figs. 5–6 (Carlisle). Neuss: Garbsch 1978, S1, Pl. 44. Eye-guards: Garbsch 1978, S3, Pl. 45,5–6 (Mainz); cf. *ibid.*, S11, Pl. 47,1 (Pompeii).

6 The Antonine period (pp. 109–121)

1. Marcomannic Wars: Zwikker 1941, 14–238; Böhme 1975; Birley 1987, 249–55.
2. Antonine Wall: Hanson and Maxwell 1983, 137–51. Hadrian's Wall: Breeze and Dobson 1987, 112–48; Allason-Jones 1988. Newstead: Curle 1911, 113.
3. Rhine-Danube advance: Schönberger 1985, 394–9. Trans-Danube: CIL III, 13439; Böhme 1975, 210–11; Kolnik 1986; Pitts 1987; Tejral 1990.
4. Syria: Isaac 1990, 51–2.
5. Abdul-Hak 1954–55.
6. Robertson *et al.* 1975, Fig. 33.18.
7. Nawa: Abdul-Hak 1954–55, 187. Newstead: Curle 1911, 188. Strageath: Frere and Wilkes 1989, Figs. 69,2–6, 8; 70,9–10, 12.
8. Tipasa: Schleiermacher 1984, Nos. 65, 67. Bratislava: Speidel 1987, Fig. 4. Arrian *Ek.*21, 31. Syria: Balty 1987, 229, Fig. 8.
9. *RE s.v.* '*contus*'; Coulston 1986, 63–6; Nicolle 1980. Cf. Tac. *Ann.* I.79.
10. Nawa: Abdul-Hak, 1954–55, 187. Canterbury: Bennett *et al.* 1982, 185–90, Fig. 99. Cf. Wild 1970.
11. Finds: e.g. Hundt 1955, Fig. 5.1–4; Kellner 1966, Figs. 1.2, 2.4; National Museum, Damascus, two examples (Hauran: inv. 1889, 2169). Aquincum: Ferri 1933, Fig. 286. Models: Raddatz 1953, Fig. 1; Hundt 1955, Fig. 1.

12. Kieseritzky and Watzinger 1909, Nos. 599–600, 619, 627. Sarmatian: Ginters 1928, 56–9, 81; Sulimirski 1970, Figs. 42, 45, 49, 67, Pl. 47. Graves etc.: Hundt 1955, Figs. 5,5–7, 6; 1960; Raddatz 1960, Figs. 1, 3, 5–6.
13. Chapes: Curle 1911, Pl. XXXV,13, 16–8; Bennett *et al.* 1982, Fig. 99; Allason-Jones 1988, No. 35a,3; Tejral 1990, Fig. 1. Marcus Column: Waurick 1989, 46–51, Figs. 3–4, 11–14.
14. Hofmann 1905, No. 63. Bonner Berg: van Driel-Murray and Gechter 1983, Pl. 16,25. Wall: Allason-Jones 1988, No. 50b.3.
15. Origins: Ginters 1928: 66–75, 79; Trousdale 1975, 110–9. Trajan's Column: Cichorius 1896–1900, Pl. II–III, Scene C. Čatalka: Bujukliev 1986, No. 100. Palmyrene sculpture: Tanabe 1986; Colledge 1976, Pl. 44 (Bet-Phasi'el, AD191).
16. Robertson *et al.* 1975, Fig. 32.15.
17. Bar Hill: Coulston 1985, 224–5. Carnuntum: *ÖRL* II, Pl. XXIV.25; Coulston 1985, 232. Avar: *ibid.*, 244–5.
18. Bar Hill: Robertson *et al.* 1975, Fig. 32,13. Burnswark: Jobey 1977–78, 89–90. Cf. Allason-Jones 1988, 202; Tejral 1990, Fig. 1. Incendiary: Coulston 1985, 266; Ptuj Museum pers. obs. Amm. XXIII,4,14–5. Veg. IV,18.
19. Cerchiai 1982–83; Greep 1987, 191, 197–200, 9–10; Griffiths 1989, 271–3; Frere and Wilkes 1989, 177–8; Völling 1990, 48–58.
20. Baatz and Feugère 1981.
21. Coulston 1988b, 6–9; Abdul-Hak 1954–55, Pl. VII. Butzbach: Simon and Baatz 1968.
22. New closures: Garbsch 1978, 7–8, 33–4.
23. Inscriptions: *ibid.*, Pls. 34–5; Pitts 1987, 26; Borhy 1990.
24. Corbridge: Forster and Knowles 1911, Fig. 41. Mušov: Tejral 1990, Fig. 1. Carnuntum: *RLÖ* II, Pl. XVI,6.
25. Newstead: Curle 1911, 156–8, Fig. 11, Pl. XXII; Robinson 1975, 180–1; Poulter 1988. Corbridge: Robinson 1975, 177–80.
26. Date: Schönberger 1985, 472, D106. Helmet: Klumbach and Wamser 1976–77, Fig. 7.
27. Klumbach 1974, 37–40, Pl. 27; Robinson 1975, 73–4, Pls. 179–86.
28. Curle 1911, Pl. XXXV,8.
29. Helmet A: Abdul-Hak 1954–55, Pls. II–IV; Robinson 1975, Pls. 345–8. Helmet B: Abdul-Hak 1954–55, Pls. V–VIII; Robinson 1975, Pls. 397–8. Echzell: Klumbach and Baatz 1970. Theilenhofen: Klumbach and Wamser 1976–77, Fig. 8; Garbsch 1978, No. F1. Inscription: *ibid*, 56.
30. Karaagach: Velkov 1928–29, Pl. III–V; Venedikov 1976, No. 420. Dakovo: Popovic *et al.* 1969, No. 206; Robinson 1975, Pl. 237. Bumbeşti: Petculescu and Gheorghe 1979.
31. Intercisa: Szabó 1986; Hainzmann and Visy 1991, No. 160.
32. Parthian: James 1986, 117–20.
33. Strageath: Frere and Wilkes 1989, Fig. 73,48. Newstead: Curle 1911, Pl. LXXXIX,25. Hadrian's Wall: Allason-Jones 1988, Figs. 4,50b.2, 6,52a.9 (terminals). Arch: Koeppel 1986, No. 31.
34. Bonner Berg: van Driel-Murray and Gechter 1983, 17–18. Strageath: Frere and Wilkes 1989, No. 220. Croy Hill: Coulston 1988b, 1.
35. Flask: Close-Brooks 1977–78. Staff: Apul. IX,39–40.
36. Newstead: Curle 1911, Pl. LXXIV,6. Nawa *phalerae*: Abdul-Hak 1954–55, 187–8, Pl. XI. Chamfron: *ibid.*, 186, Pl. X,1.
37. Fronto *Ad Verum Imp.* II,1,19.

7 The army in crisis (pp. 122–159)

1. *CAH* XII,ii, v-vi, ix; Jones 1964, 14–36; Birley 1969; Smith 1972; Brauer 1975; Fitz 1982.
2. Advances: Birley 1988, 129–35, 147–8, 152–3, 173–86; Daniels 1987, 250–5; Isaac 1990, 30. Decumates: Schönberger 1985, 422–4, 478–88; Oldenstein 1976, 59–67; Okamura 1990. Mainz: Schönberger 1985, 461–6. Danube: *ibid.*, 417–8, 421–4, 488–90; Fischer 1990, 29–32. Dacia: *CAH* XII, 150–3; Jones 1964, 35; Mócsy 1974, 209–11.
3. Corbridge: Richmond and Birley 1940, 105–7, 112–4, Pl. XI. Caerleon: Nash-Williams 1931, 122–33; 1932, 66–99, Figs. 16–43; Boon 1972, 54, Fig. 30.
4. Dura: Hopkins 1979. Units: Welles *et al.* 1959, 24–7. Fall date: James 1985.
5. Ilkjaer and Lønstrup 1982; Kunow 1986; Hines 1989.
6. Naples: von Bienkowski 1919, Fig. 117. Fiesole: pers. obs. Lucianus: Stuart Jones 1912, Pl. 82; Oldenstein 1976, Fig. 13,2. S. Angelo: Rocchetti 1967–68, Fig. 1. Valerinus: de Lachenal *et al.* 1984, V,20.
7. Apamea: Balty 1987, Fig. 6. Celje: Schober 1923, No. 199. Cf. *ibid.*, Nos. 341, 351.
8. Caerleon: Nash-Williams 1932, Figs. 20–1, 24; Boon 1972, Fig. 30,9–10. Corbridge: Richmond and Birley 1940, Pl. XI. Richborough: Bushe-Fox 1949, Pl. LVIII.281–82. German: Oldenstein 1982, IV.B.2.
9. Single leaf: Bernand 1966, Pl. 15; Balty 1988, Pl. XIII,2; Pfühl and Mobius 1977, No. 311; Speidel 1976, Fig. 4; Barkóczi 1944, Pl. L,3. Two leaf: *ibid.*, Pl. VII,3; Barkóczi *et al.* 1954, Pl. LI,1; Breccia 1914, Fig. 41. Triangular: Pfühl and Mobius 1977, No. 314; Speidel 1976, Fig. 3.

10. Heads and butts: Scott 1980, 335–9; Richmond and Birley 1940, Pl. XI; Oldenstein 1982, IV.B.1, 3; Keim and Klumbach 1951, Pl. 43,46–8; Herrmann 1969, Fig. 4,1–9; Planck 1983, 85–7, Figs. 50–1, 97; Gudea 1989, Pls. CXXIII–VIII. Caerleon: Nash-Williams 1932, Figs. 17–18. Triangular section: Scott 1980, 337, Fig. 24,9–11; Walke 1965, Pl. 108,14–16; Herrmann 1969, Fig. 4,11–13; Gudea 1989, Pl. CXXIX,16–9.
11. Engelhardt 1865, Pl. II–III.
12. Balty 1987, Fig. 5; 1988, Pl. XIV.2.
13. Heads: Ritterling 1919; Alföldi 1959b, Figs. 1–48; Herrmann 1969, Fig. 4,10; Waurick 1971; Boon 1972, Fig. 38; Oldenstein 1982, IV.B.4. Sculpture: Ritterling 1919; Alföldi 1959b, Pl. 9,2. Osterburken: Schallmayer 1984, Fig. 165; 1986, Fig. 8. Duties: Schallmayer 1991; Mirkovic 1991. Baldric plates: Engelhardt 1869, Pl. 11,3; Oldenstein 1976, No. 385.
14. Ulbert 1974, 199–211; Oldenstein 1982, IV.B.7; Biborski *et al.* 1985; Martin-Kilcher 1985, 182–3. Dura: Rostovtzeff *et al.* 1936, 82–3, 195–97, Pl. XXVI.1 and Dr S.James pers. comm. Sassanid: Herrmann 1980, Pls. 4, 41–7; 1983, Pls. 5, 10; Herrmann and Mackenzie 1989, Pls. 1–2.
15. Rosenquist 1967–68; Weise Rygge 1967–68; Dabrowski and Kolendo 1972; Ulbert 1974, 200–4; Allason-Jones and Miket 1984, 296–8; Martin-Kilcher 1985, Figs. 25–6; Ilkjaer 1989, Fig. 6.
16. Grip-assemblages: Oldenstein 1976, Nos. 11–22, 32–4; Engelhardt 1863, Pl. 9; 1869, Pl. 6. Eagle: Barnett 1983; von Bienkowski 1919, Figs. 117, 119; Rocchetti 1967–68, Figs. 1–2, 5–7; Barkóczi *et al.* 1954, No. 220; Koch and Sichtermann 1982, Pl. 82–3. Sassanid: Herrmann 1983, Fig. 1, Pls. 5, 8a, 13.
17. Künzing: Schönberger and Herrmann 1967–68, 57–61, Fig. 20; Herrmann 1969, 133, Fig. 2. Veg. II,15. Augst: Martin-Kilcher 1985, Fig. 22,1. Wehringen: Kellner 1966, Fig. 4,1. Cf. Bonnamour 1990, No. 113. Eining: Fischer and Spindler 1984, Fig. 39; Kellner 1966, Fig. 1,2. Künzing: *ibid.*, Fig. 2,4.
18. Engelhardt 1863, Pl. 10; 1869, Pls. 6, 10. Dr S. James pers. comm.
19. Pelta and heart: Cumont 1926, Pl. XCVII,4; Nash-Williams 1932, Figs. 34,40–1, 36,15–22; Rostovtzeff 1934, Pl. XXIII; Oldenstein 1976, Nos. 102–31, 178–84; Gudea 1989, Pl. CLXXX,13–14, 16; Euzennat 1989, Fig. 217,51. Box: Nash-Williams 1932, Fig. 43,1–6; Oldenstein 1976, Nos. 133–35, 148–77; Greep 1983, Fig. 1; Allason-Jones and Miket 1984, Nos. 2.75–81; Gudea 1989, Pl. CLXXX,12. Disc: Engelhardt 1865, Pl. IX,44–7; Hundt 1953; Sternquist 1955, Pls. XI, XVIII, XXII, XL–I; Kellner 1966, Fig. 3; Dabrowski and Kolendo 1972, Figs. 4, 16; Oldenstein 1976, Nos. 138–47; Martin-Kilcher 1985. Dura: Rostovtzeff *et al.* 1936, Pl. XXVI,2. Hauran: National Museum, Damascus Inv.6127.
20. Models: Raddatz 1953; Hundt 1955. Pelta: Pfühl and Mobius 1977, Nos. 305, 309, 313; Coulston and Phillips 1988, No. 195. Sassanid: Herrmann 1980, Pls. 41–5; Herrmann and Mackenzie 1989, Pl. 2. Mosaic: Colledge 1976, Pl. 140; Palmyra Museum, pers. obs.
21. Trousdale 1975, 220–9, 105–8; Nash-Williams 1932, Fig. 36,2–11; Chapman 1976; Greep 1983, Fig. 1; Dixon 1990; Oldenstein 1976, No. 35–100; Hundt 1959–60; 1960; *RLÖ* XI, Fig. 31.4; XIII, Fig. 92; Barkóczi *et al.* 1954, Pl. XX,3; Petculescu 1983; Cumont 1926, Pl. XCVI,2; Engelhardt 1863, Pl. 10,38; 1869, Pls. 6,10, 7–9; Raddatz 1987, Pl. 9. Models: Beal and Feugère 1987.
22. Trousdale 1975, 236, Pls. 18–19.
23. *Phalerae* and terminals: Amelung 1903, No. 137a; Schober 1923, Nos. 154, 158; Barkóczi *et al.* 1954, No. 220; Rocchetti 1967–68, Figs. 1–2, 5–6; Condurachi and Daicoviciu 1971, Fig. 117; Pfühl and Mobius 1977, Nos. 305, 315–16; Polenz 1986, Fig. 28. Angled: Herrmann 1983, Pls. 5, 13; Herrmann and Mackenzie 1989, Pl. 2.
24. Vimose: Engelhardt 1869, 19, Pl. 11; Sternquist 1954, Fig. 4,1, 3. Thorsbjerg: Engelhardt 1863, 44, Pl. 11,48; Raddatz 1987, Nos. 165, 167, Figs. 12, 14–5. Simris: Sternquist 1955, 116–17, Pls. VIII, XXI.11–12.
25. German finds: Oldenstein 1976, Nos. 1105–25, Pls. 84–6. Dura: Frisch and Toll 1949, Pls. I; II,9,12; VII,1938. North Africa: Boube-Piccot 1980, Nos. 199–201, 386, 478–9, 562.
26. Allason-Jones 1986; Oldenstein 1976, Nos. 1092–6, Pl. 83; *RLÖ* XIII, Fig. 102,2; Petculescu 1991a, 394–5; Callu *et al.* 1965, Pl. CXXXIII.
27. Zugmantel: Oldenstein 1976, Nos. 1097, 1100–1. Aldborough: Bishop 1991, Fig. 5,2,A2. Whole inscription: Oldenstein 1976, 223–6; Allason-Jones 1986, 69; Petculescu 1991a, 394. Corbridge: Forster and Knowles 1911, Fig. 9a. Plain terminals: Bishop 1991, Figs. 5.1, 5.3; Oldenstein 1976, Nos. 217–20, 428–30, 1062–79; *RLÖ* IX, Fig. 18,8–9; XI, Fig. 20,4; Rostovtzeff *et al.* 1944, Pl. XXIV,1. Vimose: Engelhardt 1869, Pl. 11; Sternquist 1954, Fig. 4.
28. Oldenstein 1976, 228–30, Figs. 11–12. Representations: Franzoni 1987, No. 19; Pfühl and Mobius 1977, No. 308; Speidel 1976, Fig. 3; Herrmann 1980, Fig. 1, Pl. 7; 1983, Pl. 13.
29. Wuilleumier 1950, Fig. 1; Ulbert 1974, 211–15, Fig. 4; Oldenstein 1976, 88–9.
30. Schönberger and Herrmann 1967–68, 57, 60–1, Figs. 18, 21–3; Herrmann 1969, 133, Fig. 3.

31. Copthall Court: Merrifield 1965, Pl. 99. Rhineland: Oldenstein 1982, IV.B.7d; Jacobi 1897, Fig. 77,5; *AuhV* I.V, Pls. 5, 21. Danube: Keim and Klumbach 1951, Pl. 43,44. Cf. Walke 1965, Pl. 106,6; Planck 1983, 87; Fischer and Spindler 1984, Fig. 39; Fischer 1990, Pl. 54,27; Polenz 1986, Pl. 2; Augsburg: Ferri 1933, Fig. 3; Wagner 1973, No. 29. Severus: Herodian II,13,10.

32. Representations: Coulston 1985, 234–8. Funerary bows: *ibid.*, 239–4; Werner 1956, Pls. 25, 36–7. Ear-laths: Coulston 1985, 224–34. Intercisa: Intercisa Museum pers. obs. Micia: Petculescu 1991b, 10. Tibiscum: Dr D.Baatz pers. comm. and Bona *et al.* 1983, Pl. XI,1. Parallels: Coulston 1985, 243–4.

33. Nash-Williams, 1932, Fig. 42; Coulston 1985, 227–9.

34. Esp. 1679, 1683; Coulston 1985, 260.

35. Davies 1977; Erdmann 1976; 1982; Coulston 1985, 264–70.

36. Rostovtzeff *et al.* 1936, 453, Pl. XXIV,1; James 1987, 78, Figs. 3–4. Cf. Coulston 1985, 267–8.

37. Coulston 1985, 275–8; Cichorius 1896–1900, Scene LXX; James 1987.

38. Coulston 1985, 270–5.

39. Chirila *et al.* 1972, Pls. LXIV–V.

40. Baatz 1978, 2–9, Figs. 2–7.

41. Dura: Baur and Rostovtzeff 1931, 14–5, 55; Baur *et al.* 1933, 10–11; Rostovtzeff 1934, 101; Rostovtzeff *et al.* 1936, 28. Buciumi: Chirila *et al.* 1972, Pl. LXIII.

42. Heads: Nash-Williams 1932, Fig. 19; Herrmann 1969, Fig. 4,15–16; Gudea 1989, Pl. CXXIX,1–14. Dura: Baur and Rostovtzeff 1931, 72–3, Pl. IX; Baur *et al.* 1932, 79; Rostovtzeff *et al.* 1936, 455, Pl. XXIV; James 1983. Fire-bolt: James 1983. Cf. Brok 1978.

43. Cumont 1926, 260–1, Pl. XCVII,1–2; Baur and Rostovtzeff 1931, 72–3, Pl. IX; Baur *et al.* 1933, 10; Rostovtzeff *et al.* 1936, 455–6, Pl. XXIV; James 1983; pers. comm. Dr S. James.

44. Veg II.25. Apamea: Balty 1987, 221. High Rochester: Baatz 1966, 199–200; Marsden 1969, 191; Campbell 1986, 121–2.

45. Grosskrotzenburg: Klee 1989, Fig. 106. Künzing: Schönberger and Herrmann 1967–68, Fig. 25. Straubing: Walke 1965, Pl. 103,1. Carpow: Wild 1981. Caerleon: Nash-Williams 1932, Fig. 16. Buch: Planck 1983, Fig. 26. Vimose: Engelhardt 1869, 12, Pl. 4; Waurick 1982, 112–13, Fig. 4.

46. Baur and Rostovtzeff 1931, 73; Baur *et al.* 1932, 78–80; Baur *et al.* 1933, 11. Mine: Rostovtzeff *et al.* 1936, 194–7, Figs. 17–18; Hopkins 1979, 187.

47. Plates: Garbsch 1978, Pls. 8, 36,4 and 6. Bertoldsheim: Garbsch 1984, Figs. 1–3. Copper alloy rings: Dr S. James pers. comm.; Nash-Williams 1932, Fig. 41,4; *ORL* B71a, Pl. IV,41; Alfs 1941, 78. Petculescu 1974–75, 85–7; 1980, 391; 1990, 849.

48. Istanbul: Pfühl and Mobius 1977, No. 305. Brigetio: Barkóczi 1944, Pl. L,3. Cf. Ubl 1969, No. 37.

49. Exodus: Kraeling 1956, Pls. LII–III. Ebenezer: *ibid.*, Pls. LIV–V.

50. Monuments: Brilliant 1967, Pls. 45a, 46a-b, 65; Andreae 1977, Pl. 557. Eining: Fischer and Spindler 1984, 58–62; *Arma* 2:1, 1990, 2. German finds: Oldenstein 1982, IV.6a.

51. Graffiti: Baur *et al.* 1933, Pl. XXII,2; Rostovtzeff *et al.* 1936, Fig. 8. Ai Khanoum: Bernard 1980, 452–7, Fig. 11. Greaves: Schönberger and Herrmann 1967–68, Fig. 25 (plain); Garbsch 1978, Pl. 3 (embossed). Dura greave: pers. comm. Dr S. James. Thigh-guards: Rostovtzeff *et al.* 1936, 450–2, Pl. XXIII.

52. Enns: Eckhardt, 1976, No. 86. Carnuntum: Kruger 1970, No. 320. Vienna: Naumann 1967, No. 27. Brigetio: Barkóczi 1944, No. 20. Istanbul: Pfühl and Mobius 1977, No. 308. Veria: Cormack 1941, Fig. 3 and pers. obs. Veria Museum.

53. Coulston and Phillips 1988, No. 400.

54. Pointed rims: Klumbach 1974, Nos. 29, 35, 37; Robinson, 1975, Pls. 256–57, 260–1, 273–4, 277–82.

55. Planck 1983, 142–4, 185–87.

56. Regensburg: Garbsch 1978, 76; Dietz *et al.* 1979, Fig. 30. Eining-Unterfeld: Fischer 1985. Caerleon: Nash-Williams 1932, Fig. 36,1; Boon 1972, Fig. 30,5. Dura: James 1986, 123, n.52–3. See Connolly 1991a, 362–3.

57. Robinson 1975, Pls. 391–96; Garbsch 1978, Pl. 31; Petculescu 1990, 846–48.

58. Eagle-helmets: Robinson 1975, Pls. 376–83; Garbsch 1978, Pls. 28–9. Cf. protectors: Robinson 1975, Pl. 387–90; Garbsch 1978, Pl. 30.2–4. Vimose: Engelhardt 1864, Pl. 4.1. Intercisa: Barkóczi *et al.* 1954, No. 170. Worthing: Robinson 1975, Pl. 384–6; Garbsch 1978, Pl. 30,1. Theilenhofen: *ibid.*, Pl. 10. Rome: Schafer 1979, Figs. 5–8; Andreae 1977, Pls. 587–88, 590–91; Koch and Sichtermann 1982, Pls. 78, 82, 84.

59. Masks: Keim and Klumbach 1951, Pls. 6–7, 10–11; Robinson 1975, Pls. 364–6; Garbsch 1978, Pls. 1,1, 2,3–4, 25,1–2. Vechten: Kalee 1989, Nos. 8–9, Figs. 14–5.

60. *Cod. Vat. Lat.* 3225; Vergiliana 1945, Picture 49 (cf. 44, 48).

61. Bosses: Oldenstein 1982, III.B.5A; Walke 1965, Pl. 106,1–2; Planck 1983, Fig. 98; Fischer 1990, Pls. 53,B22, 54,25. Cf. Engelhardt 1869, Pl. 5,10; Raddatz 1987, Nos. 249–97. Thorsbjerg: *ibid.*, No. 268. Decorated bosses: Klumbach 1966; Thomas 1971, 31–44.

62. Cumont 1926, 261–3; Baur and Rostovtzeff 1931, 11, 72; Rostovtzeff *et al.* 1936, 195, 204–5, Fig. 18; Rostovtzeff *et al.* 1939, 326–69; Hopkins 1979, 186–7, Fig. ; Dr S. James pers. comm. Pointed flanges: Rostovtzeff *et al.* 1936, Fig. 18. Cf. *ORL* B8, Pl. XI,27 (Zugmantel).
63. Rostovtzeff *et al.* 1939, 327–31. Thorsbjerg: Raddatz 1987, Figs. 21–2, Pls. 84–5. Experiments: *Quinta*, pers. comm.
64. Baur and Rostovtzeff 1931, 72; Rostovtzeff *et al.* 1936, 197; Rostovtzeff *et al.* 1939, 327–8, 331–69, Pls. XLI–II, XLIV–VI. Back design: *ibid.*, 326 and Dr S. James pers. comm. Cf. Sternquist 1955, 118–9.
65. *Stelae*: e.g. Ferri 1933, Fig. 274; Pfühl and Mobius 1977, Nos. 305, 311, 314–5.
66. *Stelae*: Smith 1904, No. 2271; Coulston and Phillips 1988, No. 193. Boards: Cumont 1926, 262–3; Rostovtzeff *et al.* 1936, 456–66, Pls. XXV–XXVA; Connolly 1981, 231. Boss: pers. comm. Dr S. James.
67. Schober 1923, No. 158.
68. Studs: Alicu *et al.* 1979, Fig. 265; Franzoni 1987, No. 19, Pl. V,4. Crescent loop: Stuart-Jones 1912, Pl. 82; Barkóczi *et al.* 1954, Pl. LXXI,4; Rocchetti 1967–68, Fig. 2; Pfühl and Mobius 1977, No. 309; Koch and Sichtermann 1982, Pl. 84. Along front: Schober 1923, Fig. 97; Kuszinsky 1934, Figs. 30, 53; Barkóczi 1944, Pl. X,2. Terminals: Esp. 5507; Schober 1923, Fig. 77; Barkóczi *et al.* 1954, Pl. XXI,4; Rocchetti 1967–68, Figs. 4–5; Wagner 1973, Nos. 31, 350; Pfühl and Mobius 1977, Nos. 315–16; Balty 1987, Fig. 4. Sassanid reliefs: Herrmann 1983, Pls. 10–13; Herrmann and Mackenzie 1989, Pls. 2–3, 6. Terentius: Cumont 1926, Pl. L. Eining: Wagner 1973, No. 477.
69. Plain: Oldenstein 1976, Nos. 1048–52; von Schnurbein 1977, 88, Pl. 16; Cumont 1926, Pl. XCVII,6. Adjustable: Oldenstein 1976, Nos. 1058–60, Fig. 8; Barkóczi *et al.* 1954, Pls. XXII,6–7, XXV,1, 3; Alföldi *et al.* 1957, Fig. 99. Studs: Oldenstein 1976, No. 473–903; von Schnurbein 1977, Pls. 6, 13, 50, etc. Terminals: Nash-Williams 1932, Fig. 34,6–7; Oldenstein 1976, Nos. 290–348; Raddatz 1953; Hundt 1955, 51–3, Fig. 1; von Schnurbein 1977, 92–4, Pls. 29, 45, 82, etc.; Gudea 1989, Pls. CCXII–IV. Lyon: Wuilleumier 1950, Fig. 1.
70. Gravestones: Schober 1923, No. 154; Polenz 1986, Fig. 28; Hofmann 1905, Fig. 58. Artefacts: Barkóczi *et al.* 1954, Pl. 22,13–15; Oldenstein 1976, 222–23, Nos. 1083–86, Fig. 9; von Schnurbein 1977, 87–8, Fig. 13, Pls. 56, 82, etc.; Fischer 1988, Fig. 9; 1990, Pl. 92,B1–2, etc.; Boube-Piccot 1980, No. 388; Oldenstein 1976, Nos. 971–85, 997–1025; Gudea 1989, Pls. CCXXII–III; Boube-Piccot 1980, Nos. 408–11, 537–47; Frisch and Toll 1949, Pl. IV,40. Bishapur: Herrmann 1980, Pl. 47a; 1983, Pl. 5, 10–13.
71. Frisch and Toll 1949, Pl. VI,82; Wuilleumier 1950, Fig. 1; Bullinger 1972; Ulbert 1974, 213–14, Fig. 4,2, 5; Petculescu 1991, 392–94, Fig. 74,1. Gravestones: Schober 1923, Fig. 75; Ferri 1933, Fig. 291; Rocchetti 1967–68, Figs. 2, 5–6; Oldenstein 1976, Figs. 13,2, 14,1. Appliqué types: *ibid.*, Nos. 268–72, 509–27, 539–57, 622–49, 686–712, 715–46, 785–96.
72. Allason-Jones and Miket 1984, 94–6; Oldenstein 1976, Nos. 809–12; Fischer 1990, Pl. 66,D2; Gudea 1989, Pl. CCXXIII,10; Frisch and Toll 1949, Pl. IX,31.
73. E.g. Rocchetti 1967–68, Figs. 1–2, 4–5; Pfühl and Mobius 1977, Nos. 305, 307, 316.
74. Cumont 1926, Pl. L; Luxor 1981, Fig. 154; Pfister and Bellinger 1945, 1–9, 14–5.
75. E.g. Allason-Jones and Miket 1984, 3.142–51; Böhme 1972, Pls. 25–8; Gudea 1989, Pl. CXCV; Frisch and Toll 1949, Pl. XVII,168; Gerharz 1987, 87–90, Nos. 165–7.
76. Sculpture: Hofmann 1905, No. 65; Wagner 1973, Nos. 29, 31, 350; Condurachi and Daicoviciu 1971, Fig. 117; Luxor 1981, No. 296, Fig. 156. Cf. Busch 1965.
77. Künzing: Herrmann 1969, 5–7. Caerleon: Nash-Williams 1932, Fig. 25.
78. Caerleon: Nash-Williams 1932, Fig. 22. Macrinus: Herodian IV,15,2–3. Uses: OED, *s.v.* 'caltrop'.
79. Centurions: Franzoni 1987, No. 19,59; Pfühl and Mobius 1977, Nos. 302–3. Tall staffs: *ibid.* No. 308; Bernand 1966, Pl. 13(?); Franzoni 1987, No. 15.
80. Planck 1983, Fig. 117.
81. Horse burials: Palágyi 1986; 1989. Dura: Frisch and Toll 1949. Germany and Raetia: Oldenstein 1976. Mauretania: Boube-Piccot 1980.
82. *Phalerae*: e.g. Frisch and Toll 1949, Pl. III,20; Oldenstein 1976, Nos. 1131, 1133–4; Boube-Piccot 1980, Pl. 37,106–11. Studs: e.g. *ibid.*, Pl. 118,589; Allason-Jones and Miket 1984, 3.766, 3.870–2; Oldenstein 1976, Nos. 542–57. Strap terminals: e.g. *ibid.*, Nos. 261–8; Frisch and Toll 1949, Pl. IV,47–9. Pendant streamers: e.g. Boube-Piccot 1980, Pl. 48,183–4; Allason-Jones and Miket 1984, 3.591; Oldenstein 1976, No. 885. Cheek-pieces: e.g. Frisch and Toll 1949, Pls. II,15, 17–8, III,19, 23; Boube-Piccot 1980, Pl. 30,92–4.
83. Bishapur reliefs: Herrmann 1989, Pl. XV. Contemporary harness: *Ann. Soc. Arch. Bruxelles* 17, 1903, Pl. 17; *SJ* 5, 1913, 61, Fig. 17.
84. Robinson 1975, Pls. 522–28; Garbsch 1978, Pls. 4–7.

85. Rostovtzeff *et al.* 1936, 440–49, Pls. XXI–II; Robinson 1975, 194, Pls. 529–30; Hopkins 1979, 125–6, 189, 191; Hyland 1990, 149–51.
86. Graffiti: Baur *et al* 1933, Pl. XXII,2; Rostovtzeff *et al.* 1952, Fig. 6. Xenophon, *Horsemanship* XII,8; Arrian, *Techne Taktike* 4; Heliodorus, *Aethiopica* IX,15. Crimea: Keiseritzky and Watzinger 1909, No. 650; Desyatchikov 1972. Tang-i-Sarvak: Vanden Berghe and Schippmann 1985, Fig. 12, Pl. 47. Cf. Sculpture: Pugachenkova 1966; Bivar 1972, 277–81; Robinson 1975, Figs. 198–200; Coulston 1986, 60–8.
87. Coulston 1986, 60–8; Hyland 1990, 148–56. *Catafractarii*: Herodian, VIII,1,10; Zosimos, *Historia Nova* I,50.

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1. Army: Jones 1964, 607–86; Hoffmann 1969; Tomlin in Connolly 1981; MacMullen 1988, 199–217; Lieberschutz 1990, 7–46; Casey 1991. Hadrianopolis: Matthews 1989, 296–301; Lieberschutz 1990, 24–5.
2. New sites: von Petrikovits 1971; Mócsy 1974, 266–96; Johnson 1983; Soproni 1985; Maxfield 1989. Housesteads: Bosanquet 1904, 224–5, 290–1. Intercisa: Klumbach 1973, 103–5. Lambaesis: Cagnat 1913, 496. Gornea: Baatz 1978, 14. Orşova: *ibid.*, 9.
3. Water: Ilkjaer and Lønstrup 1982; Hines 1989, 26–43. Oudenburg: Mertens and van Impe 1971. Intercisa: Vago and Bona 1976. Winchester: Clarke 1979. Ságvár: Berger 1966. Weapon graves: Böhner 1963; Blazquez 1980; Schulze-Dörlamm 1985.
4. *Spiculum*: Veg. II,15. Cf. III,14; Amm. XVI,12,46. Cf. Isid. XVIII,8,2. *Bebra*: Veg. I,20.
5. Carvoran: Richmond 1940; Cowen 1948; Manning 1976a, 20–1, Fig. 13,22; Scott 1980, 339, Fig. 24,4. Lorch: *RLÖ* XV, Fig. 59,4. Pilismarót: Soproni 1978, Pl. 37,3. Cf. Engelhardt 1865, Pl. XI,46; 1867, Pl. III,20; 1869, Pl. 14; Swanton 1973, Fig. 3; Ilkjaer and Lønstrup 1963, Fig. 3,1. *Ango*: Swanton 1973, 22–35, Figs. 3–5; von Schnurbein 1974.
6. Veg. I,17; II,16; III,14; IV,29. *Mattiaci*: Hoffmann 1969, 156–8, 172. *Mattiarii*: *ibid.*, 12–3, 221–3. *De Rebus Bellicis* 10–1; Hassall and Ireland 1979, Pl. IX.
7. Musty and Barker 1974; Barker 1979 (Wroxeter); Scott 1980, 339 (Kenchester); Wacher 1971, Fig. 26,4–5 (Catterick); Sherlock 1979 (Brough Castle); Bushe-Fox 1949, Pl. LIX,295–6 (Richborough); Casey and Davies forthcoming, Fig. 10.12,275–7 (Caernarfon); Buckland and Dolby 1971–72, 275–6 (Doncaster); *AuhV* V.V.3; *ORL* B24, Fig. (Mainz); Unz 1973, Fig. 6,30 (Vindonissa); Cahn 1989, W50 (Augst); *RLÖ* IX, Fig. 47.3 (Lorch); X, Fig. 36,3 (Carnuntum); Intercisa Museum pers. obs. (Intercisa); Hoffiller 1910–11, Fig. 16 (Sisak); Gudea 1977, Fig. 48,1–8 (Gornea); Bennett 1991 (Pitsunda).
8. Eagle 1989. Later use: Kolias 1988, 173–6.
9. Heads: Wacher 1971, Fig. 26; Cunliffe 1975, Fig. 124, 171, 175, 177–8; Blazquez 1980, Fig. 25,3; Mertens and van Impe 1971, Fig. 68, Pl. XLI,3; Bersu 1964, Pl. 9,1–2; Soproni 1978, Pl. 37,2; Gudea 1977, Figs. 47–8. Shafts: Engelhardt 1867, Pl. II–III; Delbrück 1933, Pl. 96–7; Paolucci 1971, 46–7.
10. *Stelae*: Esp. 5496, 3943; Eckhardt 1981, No. 57; Franzoni 1987, No. 12–14, 22–3. Syracuse: Wilson 1990, Pl. XII. Via Latina: Tronzo 1986, Fig. 92. *Verutum*: Veg. II,15; cf. Amm. XVI,12,46; XIX,11,10; XXVII,10,15; XXXI,10,8. *Lancea*: Veg. II,14, IV,22. Cf. Isid. XVIII,8,2. *Lanciarii*: Hoffmann 1969, 176, 218–22, 226; Drew-Bear 1981, 100, 103–4; Vermand: Bohner 1963, 154–5; Sommer 1984, Pl. 74,5–6.
11. Worms: Esp. 6044; Schleiermacher 1984, No. 49. Lyon: *ibid.*, No. 93; Esp. 1780. See Coulston 1986, 63; Kolias 1988, 191–2.
12. Veg. II,15. Cf. Isid. XVIII,6,5. Nydam: Engelhardt 1865, Pl. VII. Augst: Ulbert 1974, 207, Fig. 2. Köln: Schulze-Dörlamm 1985, Fig. 4. Cf. Sommer 1984, Pls. 27, 49, 56, 65. Representations: Delbrück 1932, Pls. 31–2, 35, 47–8, 50–1; Esp. 5496; Tronzo 1986, Fig. 92. Cf. Barnett 1983.
13. Chapes: Bersu 1964, Pls. 7,6; 20,8; Werner 1966; Gilles 1979; Böhner and Weidermann 1980, No. 204; Sommer 1984, Pl. 74.11. Cf. Gilles 1979, Fig. 3,5. Venice: Delbrück 1932, Pl. 31–2. Cf. *id.* 1929, No. 2; 1932, Pl. 35; Esp. 5496.
14. Slides: Engelhardt 1865, Pl. VIII,32; Oldenstein 1976, No. 64–5; *RLÖ* XIII, Fig. 92,3. Statues: Delbrück 1932, Pls. 47, 50–1. Monza: Delbrück 1929, No. 63 (cf. No. 69). Cf. Engelhardt 1865, Pl. VIII,25–6. Belts: Delbrück 1932, Pls. 31–2; 35; 47–8; 50–1; 1933, Pls. 30, 46; Eckhardt 1981, No. 57; Franzoni 1987, No. 3, 12–22; Esp. 5496; Tronzo 1986, Fig. 92.
15. 'German' weapons: Bushe-Fox 1949, Pls. LXI, LXIII; Bohner 1963; Mertens and van Impe 1971, Pl. XL,4; Dahlmos 1977; Schulze-Dörlamm 1985; Böhme 1986, 509–19. Cavalry: Bivar 1972, 291; Coulston 1986, 67; Srejevic *et al.* 1983, No. 42. Knives: e.g. Berger 1966, Figs. 89, 98, 100–2, etc.; Mertens and van Impe 1971, Pls. XCI–II; Vago and Bona 1976, Pls. 19–21, etc.; Sommer 1984, Pls. 25, 28–31, etc.; Blazquez 1980, Fig. 25,3–4.
16. Hoffmann 1969, 160–3, 210–1, 240–4, 264–5; Veg. II,2; 15; 17; III,14; cf. Julian, *Or.*57D.
17. Intercisa: Salamon 1976, 48–50, Pls. 24–6; Coulston 1985, 233. Hunnic bows and burials: *ibid.*, 242–4; Werner 1956, 46–50, Pls. 25; 36–7; 70,4.

18. Veg. II.15; IV.21. See Marsden 1969, 7–16, Fig. 1; Kolias 1988, 240–53.
19. Gundremmingen: Bersu 1964, Pl. 9,6–9. Gornea: Gudea 1977, Figs. 47–8. Housesteads: Manning 1976a, 22–3, Fig. 14. Lobate: Werner 1956, 49; Neugebaur and Neugebaur-Maresch 1990, Fig. 3. Quiver: Coulston 1985, 273–4.
20. Vindolanda: Greep 1987, 191. Lambaesis: Cagnat 1913, 496. Veg. I,10; 20; II,15; 17; 23; III,3; 14; IV,29. Cf. Haldon 1975, 38–9; Kolias 1988, 254–9. Slingers: Amm. XIX,5,1; XXIV,2,15; Julian, *Pan. Or.* 57D. *ND Or.*VII.52. Elephants: Veg. III,24.
21. Gudea 1977, 82–3, Figs. 46, 59; Gudea and Baatz 1974, Figs. 3–10; Baatz 1978, 9–16, Figs. 8–9, 12. Heron: Marsden 1969, 3, 188–90, Fig. 8,1; 1971, 18–61; Gudea and Baatz 1974, 59–72; Baatz 1978, 14–16. *Carroballistae*: Veg. II,25; IV,22; 24. Wall-mounted: IV,9–10, 22, 29. Cf. Amm. XIX,1,7; 5,6; 7,2; 5–7; XX,7,2; 10; 11,20; 22; XXIII,4,1; XXIV,2,13; 4,16. Heads: Cunliffe 1975, Fig. 124, 170; Bersu 1964, Pl. 9,3–5 (?); Gudea 1977, Figs. 47–8. Amm. XXIV,4,16. Procop. V,21,16; cf. Veg. IV,18.
22. Veg. II,10; 25; III,3; 14; IV,8; 9; 22; 28; 44; Amm. XXIII,4,4; 7; XXXI,15,12. *Scorpio*: XIX,2,7; 7,6; 7; XX,7,10; XXIII,4,4; 7; XXIV,4,16; 28; XXXI,15,12. See Marsden 1969, 179–80, 189.
23. Veg. II,25; Marsden 1969, 195–7. *ND Or.* VII,43; 57; VIII,46–7; IX,47; *Occ.* VII,97; XLI,23. Danube: Brennen 1980. Julian: Amm. XVI,2,5.
24. Independenţa: Zahariade 1991, 315. Monuments: Coulston 1990, 139–47.
25. Disuse: Couissin 1926, 448; 512–13; 517–18; Alfs 1941, 104; MacMullen 1960, 30–1; Robinson 1975, 171; Harmand 1986, 197–9. Veg. I,20. Cf. Coulston 1990, 148–9.
26. Chiaramonti: Koeppel 1986, No. 48. Wood: Alfs 1941, Fig. 9. Via Latina: Tronzo 1986, Fig. 92. *ND Or.* XI; *Occ.* IX. *Thoracomachus*: Hassall and Ireland 1979, 105–10, Pls. XVI–II; *De Rebus Bellicis* XV.
27. Hoffmann 1969, 265–77; Bivar 1972, 276–81; Speidel 1984; Coulston 1986, 60–3.
28. Veg. II,15–6; III,18; Amm. XVI,10,8; XIX,8,8; XXIV,6,9; XXV,1,16; XXVI,6,16; XXXI,10,11; 17; 13. Later: Kolias 1988, 37–54.
29. Klumbach 1973, 103–9, Pls. 45–57.
30. Augst: *ibid.*, 115–7, Pls. 61–4; Worms: *ibid.*, 111–4, Pls. 58–60; Carnuntum: *RLÖ* IV, Fig. 47,6.
31. Klumbach 1973, 95–101.
32. *ibid.*, 15–38, Pls. 1–9.
33. Burgh Castle: Johnson 1980. Conceşti: Klumbach 1973, 91–4, Pls. 32–7. Deurne: *ibid.*, 52–89, Pls. 19–21.
34. Independenţa: Zahariade 1991, 315. 'Berkasovo' cheek-pieces: Hoffiller 1912, Fig. 21; Klumbach 1973, Fig. 1 (iron, Vinkovci); *ibid.*, 85–9, Pl. 30; Milano 1990, 1a7b (silver, S.Giorgio di Nogara). 'Intercisa' cheek-pieces: Peterson 1990, Fig. 1 (iron, Germany); Klumbach 1973, Fig. 19 (copper alloy, Brunehaut-Liberchies); neck-guards: *ibid.*, Pl. 31,1 (silver, S.Giorgio di Nogara); *RLÖ* IV, Fig. 47,6 (iron, Carnuntum); Bushe-Fox 1949, Pl. 179 (iron with copper alloy edging). Florence: Robinson 1975, Figs. 104–6.
35. Thomas 1971, 17–25, Pls. XXIX–XXXVII; Klumbach 1973, 39–50, Fig. 3, Pls. 12–18
36. Berkasovo: Klumbach 1973, 28, 36–7. Stamps: *ibid.*, 44–5, 48–50, Fig. 3, Pls. 17–18. Conceşti: *ibid.*, 14, 91–2. Deurne: *ibid.*, 66–72.
37. Gamzigrad: Srejevic *et al.* 1983, No. 42. Heads: Delbrück 1932, Pl. 102. Coins: Alföldi 1932, Pls. II–III; 1934, 99–104, Figs. 1–4; Overbeck 1974, Pls. 23–4; Klumbach 1973, 10–11, Pl. 65. Constantine: Alföldi 1932, 12. Valentinian: Amm. XXVII,10,11. 'Berkasovo' coin: Klumbach 1973, Pl. 65.2. Aquileia: Franzoni 1987, No. 12–14, 22–3; Syracuse: Wilson 1990, Pl. XII. Geneva: Delbrück 1933, Pl. 79.
38. Amm. XXIV,6,9; XXVI,6,16. *Cornuti*: L'Orange and von Gerkan 1939, 43, Pls. 7, 8a, 9–10, 18c; Alföldi 1959a, 173. Christian badge: Alföldi 1932; Klumbach 1973, 11, Pl. 65.1.
39. Alföldi 1934; Post 1951–53; Werner 1949–50; 1989.
40. James 1986.
41. Belt-fittings: Klumbach 1973, 25, Pl. 10,3–4. Terminology: *ibid.*, 9; James 1986, 112. Deurne: Klumbach 1973, 60.
42. Leiden: Ebert 1909. Der el-Medineh: Dittmann 1940.
43. Frescoes: Rostovtzeff 1913, Pls. LXIV,1, LXXVIII,1, LXXIX, LXXXVIII,2. Trajan's Column: Cichorius 1896–1900, Pl. II–III. Cf. Scenes XXXI, XXXVII, LXVI, LXX, LXXVIII, CVIII, CXV. Galerius: Laubscher 1975, Pl. 12.2, 31–2, 65. Sarcophagus: Delbrück 1932, Pl. 103.
44. Werner 1989, 422–6, Figs. 1–2.
45. Veg. I,20. Representations: Delbrück 1929, No. 69; 1932, Pls. 31–7; L'Orange and von Gerkan 1939, Pls. 6, 19b-c, 23a; Esp. 870; Speidel 1984, Pl. 16; Franzoni 1987, No. 21; Srejevic *et al.* 1983, No. 42; Bandinelli 1971, Pl. 73; Via Latina Catacomb fresco, brown cap, pers. obs.; Carandini *et al.* 1982, Figs. 16–17. Amm. XIX,8,8.
46. Vindolanda: Bidwell 1985, Fig. 47,1. Gundremmingen: Bersu 1964, Pl. 9,12. Domed and pointed: Bushe-Fox 1949, Pls. LXIII–IV; Sommer 1984, Pls. 58,16, 74,12, etc.; Schulze-Dörlamm 1985, Figs. 2, 15–17, etc. Misery: Sommer 1984, 95–6, Pl. 56,3. Vermand: *ibid.*, 96, Pl. 74. Stilicho: Kiilerich and Torp 1989, Fig. 15.

47. Constantine: L'Orange and von Gerkan 1939, Pls. 6–9, 12–13, 24c, 30c. Frescoes: Tronzo 1986, Fig. 3; Wilson 1990, Pl. XII. Gravestones: Esp. 1780, 3943, 5496; Franzoni 1987, Nos. 12–14, 22–3. Bodyguards: Delbrück 1933, Pls. 79, 94, 108. Cf. Berger 1966, Pl. XCV; Mócsy 1974, Pl. 44b-c. Galerius: Laubscher 1975, Pls. 30–4, 36, 65. Theodosian: Delbrück 1933, Pls. 86, 88; Becatti 1960, Pls. 51–5; Freshfield 1922, Pls. XV–VI, XVIII–XXIII. Danish: Raddatz 1987, Figs. 21–2.

48. Berger 1981, 43–57.

49. Eagle: Laubscher 1975, Pl. 12,2; 38.1; 42.2; 65.2. Hercules: Pls. 34–5, 38, 51, 56.2. Lion: Pl. 35. Geneva: Deonna 1920, 95–101; Delbrück 1933, 180–1, Pl. 79; Böhner and Weidermann 1980, No. 68. *Cornuti*: L'Orange and von Gerkan 1939, 43, Pls. 28c, 32i; Alföldi 1935; 1959; Berger 1981, 45–7. Cf. Kiilerich and Torp 1989, 326–30. Amm. XVI,12,6.

50. Grigg 1979, 111–12; 1983. Chi-rho: Delbrück 1929, Fig. 14, 26; Becatti 1960, Pl. 51; Freshfield 1922, Pls. XVII, XX, XXIII.

51. Positions: Berger 1966, Figs. 6–80; Bullinger 1969, Fig. 62. Leather: Sommer 1984, 4 (Cf. Pl. 48).

52. Stiffener depictions: Delbrück 1932, Figs. 40, 42; L'Orange and von Gerkan 1939, Pls. 33a, 34a, c; Carandini *et al.* 1982, Figs. 107, 118, 125, 130. Residuals: Berger 1966, Fig. 117,284; Oldenstein 1979. Buckles and strap-ends: Hawkes and Dunning 1961, Fig. 13, 15; Bullinger 1969, Figs. 9–10, Pls. XII–V; Simpson 1976; Blazquez 1980, Fig. 25,5–8; Sommer 1984, Pls. 1–8, 19–24; Böhme 1986, Figs. 5, 25–8. 'Utere felix': Bullinger 1972, Fig. 1.

53. Propellers: Bullinger 1969, Pls. XXVII–XXXII; Sommer 1984, Pls. 29, 32–5, 40, 42, 54; Böhme 1986, Fig. 13. Intercisa: Bullinger 1969, Pls. LXVII,1; LXIX. Arch: L'Orange and von Gerkan 1939, Pl. 33a. Piazza Armerina: Carandini *et al.* 1982, Fig. 118. Pecs: Fülep 1984, Pl. XXXI,1; Bullinger 1969, Pl. XXVII.1. Köln: *ibid.*, XXIX,2. Propeller buckles: Bullinger 1969, Pl. III,2; XXVII,2, etc.; Sommer 1984, Map 2, Pls. 14–15, 40, 42, 54; Böhme 1986, Fig. 12. Berkasovo: Klumbach 1973, Pl. 10.3–4; Sommer 1984, 95. Long propellers: Bullinger 1969, Pls. LII, LXV; Sommer 1984, Figs. f, h, Map 3, Pls. 53, 55, 77; Böhme 1986, Figs. 21.9, 24.

54. Openwork: Hawkes and Dunning 1961, Figs. 17–19; Bullinger 1969, Fig. 56, Pls. III, XXVIII, XXXI–II; Blazquez 1980, Fig. 25,7; Sommer 1984, Pls. 4, 13–6, 29, 31–2, 35; Böhme 1986, Figs. 8–10. Distribution: Sommer 1984, Map 1–2; Böhme 1986, Fig. 11.

55. Chip-carved fittings: Bullinger 1969, Figs. 19–34, 54, 58–61, Pls. IV–VIII, XXXIV–L; Sommer 1984, Pls. 9–12, 17, 43–5, 55, 66; Böhme 1986, Figs. 1–2; Milano 1990, 1e7a, 1e3b, 1e8c, 1e8e. Oudenburg: Mertens and van Impe 1971, 54–6, Figs. 24–6, Pls. II, LXXXIII. London: Mills and Whittaker 1991, 160. Forts: Sommer 1984, 88–93. Distribution: *ibid.*, Map 4–6; Böhme 1986, Fig. 3.

56. Winchester: Clarke 1979, 267–9, Fig. 33, Pl. XIVb. Oudenburg: Mertens and van Impe 1971, Pls. XLII, LXXXVII; Bullinger 1969, Pl. LIII. Galdenberg: *ibid.*, Pl. LV. Cf. Hawkes and Dunning 1961, Figs. 1–2, 23–4; Bullinger 1969, Figs. 35–46, Pls. LI–LXV; Sommer 1984, Pls. 46–53, 57–62, 67–79; Böhme 1986, Figs. 19–21. Distribution: Sommer 1984, Map 7; Böhme 1986, Fig. 22. Dating: *ibid.*, 492–501; Bullinger 1969, 65–7; Clarke 1979, 268, 286–8; Sommer 1984, 74–80.

57. Bullinger 1969, Figs. 50–1. 'E'-loops: *RLÖ* IV, Fig. 23,2; Bullinger 1972, Figs. 2–3; Petculescu 1991a, Fig. 74,2. Cf. Klumbach 1973, Fig. 11; Schulze 1982; Ilkjaer 1989, Fig. 7.

58. Zengövarkóny: Bullinger 1969, Fig. 62,5. Winchester: Clarke 1979, 267–9. Vienna: Delbrück 1932, Fig. 40. Piazza Armerina: Carandini *et al.* 1982, Figs. 17, 122, 127. Ravenna: Delbrück 1932, Fig. 42.

59. Ownership: Sommer 1984, 87–101.

60. Brooches: e.g. Berger 1966, Pls. LXXXIX–XCI; Mertens and van Impe 1971, Pls. LXXIX–LXXXII; Vago and Bona 1976, Pls. XXXV–VI; Sommer 1984, 74. Representations: Esp. 5496; Franzoni 1987, No. 21; L'Orange and von Gerkan 1939, Pls. 6–7; Carandini *et al.* 1982, Figs. 16, 18, etc.; Delbrück 1929, No. 63; 1933, Pls. 86–8.

61. Syracuse: Wilson 1990, Pl. XII. Luxor: Kalevrezou-Maxeiner 1975, Pls. II–IV. Via Latina: pers. obs. Piazza Armerina: Rinaldi 1964–65, 218–36. Cf. Lauscher 1975, Pl. 32,1. *SHA Gallieni duo* VIII,1; *Claudius* XIV,5.

62. Baginski and Tidhar 1980, 19–33; Donadoni Roveri 1988, 208–10, Fig. 299.

63. Kendrick 1920, Pls. IV, XVIII, XIX, XXVII–XXX; Du Bourguet 1964, A11–12, 16–18, 23, B4, 6–8, 10, 31.

64. L'Orange and von Gerkan 1939, Pls. 6–11, 24c, 30c, 31a. Kalevrezou-Maxeiner 1975; Carrandini *et al.* 1982, Figs. 12, 16. Deurne: Klumbach 1973, 73–5, Fig. 12.

65. Staffs: Franzoni 1987, Nos. 16–17, 20–1; Kalevrezou-Maxeiner 1975, Fig. 8; Carandini *et al.* 1982, Figs. 12, 16–17. *Torques*: Delbrück 1933, Pls. 96–7, 86–8, 108; Volbach 1961, Pl. 234. Cf. Amm. XXIX,5,20.

66. Winter 1936, 278.

67. *SHA Claudius* XIV, 5–10.
68. Dish: *Minerva* 1:4, 1990, front cover. Arch: L'Orange and von Gerkan 1939, Pl. 8a. Saddles: Herrmann 1989; Werner 1956, 50–3. Deurne: Klumbach 1973, 61–2, Fig. 7.
69. Gravestones: Schleiermacher 1984, No. 49, 88, 93. *Notitia*: Hofmann 1969, 265–77. Later: Coulston 1986, 60, 67.

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1. Central production: Cf. Toynbee and Clarke 1948, 21–2. Private production: Parker 1928, 218 n.1; MacMullen 1960; Wierschowsky 1984, 173–203.
2. Diod. Sic. XIV,41–3.
3. New Carthage: Livy XXVI,47. Carthage: Appian VIII,93.
4. Sertorius: Schlesinger and Geer 1959, 188–90, Frag.18. Piso: Cicero, *In Piso* 87. Contracts: Livy XXVII,10; Appian XXX,3.
5. Mutz 1987.
6. MacMullen: 1960, 25. Corbridge: *ibid.* 28–9.
7. Robinson: 1975, 8; Oldenstein: 1974; 1976, 68–75; 1985. Metalworkers: Robinson 1977, 558–9. Camps: Webster in Niblett 1985, 114.
8. Vegetius: II,11.
9. Cf. Oldenstein 1974.
10. Rheingönheim: Ulbert 1969a, 10, Pls. 59, 61. Sheepen: Niblett 1985, 112; Hawkes and Hull 1947, 346, Fig. 65, Musty 1975. Smithing hearths: Manning 1976b, 143–4. Haltern: *MAKW* 5, Pl. XXXIX,2.
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12. Pitts and St Joseph 1985, 105–15.
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14. Ritterling 1904, 8–14, Pls. I–II; 1913, 59–65, Pl. III.
15. Neuss: von Petrikovits 1961, 479. Kingsholm: Hurst 1985, 95–6. Sheepen: Hawkes and Hull 1947, 93, 341, 346.
16. Bruckner and Marichal 1979, No. 409.
17. Bowman and Thomas 1983, No. 1.
18. *Digest* 50,6,7; Vegetius: II,11.
19. *Scutarii*: Bowman and Thomas 1983, No. 3; *AE* 1926, No. 3. *Gladiarii*: CIL XIII, 11504; Bowman and Thomas 1983, No. 3.
20. Bow production: Coulston 1985, 248–59. Caerleon and Corbridge: *ibid.* 226, 229. Micia: Petculescu 1991b, 10. Intercisa: Salamon 1976, 50. Turin: *N.D., Oc.* XI,28.
21. Vindonissa: Ettlinger and Hartmann 1984, 7–8. Strasbourg: *ibid.*, 38; Forrer 1927, Pl. LXXV,A. Oberammergau: Ulbert 1971.
22. Bonis 1986; Benea and Petrovsky 1987; Petculescu 1991b.
23. Blankets: Lewis and Reinhold 1966, 515–16 (*P. Berlin* 1564). Shafts: Speidel 1981. Tacitus: *Hist.* II,82; Cassius Dio: LXIX,12,2. Cities: Hodgson 1989. New legions: Mann 1963.
24. Avitus: CIL XIII,2828. Annianus: CIL XIII,6763.
25. *N.D., Or.* IX,18–39; *Oc.* XI,16–39. James 1985, Figs. 4–6.
26. *Ibid.*, 262–5.
27. *Ibid.*, 265–73.
28. Belt-fittings: Sommer 1984, Fig. i. Intercisa: Salamon 1976. Housesteads: Bosanquet 1904, 224–5, 290–1. Novae: Sarnowski 1985.
29. Inadequate weapons: Polyb.II,33. Philon: 71, in Marsden 1971, 141–2. Suidas *s.v.* '*machaira*'.
30. Lang 1988.
31. Biborski *et al.* 1985.
32. *Ibid.* 73–80; Maryon 1960; Rosenquist 1967–68, 164–89; Engelhardt 1865, Pls. VI–VII; Bennett *et al.* 1982, 189.
33. Soft armour: Williams 1977, 77. Design: Allason-Jones and Bishop 1988, 100–2.
34. Stamped: Robinson 1975, 164. Coppergate: Tweddle 1984, 19. Newstead: Curle 1911, 161. Danish: Engelhardt 1863, 26. Carlingwark: Piggott 1951–53, C74. Roman date: Manning 1972, 233; Robinson 1975, 171–3.
35. Paddock 1985, 147.
36. Spinning helmets: Paddock 1985, 146. Spun bosses: Thomas 1971, 34, 37, 38.
37. Augustus: Kent 1978, 19. Nature: Caley 1964; Craddock 1978. Zinc content: Musty 1975, 411. Cementation: Caley 1964, 93–4. Sheepen: Musty 1975.
38. '*Lorica segmentata*': Bishop 1989d, Table 2 Nos. 3, 7, 9. Rivets: *loc. cit.* Nos. 4 and 8. Lead: *loc. cit.* No. 2; *id.* 1989c, 13.
39. Alloys: Bayley in Niblett 1985, 115. Trace elements: cf. Craddock and Lambert in Jenkins 1985, 162.
40. Lost-wax: Tylecote 1962, 110. Two-part mould: *ibid.*, 107–10. Nijmegen: Bogaers and Haalebos 1975, 156, Pl. LII,1a-d. Alesia: Rabeisen 1990, 75. Moulds: Bonis 1986, Fig. 1,1; Benea and Petrovszky 1987, Fig. 5,4–9; Sommer 1984, Fig. i,5; Frisch and Toll 1949, Pl. IX,35. Unfinished: Petculescu 1991b, Figs. 1–2; Sommer 1984, Fig. i,4; Bonis 1986, Fig. 2,1–6. Trial: *ibid.*, Fig. 3; Sommer 1984, Fig. i,1.
41. Handlesbank 1989, Monatsbild Januar.
42. *Paterae*: den Boesterd and Hoekstra 1965, 106–7. Buch shape: pers. comm. *cohors V Gallorum*. London: pers. comm. Dr S.James.
43. Rollason 1961, 127–8.

44. Alesia: Pliny *Natural History* XXXIV,48. Tinning: Brown 1976, 39. Silvering: Craddock *et al.* 1973, 16. Helmets: Oldenstein 1990, 27. Scabbards: Ettlinger and Hartmann 1984, 8. Belts: Rupprecht 1987, 223. Harness: Hassall 1980, 343. Ham Hill: Webster 1958, No. 105, Pl. XI,c. Silvered: Jenkins 1985, 145 (Xanten). Belts: Morel and Bosman 1989, 180. Rheingönheim sword: Ulbert 1969a, 44–5.
45. Sheathing: Klumbach 1974, No. 32. London: pers. comm. Dr Ś. James.
46. Niello: La Niece 1983. Belts: Grew and Griffiths 1991, 56–60. Cavalry: Craddock *et al.* 1973, 14–15. Sheaths: Scott 1985, 168. Enamel: Bateson 1981, 54–5. Scabbards: Scott 1985, 168.
47. Embossing: Brown 1976, 37–9. Belts: Grew and Griffiths 1991, 54. Kingsholm: Robinson in Hurst 1975, 287–9. Cavalry: Robinson 1975, 110.
48. Stamp: Niblett 1985, Fig. 66,61, Pl. 14. Cf. Robinson in Hurst 1975, 288. Composition: Bayley in Niblett 1985, 115. Belt-plates: Böhme in Schönberger 1978, 218–22, Fig. 76; Deschler-Erb *et al.* 1991, 142, Fig. 16. Magdalensburg: Deimel 1987, Pl. 77,13; cf. 77,14.
49. Pitch: Robinson in Hurst 1975, 288. Former: *loc. cit.* Chichester: Down 1978, Fig. 10.30,13.
50. Lippold 1952.
51. Pliny: *Natural History* XVI,186–219, 222–33. Analysis: E.g. Allason-Jones and Bishop 1988, Nos. 26, 31, 38.
52. Wood and timber: Rackham 1986, 67. Coppicing: *loc. cit.*, Fig. 5.1. Ash: Allason-Jones in Bishop and Dore 1989, 193, Nos. 9 and 18; cf. Pliny *Natural History* XVI,159. Hazel: Tagg in Curle 1911, 360, Table II. Characteristics: Taylor 1981, 45–6 (ash); 50 (hazel). *Pilum*: Albrecht 1942, Pl. 48.
53. Kasr el-Harit: Kimmig 1940, 106–8. Dura: Rostovtzeff *et al.* 1936, 456–7. Rawhide: Rostovtzeff *et al.* 1936, 457. Guttering: *RLÖ* II, Pl. 24,1–4. Doncaster: Buckland 1978, 251, 268–9.
54. Dura: Rostovtzeff *et al.* 1939, 328–30. Bog: Raddatz 1987, 34–57, Figs. 21–2, Pls. 84 and 85,1.
55. Handles: Fellman 1966. Sheaths: Ulbert 1969b, 98; Bonnamour 1990, No. 103. Dagger: Scott 1985, 165; Gerhartl-Witteveen and Hubrecht 1990, No. 10, Fig. 12,A. Tool: Tagg in Curle 1911, 360, Table II. Arrows: Coulston 1985, 266–8. Practice weapons: Veg. I,11; I,14. Bows: Coulston 1985, 250. Engines: Veg. IV,14–18. Artillery: Amm. XXIII,4,4.
56. Dura: Baur and Rostovtzeff 1929, 16–17, Fig. 4. Cf. Amm. XXIV,6,8. Wicker: Veg. I,11. Egypt: Bruckner and Marichal 1979, No. 409.
57. Pommels: Oldenstein 1976, 92, 240, Pls. 10–11. Handgrips: Greep 1983, 20. Guards: Oldenstein 1976, 94–5, 241, Pl. 11.
58. Laths: Coulston 1985, 224–34, 251. Horn: *ibid.*, 252. Dagger handles: Ypey 1960–61, 347.
59. Handles: Braat 1967, No. 1, Pl. II,1–2; *SHA Hadrian* X,5 Scabbard: Trousdale 1975, 236, Pls. 18–19.
60. Tents: van Driel-Murray 1990. Footwear: *id.* 1986a, 140–4; Groenman-van Waateringe 1967, 129–46; Göpfrich 1986, 16–25. Baldrics: Oldenstein 1976, 228. Horse-harness: Jenkins 1985, 148, Pl. X,B. Shield covers: Groenman-van Waateringe 1967, 52–72; van Driel-Murray 1986a, 139–40; 1988. Covering: Rostovtzeff *et al.* 1936, 457; Buckland 1978, 256, 269. Sword sheaths: Klumbach 1973, 73. Dagger: Scott 1985, 165. '*Lorica segmentata*' ties: Robinson 1975, 181. Helmet ties: *ibid.*, 14. Armour straps: Robinson 1975, 177. Backing: *ibid.*, 156–7; pers. obs. (Vindonissa Museum). Personal items: Robertson *et al.* 1975, Fig. 28,39; Klumbach 1973, 72–3, Fig. 11. Leather armour: Robinson 1975, 164–9; Pliny *Natural History* VIII,9,5. Augst: Sommer 1984, 4.
61. Van Driel-Murray and Gechter 1983, 19.
62. Van Driel-Murray 1990. Seams: *ibid.*, 116, Fig. 4.
63. Oiled: 44, 69 n.1. Xanten *phalera*: Jenkins 1985, Pl. X,B. Mainz strap: *AuhV* 2, Heft X, Pl. 4,2.
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66. Montefortino ancestry: Robinson 1975, 13. Coolus: *ibid.*, 26; Imperial-Gallic: *ibid.*, 45; Connolly 1989a.
67. Celtic: Varro V,116. East: Robinson 1975, 153. Greece: Connolly 1981, 58. Armguards: Gamber 1968, Fig. 10; Grant 1967, Pls. 4–6.
68. Celtic: cf. Stary 1981. Hoplite shield: Connolly 1981, 97. Rectangular: *ibid.*, 95–6.
69. Suidas, *s.v.* '*machaira*'; Polyb. VI,25. Prototypes: Sandars 1913, 228–31. *Spatha*: Curle 1911, 184; Connolly 1981, 236.
70. Origin: Reinach 1907; Schulten 1911. *Solliferrea*: Sandars 1913, 272–6, Figs. 44–6, Pl. XIX. Etruscan: Connolly 1981, 100.
71. Artillery: Marsden 1969, 174. Theory and technology: Marsden 1971; Lendel 1975.
72. Bivar 1972, 281–6; Coulston 1985, 234–45.
73. Coulston 1985, 245–8.

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2. Strap-ends: e.g. Esp. 5507; Hofmann 1905, No. 59; Pfühl and Mobius 1977, Nos. 315–6;

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7. Vindonissa: Hartmann 1986, 68–71. Cerialis: *RE s.v.* '*legio*', 1785–6. Bonn: *loc. cit.* Nijmegen: *ibid.*, 1440. Britain: *ibid.*, 1440–1. Daggers: Anon n.d., 2–3, No. 2; pers. comm. Dr P. Carrington. Vindonissa: Ulbert 1962a, Fig. 6. Cheek-piece: Anon n.d., 3, No. 2. Aquincum: Robinson 1975, Pl. 144. Aquincum transfer: *RE s.v.* '*legio*', 1444.

8. Cavalry differentiation: e.g. Maxfield 1986, 66. Draft and baggage: cf. Palagyi 1986. Officer: Bishop 1988, 114–15. Decoration: *ibid.*, 115.

9. *Phalerae*: cf. Frisch and Toll 1949, Pl. VII and Boube-Piccot 1980, No. 199–200, 562 with Oldenstein 1976, Nos. 1110–11. Buckles: Sommer 1984, Maps 1–2; Böhme 1986, Figs. 11–12. Traprain: *ibid.*, Figs. 15,2, 21,1.

10. Breeze *et al.* 1976, 93–5.

11. *Ann.* I,17.

12. *P. Gen. Lat.* 1 recto i: Fink 1971, No. 68. *P. Columbia inv.* 325: Gilliam 1967.

13. *P. Fouad* I,45: Cavenaile 1958, No. 189. *P. Vindob.* L135: Harrauer and Seider 1981.

14. Pliny *Ep.* VI,25,2–3; *SHA Hadr.* XVII,2; Suetonius, *Div. Iul.* 67. Terentianus: Youtie and Winter 1951, Nos. 467–8.

15. *Castrense peculium*: *Digest* XLIX,17; Campbell 1984, 231–6. Ammonius: Gilliam 1967.

16. *Armamentarium*: Johnson 1983, 108–9. Lanchester: RIB 1092. *Custodes armorum*: Cagnat 1913, 171–2.

17. Lambaesis: Cagnat 1913, 496. Housesteads: Bosanquet 1904, 224–5. Künzing: Schönberger and Herrmann 1967–68, 54–5. Bar Hill and Newstead: Manning 1972, 244 n.129.

18. MacMullen: 1960, 23 n.2; Cagnat 1913, 495.

19. Normal use: Johnson 1983, 108. Abandonment: cf. Manning 1972, 244 n.129.

20. RIB 1091, 1234; CIL XIII,8824.

21. Robinson: 1975, 9.

22. Tacitus *Hist.* I,38; Parker 1928, 218 n.1; Durry 1938, 115.

23. *Cheveux*: Albrecht 1938, Pl. 21. Speidel: 1983, 33. Agilis: CIL XIII, 11504.

24. *RLÖ* II, 39–44.

25. Nash-Williams 1931, 126–33.

26. *Custos armorum*: von Domaszewski 1967, 44, 55. Durosturum inscription: Speidel and Dimitrova-Milceva 1978, 1551–3. Bergamo tombstone: Franzoni 1987, No. 56.

27. Veg. II,14.

28. City stores: Tac. *Hist.* I,80; Veg. IV,8.

29. Infrastructure: Millar 1982. Late *fabricae*: James 1988.

30. Pride and interest: Pliny *Natural History* XXXIII,152; Tacitus, *Hist.* I,57. Cf. Suetonius *Div. Iul.* 67.

31. Bishop 1987, 111.

32. Mental template: Clarke 1978, 153, Fig. 48. *Mimesis*: Plato, *Republic* X,1.

33. *SHA, Hadr* X,7.

34. Specialists: Coulston 1985, 284–98; 1986, 63, 69.

35. Livy VII,10. Connolly 1991.

36. *Ibid.*, 363.

37. Wahl 1977.

38. *Lancea*: Suetonius, *Dom.* 10.

39. *SHA, Hadr* X,7.

40. E.g. Vetters and Kandler 1990, 83–160; Maxfield and Dobson 1991, 411–54.

41. Oriental influence: Coulston 1985, 239–41, 271–3; 1986, 62–3.

42. Moors: Speidel 1975, 208–11. Javelin: Maurikios, *Strategikon* XII,2,20.

43. 'Thracian' burials: Velkov 1928–29; Mansel 1938; Abdul-Hak 1954–55; Radulescu 1963. Čatalka: Nikolov 1976, 48–50, Figs. 103–9; Bujukliev 1986, 71–4, Pls. 7–12.

44. Coulston 1985, 241–5, 273–8; 1986, 69–70.

45. *Negotiator*: *CIL* XIII,6677. Trade: Kunow 1986; Lønstrup 1986.

46. Sassanids: Herodian III,4,9. Dacians: Dio LXVIII,9,5–6.

Appendix: Was there 'legionary' equipment? (pp. 206–209)

1. Assumptions: Webster 1985, 122–30, 151–5. Column: Coulston 1989.

2. Ulbert 1970, 12; Frere and St Joseph 1974, 40; Maxfield 1986.

3. Auxiliary equipment: Maxfield 1986, 68.

4. *Pilum* and curved shield: Esp. 5835, Germ. 11, Schober 1923, No. 162. Spears and flat shield: Esp. 6125, 6207, Germ.16.

5. *Pilum* and curved shield: Esp. 6254. Mainz: Esp. 5816, 5819, 5822. Adamklissi: Florescu 1965, Inv. Nos. 12, 28, 31, 35, 38, 43. Inserts: Coulston 1988b, 20 n.82.
6. Running infantryman: Esp. 5819. Curved body shields and *pila*: Esp. 5822. Adamklissi: Florescu 1965, Inv. Nos. 12, 28, 31, 35, 38, 43.
7. Tyne: Allason-Jones and Miket 1984, 3.724. Vindonissa: Simonett 1935; Hartmann 1986, Fig. 99.
8. Pliny, *Pan.* 56,5; Tacitus, *Ann.* I,64; II,14; III,46; XII,35; *Hist.* II,42; III,20; IV,29.
9. Tacitus, *Ag.* 35–7. Cf. *Hist.* IV,20.
10. Tacitus, *Ann.* II,52; XII,35; XIII,38; XIV,34, 36–7; *Hist.* III,21–3; Josephus *History of the Jewish Wars* II,512; Veg. II,17; III,14–17. Placentia: Tacitus, *Hist.* II,22; Arrian: *Ek.* 25–31.
11. Veg. II,2.
12. Tacitus, *Hist.* I,38.
13. No representations: Maxfield 1986, 68. Protection: Allason-Jones and Bishop 1988, 102. Blows: Connolly 1991a, 362. Helmets: *ibid.*, 359–60. Weight: Connolly 1981, 231–3.
14. *Pilum*: Ulbert 1970, Pl. 29,483; Ulbert 1959, Pl. 27,1–3; *ORL* B62a, Pl. XII,41; Schönberger 1978, Pl. 18,B21–2. Artillery: Ulbert 1970, Pl. 17,260–6; Ulbert 1959, Pl. 27,4–6; *ORL* B62a, Pl. XII,31–4, 39–40, 42–3, 45; Ulbert 1959, Pl. 53,1–2; Schönberger 1978, Pl. 18,B24–7, B29–49; Maxfield: 1986, 70.
15. Garrisons: Johnson 1983, 19; Webster 1985, 167. Vexillation fortresses: *ibid.*, 175. Tacfarinas: Tacitus, *Ann.* III, 20–1, 74. Cf. Coulston 1988b, 13–5.
16. Coulston 1989.

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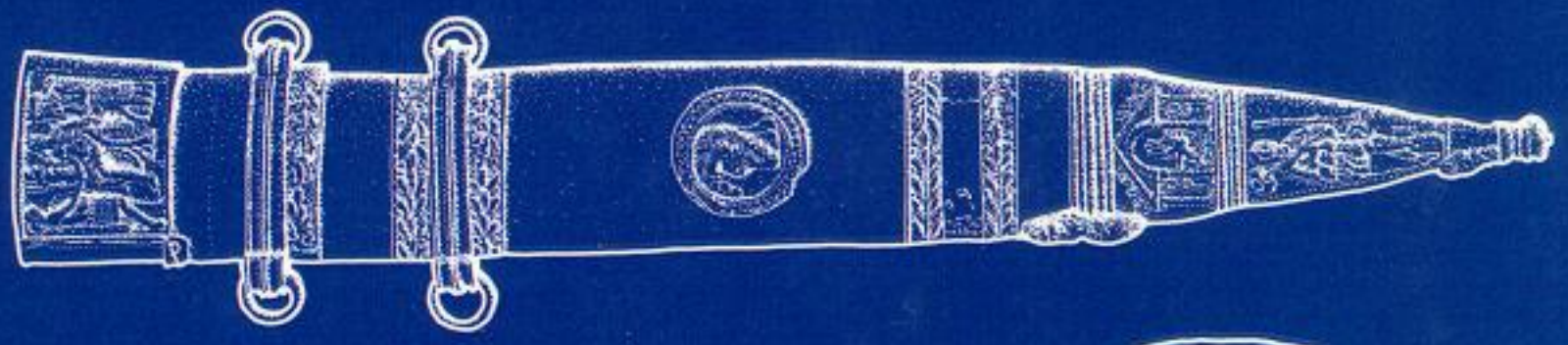
INDEX

Rome's rise to empire is often said to have owed much to the efficiency and military skill of her armies and their technological superiority over barbarian enemies. But just how 'advanced' was Roman military equipment? What were its origins and how did it evolve?

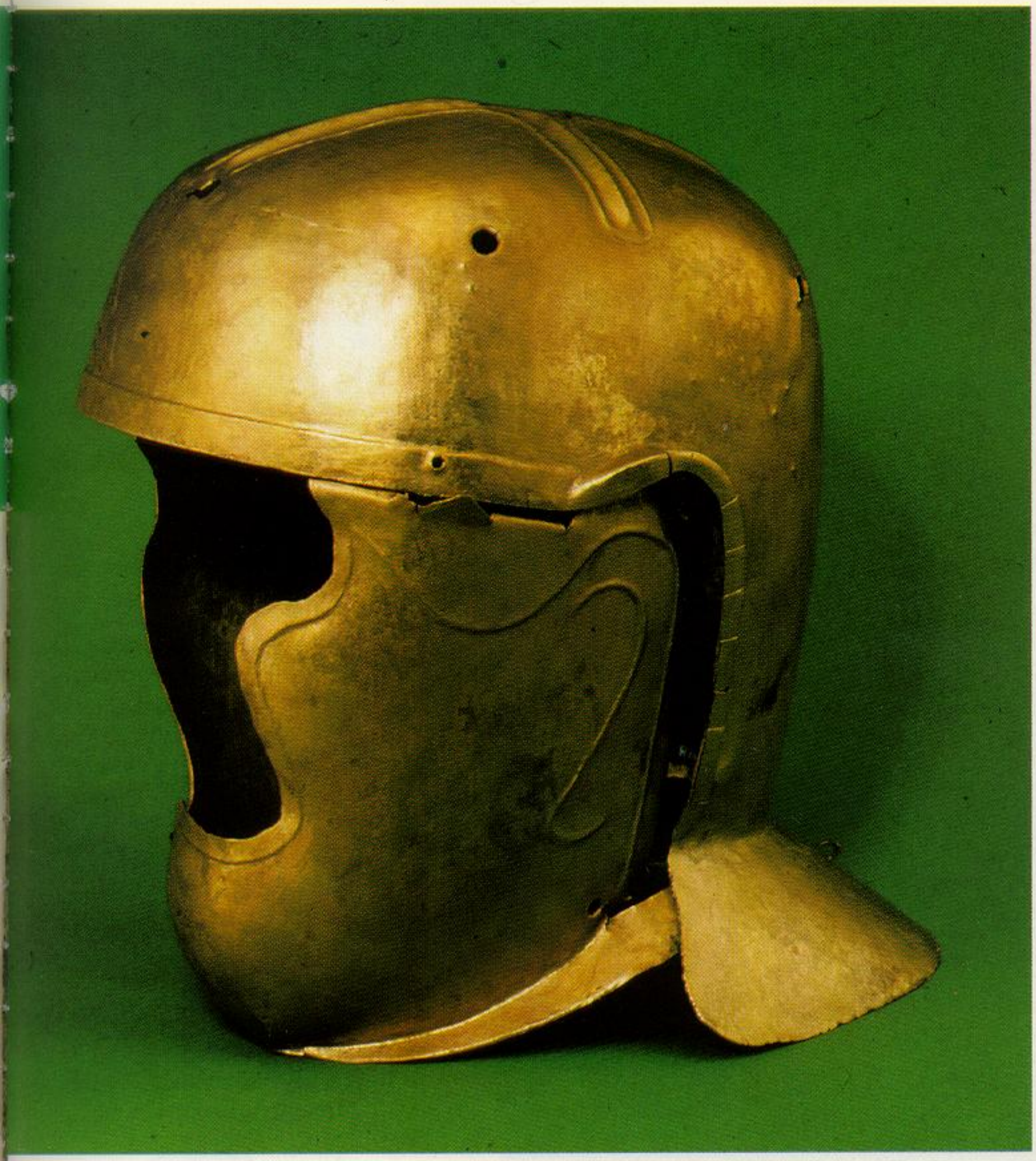
The authors of this book bring together a wealth of evidence from all over the Roman Empire to present a picture of what range of equipment would be available at any given time, what it would look like and how it would function.



1 Oberammergau dagger and sheath, dating to the first half of the first century AD. A fine example of ironwork inlaid with silver, the decoration on this Type A sheath incorporates traditional classical motifs, such as Greek Key, wave crests and the vine leaf. The contrast between the iron and silver would have been very fine, when in pristine condition, and might be thought to show considerable sophistication of taste on the part of the owner. On the reverse of the dagger handguard it bears the name of the man who made it, C. Antonius. (Photo: Prähistorichen Staatssamlung, München)

2 *a* Xanten cavalry helmet, first century AD. An iron cavalry battle helmet with tinned brass sheathing over the bowl. The sheathing imitates human hair adorned with a laureate crown, with the bust of a deity over the brow. The helmet has very pronounced ear-guards, and a cheek-piece similarly sheathed, which cover the entire ear. (Photo: Rheinisches Landesmuseum, Bonn)

b Theilenhofen helmet, late second or early third century AD. A tinned brass cavalry battle helmet with embossed decoration in the form of an eagle crest. Based on the Attic type of helmet, it has large cheek-pieces covering the ear. It bears three punched ownership inscriptions, one of which shows the helmet belonged to Aliquandus, in the *turma* of Nonus, of *cohors III Bracaraugustanorum*. (Photo: Prähistorichen Staatssamlung, München)

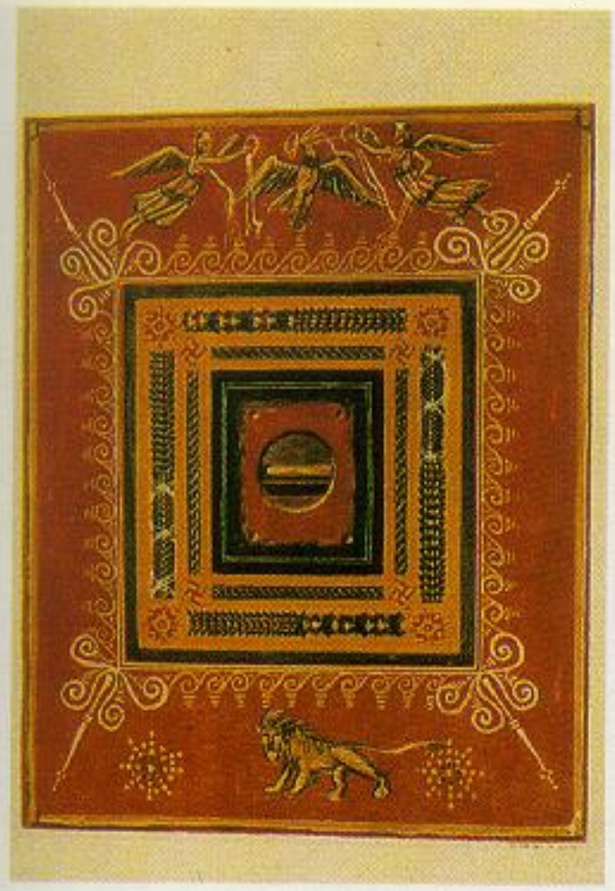


c Buch helmet, third century AD. This *orichalcum* helmet, from Well 9 in the *vicus,* is unfinished, and the angled peak, for which rivet-holes have been cut, may never have been affixed. Bowl cross-pieces are embossed, not applied. The large cheek-pieces cover the wearer's ears and overlap on the chin. (Photo: Landesdenkmalamt Baden-Württemberg)

d Deurne gilded silver helmet sheath (Holland, Rijksmuseum van Oudheden). View from wearer's left. Found with a coin-hoard dating to *c.* AD 319. Gilded silver sheath with a bowl in six pieces, a nasal-guard and 'Berkasovo' type cheek-pieces. (Photo: JCNC)

b Copper alloy medallion (Cabinet des Médailles, Bibliothèque Nationale, Paris), third century AD. Two ranks of soldiers wearing peaked helmets and carrying bossed oval shields are headed by a pair of *vexilla*. They are identified by the standards, inscriptions and badges as forming detachments from the British *legiones II Augusta* and *XX Valeria Victrix*. The date is suggested by the motto *'utere felix'*, the style of animal decoration and the owner's name, Aurelius Cervianus. The latter may have commanded the combined force. (Photo: Bibliothèque Nationale, France)

3 *a* Curved, rectangular shield boss from the river Tyne. Made of tinned brass, it has been decorated with figures of Mars, the four seasons (in each corner) and an eagle clutching an olive branch on the dome. It bears the legend LEG VIII AVG *(legio VIII Augusta,* present in Britain in the second century AD). The legion's emblem, a bull, is visible at the bottom of the flange and there are standards on either side of the dome. There is also a punched ownership inscription on the edge of the flange, reading >IVL MAGNI IVNI DVBITATI ('[belonging to] Junius Dubitatus, of Julius Magnus' century'). (Photo: British Museum)



4 *a* Curved rectangular shield, from Tower 19, Dura-Europos, third century AD. Reconstruction painting of the decorated front. The boss was surrounded by concentric motifs, including laurel garlands. A lion in the lower field may be a legionary badge. It is flanked by stars or sun-bursts which are reminiscent of earlier designs. An eagle in the upper field is crowned by two Victories, presaging some Dominate blazons. (From Rostovtzeff *et al* 1936, painted by Herbert J. Gute)

SHIELD II (pp. 349—363). (PAINTED BY HERBERT J. GUTE)

b Flat oval shield, from the north side of Tower 24, Dura-Europos, third century AD. Reconstruction painting of the decorated front. The boss was encircled by a laurel wreath, and motifs on both this board and Pl. 4a are paralleled by copper alloy boss ornament (Cf. Fig. 106), which depicts combat between Greeks and Amazons *(Amazonomachy)*. (From Rostovtzeff *et al* 1939, painted by Herbert J. Gute)

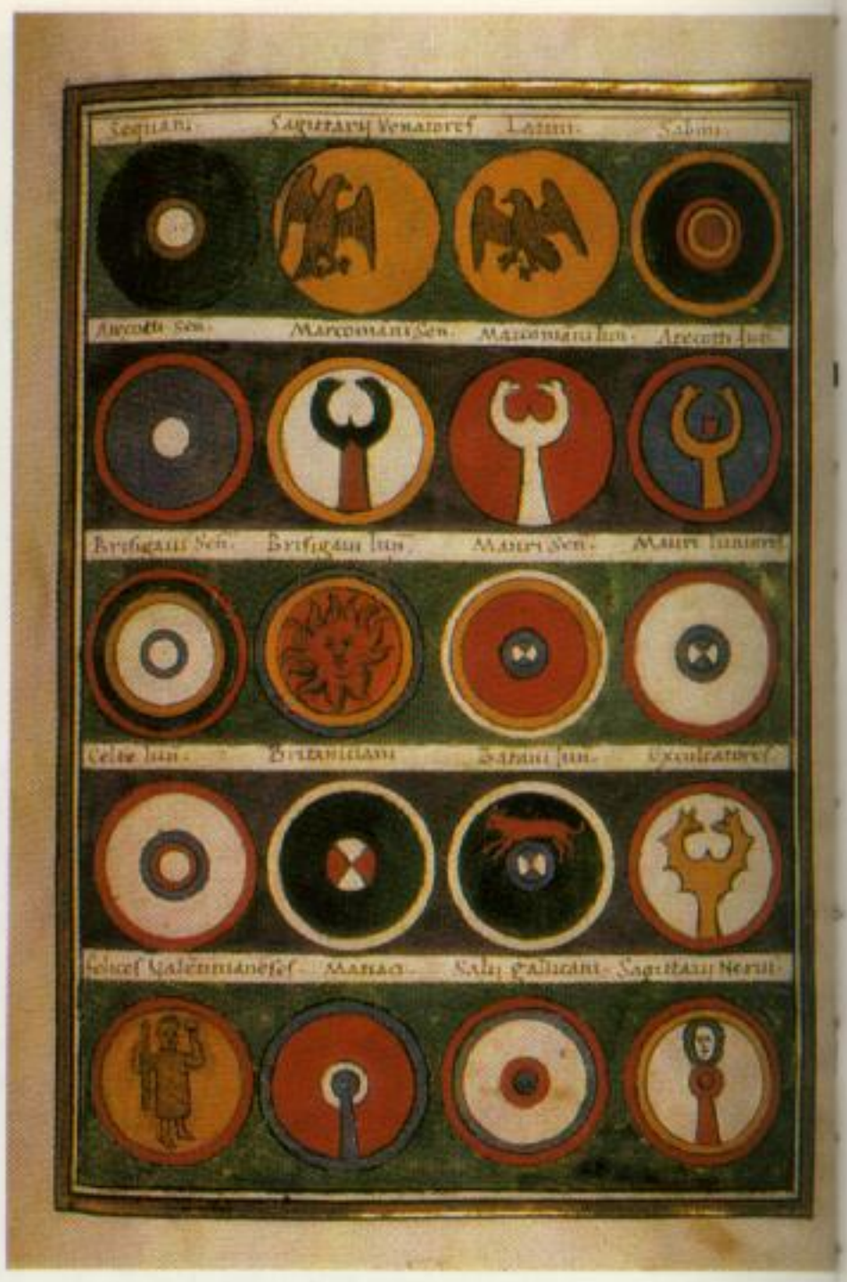
c Rear of Pl. 4b, reconstruction of painted decoration with attached shield-bar. The radiating hearts and rosettes anticipate later blazons. (Painting by Simon James)

5 Trajan's Column, Rome, detail of Scene LXXII. Carrara marble with (lost) metal inserts. It shows citizen troops wearing *'lorica segmentata'*. Shields and cheek-pieces have been scaled down in size so as not to obscure the human subjects. The sculptor has omitted to show the belts, apron and sword, which appear in other scenes. Small armour fittings are also not carved, and the scalloped short sleeves of mail have been mistakenly added below the shoulder plates. The helmets are based on the 'Imperial' types, not stylized 'Attic' forms. These figures demonstrate the mixture of empirical observation, stylization, confusion and lassitude which went into the composition of the frieze. (Photo: JCNC)

6 The Ermine Street Guard. Reconstruction of equipment for Flavian centurion, standard-bearers and legionaries. Display at Corbridge, August 1991. (Photo: JCNC)

7 *a* Painting of a biblical Pharaonic warrior in the guise of a fourth-century AD Roman soldier (Via Latina Catacomb, Rome). He is wearing a wrist-length mail cuirass and a crested helmet, and is equipped with oval shield, long sword and two shafted weapons. (Photo: JCNC)

b Painting of a fourth-century AD soldier (Via Maria Catacomb, Syracuse). He is wearing a gilded(?) and crested 'Ridge' helmet with frontal 'eyes'. This is an exceptionally rare representation of a soldier in a red tunic. (Photo: Roger Wilson)



8 *Notitia Dignitatum* shield blazons *(N.D. Oc.* V, 44-63, *magister peditum praesentalis)* (Bodleian Manuscript). Late fourth to early fifth century AD. The confronting animal heads, imperial figure and eagles find parallels in the representational sources (Cf. Fig. 7), so the *types* of designs were based on contemporary usage. However, there is no certainty that each named regiment carried the particular attributed blazon. (Photo: Bodleian Library)