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STUDIES

# LORICA SEGMENTATA

**Vol. I**

**A Handbook of Articulated Roman  
Plate Armour**

**M.C. Bishop**

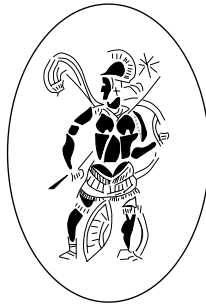
*JRMES* Monograph No.1

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**Volume I: A Handbook of  
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*JRMES* Monograph 1

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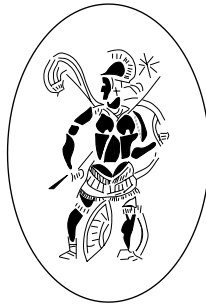
For Peter Connolly,  
who cajoled, inspired, and nagged over many years  
(I hope he thinks it was worth it)

Argiletanas mavis habitare tabernas,  
cum tibi, parve liber, scrinia nostra vacent  
Martialis *Epigrams* I,3



*Lorica Segmentata*  
**Volume I: A Handbook of  
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*JRMES* Monograph 1

THE ARMATVRA PRESS

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# Preface

This monograph is about Roman segmental armour. I have thought about writing it for a number of years (the germ of the idea may even have been sown the day I first marvelled at H. Russell Robinson's momentous *The Armour of Imperial Rome* in 1975), but it is only comparatively recently that (failing to avoid a pun) all the pieces have begun to fall into place: I have seen all the major finds and important new discoveries have been made that have started to cast light into previously shadowy corners.

There will be a second volume, by Dr M.D. Thomas, which will include detailed lists and illustrations of the published archaeological finds of *lorica segmentata* and it is very much a companion to the present volume, although each may be used independently of the other. For this reason, bibliographic references are given for finds mentioned in the text in case the reader does not have Volume 2 to hand. In drawing artefacts, I have attempted to depict fittings at 1:1 (since they are so rarely shown at full size in older archaeological reports) and larger sections of plates at 1:2 for the sake of consistency and to allow comparison.

A companion website ([www.loricasegmentata.org](http://www.loricasegmentata.org)) provides additional material, including animations, 3D digital models, and full-size patterns, which is beyond the limited capabilities of the present cellulose-based medium. Likewise, whilst colour printing is expensive, colour images on the web are not, so more colour illustrations can be found on the website.

This book is by no means the last word on *lorica segmentata*: in fact, it could equally be taken as a statement of how little we know about the subject, as it could how much we have found out. Thus it is perhaps both an attempt at an overview of how far we have come since the publication of Robinson's book more than 25 years ago, and a perspective on how much further we still have to go.

Lastly, whilst many see writing a book as an end in itself, there is something special (perhaps even self-indulgent) in writing, illustrating, designing, and publishing a volume on a subject close to one's heart. It is perhaps fitting that my interest in publication design was first tweaked by *The Armour of Imperial Rome*. Here, then, is a book about *lorica segmentata*.

*M.C. Bishop*  
*Chirnside April 2002*

# Acknowledgements

A work of this nature inevitably draws upon the kindnesses of many people in its preparation, and thinking of – and thanking – these provides a special sort of satisfaction to the writer.

Lindsay Allason-Jones and I spent much time discussing the Corbridge material whilst preparing our monograph on the Hoard and it goes without saying that I am highly appreciative of her contributions to our joint work. She and Georgina Plowright always allowed me generous access to the material from the Hoard held in the Museum of Antiquities at Newcastle upon Tyne and at Corbridge Roman site museum. The late Charles Daniels provided reminiscences, photographs, sketches, and even the original cardboard mockups used by him and Russell Robinson in the reconstruction process.

At the National Museums of Scotland, Fraser Hunter has been most helpful with access to, and information about, the Newstead cuirass and armguard fragments, whilst the enthusiasm of Walter Elliot, Donald Gordon, and all the other members of the Trimontium Trust reminds me why it is so much fun to delve into the nooks and crannies of the Roman army's toy cupboard.

Jenny Hall of the Museum of London allowed me to examine the Bank of England breastplate (and has arranged for me to see every piece of military equipment known from Roman London... but that is another story), whilst the late Martin Howe of Peterborough City Museum enabled me to study the Longthorpe armour fragments at my leisure. Dan Robinson of the Grosvenor Museum in Chester helped untangle the history of the Chester legionary model and Chester City Council Grosvenor Museum were good enough to permit me to reproduce an image of that same soldier figure.

Mrs Margaret Robinson kindly gave me permission to use some of her late husband's illustrations, and both she and Miriam Daniels were kind enough to allow me to use the photographs of the early attempt at reconstruction of the Corbridge type cuirass.

Prof Thomas Fischer first told me about, and sent photographs of, the Eining cuirass, whilst Dr Christof Flügel, and later Dr Bernd Steidl, of the Archäologische Staatssammlung (formerly the Prähistorische Staatssammlung) at München permitted me full access to it and generously provided further photographs. Dr Egon Schallmayer similarly made it possible for me to study the Zugmantel fragments and this and the München expedition were generously funded by the Gunning Jubilee Gift of the Society of Antiquaries of Scotland.

I am particularly grateful to Dr Ernst Künzl and Sebastian Keil of the Römisch-Germanisch Zentralmuseum Mainz for the opportunity to examine the Stillfried cuirass fragments whilst they were being conserved.

In Osnabrück, Dr Günther Moosbauer was most helpful in arranging for me to see the Kalkriese *segmentata* pieces and Dr Wolfgang Schlüter very kindly allowed access to the material outside normal museum hours.

Many re-enactors have also helped me during my studies of *lorica segmentata*. To those – like Matthew Amt and Sean Richards, Dan Peterson, and the indomitable Chris Haines – who have provided detailed accounts of their experiences working with and using replica armour, down to the humble foot soldiers (the PBI) who have patiently (often bemusedly) posed to allow me to photograph details, I must say a hearty 'thank you'. Michael Simkins kindly allowed me

to use his photograph of his reconstruction of the Arlon mail cuirass with segmental shoulderguards and provided details of the evidence and techniques he used for it.

Mike Thomas has been a constant source of inspiration, fascinating facts, and obscure references (which I have always tried to counter with my own, equally obscure). Thom Richardson of the Royal Armouries at Leeds has participated in extremely useful discussions on the recent Carlisle find and helped me with details relating to this important discovery and provided invaluable advice on medieval armour, as well as a deeply instructive tour of the Royal Armouries in Leeds; he has also been good enough to read through a preliminary draft of the text. I owe a debt of thanks to Thom and to the Royal Armouries for permission to reproduce Fig.8.3 from the *Royal Armouries Yearbook* 6 (2001). I am also grateful to Mike McCarthy, formerly of Carlisle Archaeology, for drawing the Carlisle material to my attention and allowing me to examine it.

My friend and colleague Dr Jon Coulston has invested much time and effort enduring my interrogations on the subject of the iconographic evidence, especially Trajan's Column (about which he has an unparalleled knowledge), contributed generously from his vast photographic archive, and provided a particularly noteworthy discussion on the origins of segmental armour whilst driving through northern Germany. He too has, for his sins, read (and commented widely upon!) a preliminary draft of this book.

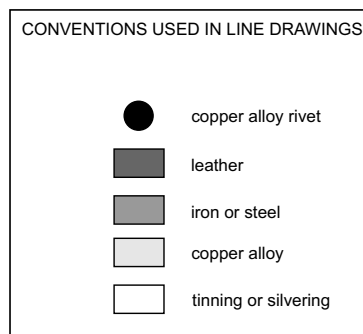
A special debt of thanks is owed to Peter Connolly. Not only has he been a persistent driving force behind this monograph and allowed me to use some of his illustrations, but he has frequently provided invaluable information about his friend Russell Robinson's involvement in the understanding and reconstruction of *lorica segmentata*. Most importantly, he has been an unwitting inspiration: there is no more eloquent an advocate of the importance of Robinson's work.

Finally, my wife Martha Andrews and my children, Oliver and Christabel, have shown great patience in living, breathing, and tripping over *Lorica Segmentata* for far too long. For some reason which defies logic, Martha nevertheless also read the final draft of the book for me.

I apologise to any I have overlooked and caution, as I always do, that whilst all of the above have helped me in the preparation of this volume, I must accept sole responsibility for all horrors, howlers, and ill-conceived notions that may lurk within. You have been warned.

## Note

Sites from many countries are discussed in the text and, in order to avoid constant repetition, information about the country of origin of any given site is given in the index entry as an ISO 3166 abbreviation.



# Chapter 1: Introduction

## NAMING THE PARTS

Few images are more redolent of Roman military might than the sight of legionary troops clad in body armour made of strips of mild steel plate. Known nowadays by the term *lorica segmentata*,<sup>1</sup> the name – which is not Roman in origin – seems first to have been used at the end of the 16th century, when scholarly interest in Roman arms and equipment began to make its way into print. Since academic works at that time tended to be written in Latin, the lingua franca of European scholars, the term was invented by writers to describe this unusual type of armour. It can be seen being used by a native of the Netherlands, Just Lips (better known by the Latinised form of his name, Justus Lipsius) in his 1596 work *de Militia Romana* in a way that implied that the term had been in use for some time (there is no indication that Lipsius actually invented it).<sup>2</sup>

The Roman name for this type of armour is not known. *Lorica* ('body armour' or 'cuirass') is obvious, but the qualifying epithet has not survived.<sup>3</sup> A reasoned guess has been made at *lorica lam(m)inata*,<sup>4</sup> based on the use of *lamina* to describe a sheet of metal. There is at least one instance of the use of the word *lam(i)nae* in a military context, in Berlin papyrus inv. 6765 (which appears to be a report from a legionary *fabrica*, probably that of *legio II Traiana Fortis*).<sup>5</sup> In that, we find reference to *lam(i)nae levisatares*, possibly to be interpreted as 'light plates'. Unfortunately, there is no reason why this term needs to be associated with the segmental cuirass in this particular context.

Tacitus, when describing the armour worn by Sarmatian horsemen of the Rhoxolani, invading the Roman empire along the Danube frontier in AD 68, talks of them being '*tegimen ferreis laminis aut praeduro corio consertum*',<sup>6</sup> or 'completely covered with iron plates or toughened leather' (see below, Chapter 3). In a familiar rhetorical device, Tacitus sought to contrast their unwieldy armour with the much more flexible cuirasses of the Romans. Again, when describing the gladiators called *crupellarii* who, completely encased in iron,<sup>7</sup> participated in the revolt of Florus and Sacrovir in AD 21, he says they were equipped with '*restantibus lamminis adversum pila et gladios*'.<sup>8</sup> In the end, little reliance can be placed upon so fickle a writer as Tacitus and there is no guarantee that, when he talks of *laminae*, he might not in fact have meant scale armour. Indeed, in his *Origines*, the 6th century lexicographer, Isidore of Seville, defines scale armour using precisely this word: '*squama est lorica ferrea ex laminis ferreis aut aeneis concatenata*'.<sup>9</sup> More-

over, Tacitus' account, whether rightly or wrongly, inevitably brings to mind the images of scale-clad Sarmatian cavalry depicted on Scenes XXXI and XXXVII of Trajan's Column<sup>10</sup>. Nevertheless, the segmental armour depicted on the pedestal reliefs of Trajan's Column might be captured Dacian equipment, possibly even Sarmatian (see below, Chapter 3), in which case Tacitus' account would gain a little more plausibility.<sup>11</sup>

Inevitably, it has to be conceded that there is insufficient evidence to allow any firm conclusion on the original Roman name for this type of armour to be reached. It is not beyond the bounds of possibility that discoveries of new sub-literary texts, like the writing tablets from *Vindolanda* or Carlisle (England),<sup>12</sup> may eventually provide more information, but until such time arrives, we are forced to retain the Renaissance coinage of *lorica segmentata*.

A final pedantic question concerns the best way to commit the phrase to print. Since *lorica hamata* and *lorica squamata* are genuine Latin terms that were in ancient use, it is tempting to mark the early modern formulation of '*lorica segmentata*' thus with quotation marks.<sup>13</sup> An alternative approach might be to write of *lorica segmentata*, marking its difference (and its lack of ancient authenticity) by *not* italicising it. In the end, however, too many quotation marks become obtrusive on the printed page and editorial niceties of this nature seem unimportant beside the bigger questions tackled here. So it remains *lorica segmentata* with the proviso that the reader is aware of the problems attached to the name.

## WHAT IS LORICA SEGMENTATA?

The type of armour that has become known as *lorica segmentata* was an articulated cuirass – in other words, its component parts moved in relation to each other to allow greater flexibility than was possible with a rigid form of body armour (such as a muscled cuirass). In fact, most of the body armour used by the Roman army was articulated to some extent, insofar as the majority of cuirasses were of mail, scale, or segmental armour.

Also known in recent times as laminated or segmental armour, *lorica segmentata* was modular and consisted of four principal elements or units: one for each shoulder, and one for each side of the torso. Each of these four sections was made of overlapping curved strips of ferrous plate riveted to leather straps (known

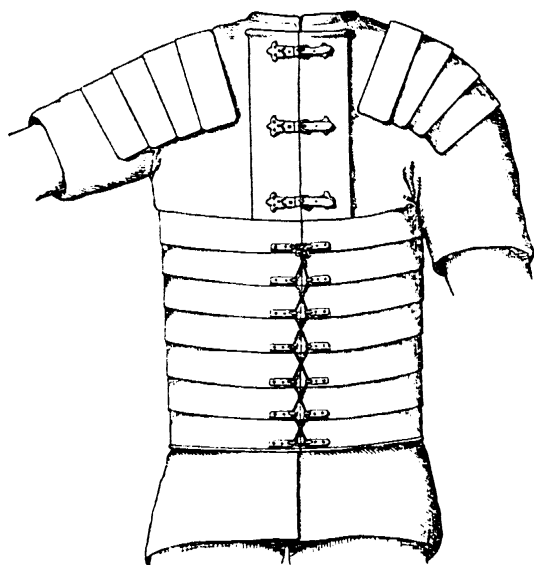


Fig.1.1 Von Groller's reconstruction of lorica segmentata based on Trajan's Column

as 'leathers'), permitting a considerable amount of movement between neighbouring plates (Plate 3). The same technology, although in a less complex form, was used for ancient articulated limb armour and re-invented in the medieval period.

## PAST WORK

It was not until the end of the 19th/beginning of the 20th century that scholars made any serious attempt to understand segmental armour, fuelled by the new archaeological studies of the second half of the 19th century. A first wave of finds (*Carnuntum*, Newstead, Zugmantel, and Eining) did not lead to the immediate solution of the problem and it took more than half a century and the discovery of the Corbridge Hoard (England) for a better understanding of *lorica segmentata* to develop, independent of the somewhat unsatisfactory iconographic record. As knowledge of this type of armour has improved, so its accepted earliest use has been pushed ever earlier in the imperial period.

## Oberst Max von Groller-Mildensee

Von Groller was one of the leading excavators of the legionary base of *Carnuntum* at Bad Deutsch-Altenburg (Austria). In the summer of 1899, he was directing the excavation of a building behind the west rampart. This structure (Building VI), which became known as the *Waffenmagazin*, contained a sizeable deposit of weaponry, apparently originally stored on shelving, divided by type over several partially subterranean rooms.<sup>14</sup>

Amongst this material (excavated 1899, published 1901),<sup>15</sup> von Groller was able to recognise 302 fragments of segmental armour and a small amount of this was duly illustrated in the publication, together with his thoughts on the likely reconstruction of this type of armour.<sup>16</sup> It is not now possible to know the condition of the material he found, but it seems likely that it was not as well-preserved as the later Corbridge Hoard, since von Groller went on to make some crucial mistakes that would not be put right until the Corbridge find was analysed.

Interpreting the *Carnuntum* finds in the light of reliefs showing segmental body armour on Trajan's Column (see below, Chapter 2),<sup>17</sup> von Groller decided the armour must have been articulated on a short-sleeved leather garment (Fig.1.1). It is therefore clear that he recognised that the cuirass was articulated on leather, but mistook the remains of the internal straps (or 'leathers') for fragments of a garment. In doing so, it is unlikely that he was influenced by the design of medieval coats of plates (and *lorica segmentata* in fact more closely resembles later medieval plate armour).<sup>18</sup> He also used the Column as a guide for selecting the positions of the various fittings that were attached to the cuirass. In both cases he was making assumptions about the accuracy of the Column that would not now find much support, although contemporary scholarship gave him little reason to doubt the interpretation.

Von Groller's use of Trajan's Column to interpret the *Carnuntum* find in this way was to influence Roman armour studies for many years to come, and even H. Russell Robinson's early attempts to understand segmental armour (see below) were to be affected by this particular methodology.

Could the *Carnuntum* material have allowed von Groller to pre-empt Robinson in reconstructing segmental body armour? It seems doubtful: the limited evidence we have suggests the find was not in as good a condition as the Corbridge material (see below, Appendix A) and, crucially, he was no expert on medieval armour (whilst Robinson was). Moreover, his reliance upon the reliefs of Trajan's Column – a flawed source, as we shall see – ensured that he would not succeed. Thus the misinterpretation of the *Waffenmagazin* armour was probably inevitable. Its significance, in terms of the transition from the Corbridge to Newstead types, went unnoticed.

## James Curle

Curle was the polymathic excavator of the fort at Newstead (Scotland), where work was undertaken soon after that of von Groller, whose excavations in the *Waffenmagazin* were well known. Curle's discovery of the remains of a significant portion of a



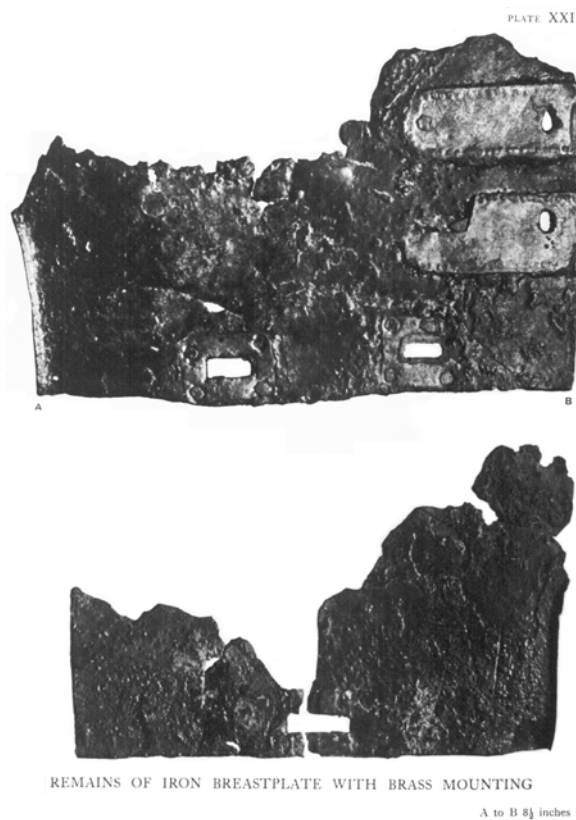


Fig.1.2 Curle's orientation of the largest Newstead lorica segmentata plates. Photo courtesy NMS

segmental cuirass in a well in the headquarters building at Newstead (excavated 1905, published 1911) was certainly important.<sup>19</sup> However, his interpretation was inevitably based on von Groller's flawed reconstruction of the *Carnuntum* material.

So it was that Curle viewed what are now recognised as the back- and breastplates of a cuirass as having fitted at right-angles to their true position. He thought the rectangular slots belonged on the lower edge and served for attaching the girth hoops by means of straps,<sup>20</sup> and he duly published the main pieces in that orientation (Fig.1.2).

With the benefit of hindsight, it is easy to forget that nobody was then aware that there might be various types of segmental armour. It was not until Robinson had begun to understand the armour in the Corbridge Hoard that he was able to see that a separate Newstead type had existed.

As with von Groller, none of this can be viewed as having been the fault of Curle – the evidence available was just too flimsy to allow any interpretation other than that proposed by von Groller.

Curle was also fortunate enough to excavate fragments of a segmental armguard, although he failed to understand the significance of the find, or compare it with the examples von Groller had noted from the

*Waffenmagazin*. He thought it was a type of scale armour, noting that the curvature of its plates may have fitted the shoulders and arms.<sup>21</sup>

### Couissin

In his *Les Armes Romaines* (published 1926), Paul Couissin interpreted the segmental cuirass purely from the monumental evidence<sup>22</sup> and went on to suggest its evolution in exactly the same way.<sup>23</sup> Although he was aware of the material excavated at *Carnuntum* by von Groller, he merely saw this as confirming his views. His approach typified the uncritical acceptance of metropolitan propaganda sculpture that is still occasionally found today, despite Robinson's warnings about its reliability.<sup>24</sup>

### Alfs

Alfs' paper on the use of articulated cuirasses in the Roman army (published 1941)<sup>25</sup> might arguably be regarded as a low point in 20th century studies of *lorica segmentata*. Dealing with the other forms of armour used by the army, his section on segmental armour – like Couissin before him – laid heavy emphasis on the iconographic evidence at the expense of archaeology, even to the extent that he tried to interpret the fittings and fastenings used from Trajan's Column (Fig.1.3), with little more than passing reference to the excavated examples from *Carnuntum*, *Zugmantel*, and *Newstead*.<sup>26</sup> The extent of his preference for the iconographic evidence is even apparent from the crude measure of size: nine-and-a-half pages on sculpture, compared to just one page on the archaeological material.

Rather bizarrely, Alfs had brought the pre-eminence of the Column in segmental armour studies to a point where it was virtually possible to discard the hard archaeological evidence in favour of what, by any measure, was a very subjective medium.

### Graham Webster

After a long sterile period, when little new was published on the subject of *lorica segmentata* after Alfs' paper, an important article by Graham Webster<sup>27</sup> about a breastplate in the then Guildhall Museum in London, found on the site of the Bank of England (excavated 1936, published 1960), was the first step in remedying the situation.

This work inspired a new wave of scholarship that was ultimately to lead to the solution of the riddle of segmental body armour.

Webster followed von Groller and interpreted the London piece as having lain horizontally at the back of

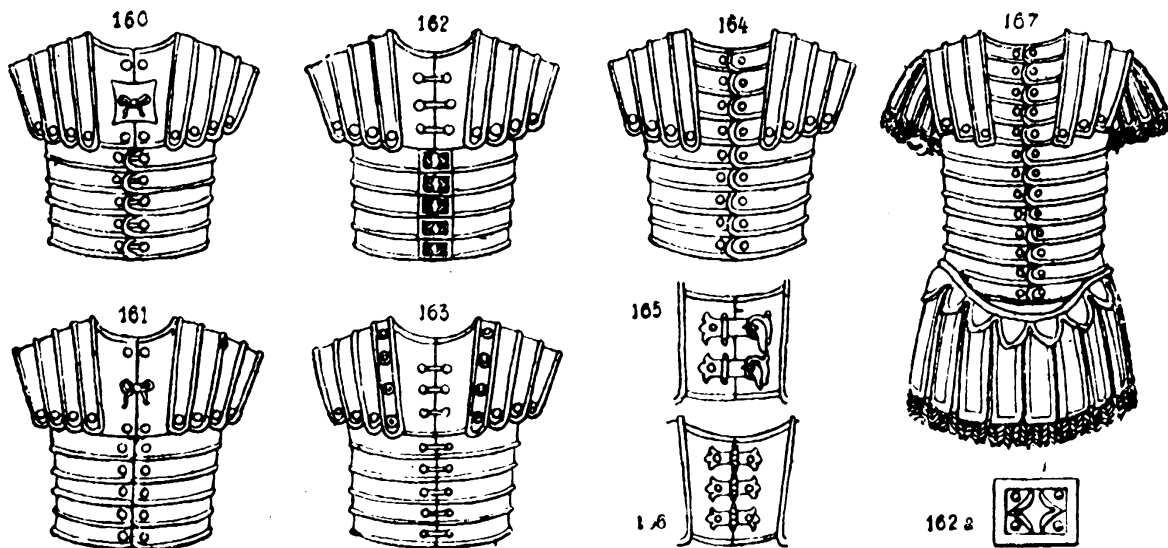


Fig. 1.3 Couissin's diagram illustrating the types of fittings shown on Trajan's Column

the cuirass. However, significantly, he admitted that less emphasis needed to be put on Trajan's Column and more on the archaeological finds.

### H. Russell Robinson

Robinson is first mentioned in connection with Roman segmental armour in an acknowledgement in Webster's publication of the Bank of England plate,<sup>28</sup> but by then the former had been working on it for a while. His association with Webster led him on to producing the reconstruction soldier (complete with *lorica segmentata*) for the new Newstead Gallery<sup>29</sup> of the Grosvenor Museum in Chester (where Graham Webster was curator from 1949) (Fig. 1.5). This was opened in 1953 and the reconstruction utilised the Newstead backplate as a model for the breastplates (albeit in the correct orientation, unlike Curle). The shoulderguards were still influenced by Trajan's Column (complete with rivets near their rounded ends) and the girth hoops were fastened by buckles. A slightly modified version of this reconstruction of the cuirass was illustrated in the first edition of Graham Webster's seminal *Roman Imperial Army*<sup>30</sup> as a line drawing by Robinson (Fig. 1.4).

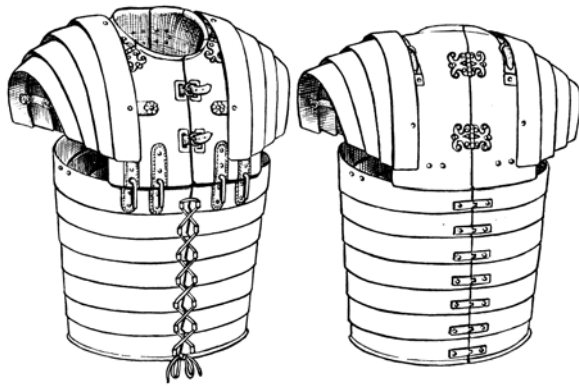
There was one important difference between Robinson and the scholars who had preceded him: instead of being a historian or an archaeologist, he was a practising armourer and a specialist in both western and oriental traditions, both of which made widespread use of articulated defences. He became involved with the armour from the Corbridge Hoard (excavated 1964, reconstructions published in 1972–5 and the artefacts in 1988) in June 1967, some three years after its discovery.<sup>31</sup> Various problems had delayed progress

in conserving this unusual find, but as new details became clear to Charles Daniels, he shared them with Robinson. The first attempt at reconstructing a cuirass using the Corbridge discoveries was still heavily influenced by the Grosvenor Museum model (Fig. 1.5), but as the new evidence reached him (in the form of sketches and cardboard mock-ups supplied by Daniels), the now-familiar reconstruction began to take shape.<sup>32</sup>

The completeness of the pieces in the Hoard allowed Robinson to reconstruct three variants on the cuirass, the Types A, B, and C. The replica Type A, now on display at the Museum of Antiquities in Newcastle upon Tyne (Fig. 1.6) in fact re-used many of the components from his first attempt at a reconstruction of the Corbridge type of armour.<sup>33</sup> Many of the superseded original rivet holes can still be seen.

Robinson's successful reconstruction of the Corbridge armour in time for the 1969 Roman Frontiers Congress saw an exhibition of his replicas in both Cardiff and, later, Newcastle.<sup>34</sup> Moreover, his new-found understanding of Roman segmental armour enabled him to move on to re-examine the Newstead armour and even attempt a reconstruction of segmental limb armour from the same site.

The significance of his study of the Newstead armour was that he realised that it was a different type to those found in the Corbridge Hoard. He deduced that, despite missing many diagnostic pieces, the Newstead type may have been simpler in form to its predecessors, going so far as to venture the notion that the tripartite upper shoulderguards were replaced by a single plate and that the breast-, mid-collar-, and backplates were riveted together, rather than joined by lobate hinges as was the case with the Corbridge types.<sup>35</sup> Robinson



*Fig.1.4 Illustration by H. Russell Robinson for Graham Webster's Roman Imperial Army of a pre-Corbridge Hoard attempt at reconstructing lorica segmentata.*



*Fig.1.6 Robinson's first reconstruction of a Corbridge Type A cuirass, now in the Museum of Antiquities, Newcastle upon Tyne. Photos H.R. Robinson*



*Fig.1.5 The Chester legionary, equipped by Robinson (cf. Fig.1.4). Photo Chester City Council – Grosvenor Museum*

started, but never completed, a replica of this 'new' type of armour and his premature death in 1978 meant that it was left to others to attempt, using Peter Connolly's reconstruction drawing.

Finally, Robinson looked at the fragments of laminated limb armour which had somewhat baffled Curle, and produced a reconstruction of the piece as a *cuisse* or thigh-guard.<sup>36</sup>

### **Andrew Poulter**

At the third Roman Military Equipment Seminar, held in Newcastle upon Tyne in 1987, Andrew Poulter gave details of a revised reconstruction of Robinson's 'Newstead' form of the segmental cuirass. A number of significant problems had struck him and, with the help of Jim Turner (an experienced craftsman), he presented the revised version



*Fig.1.7 Turner's revised reconstruction of the Newstead-type cuirass. Photo J.C.N. Coulston*

(Fig.1.7). Poulter was unhappy with Robinson's suggested method for fastening the breast- and backplates and preferred a simple strap and buckle, ironically reverting to the method Robinson had used on that early Grosvenor Museum model.<sup>37</sup> He also felt that the neck opening would have been bound in copper alloy, based on a new interpretation of the small holes near the top of the breast- and backplates.<sup>38</sup> Poulter's final contribution to the study of the Newstead cuirass was to note that, rather than being Trajanic, as Robinson had thought, that it was more likely to belong to the Antonine period.<sup>39</sup>

## THE FUTURE

Even now, our understanding of Roman segmental armour is far from perfect and new finds, such as those from Carlisle (England)<sup>40</sup> and Stillfried (Austria)<sup>41</sup>, continue to shed fresh light on the

subject. Only the Corbridge type has been recovered in sufficient diagnostic amounts to enable any real confidence in its reconstruction. Knowledge of the other main types – the Kalkriese, the Newstead, and the Alba Iulia – is essentially derived from composites of fragments from a wide range of sites or, in the case of the last, exceptionally based upon iconographic evidence alone. Moreover, there exists the very real possibility of other as yet unrecognised variants coming to light in the next few years.

In all future work, Robinson's crucial interpretation of the Corbridge Hoard cuirasses will remain pivotal. However, it must be remembered that he inherited nearly three-quarters of a century of archaeological scholarship of varying quality. Just because much of it was wrong does not make it any less important to the process of understanding *lorica segmentata*, but it does highlight the importance of interdisciplinary cooperation.

## NOTES

- 1 Literally 'Body armour (or cuirass) in pieces'.
- 2 'Cum segmenta ferrea, tamquam fasciae aliae aliis superpositae, corpus ambiunt. Nusquam legi, fateor: sed in columna Traiani assiduam et paene unicum in romano milite hoc genus' with a marginal heading 'lorica segmentata' – LIPSIUS, 1630, 132 (Liber III Dialog. vi). Interestingly, Lipsius assumed the cuirass was made of iron. The term is not used in the literary-based account of Roman feats of arms by his contemporary, Alberico Gentilis (where the subject of military equipment is rather comprehensively ignored: GENTILIS, 1596).
- 3 *Lorica hamata* (mail) and *lorica squamata* (scale) have both come down to us from more than one source (Isidore *Etym.*, XVIII,13); not so, alas, the term for segmental armour.
- 4 SIMKINS, 1990.
- 5 *P. Berlin* inv.6765: BRUCKNER & MARICHAL, 1979, 409.
- 6 *Hist.* I,79.
- 7 'Continuum ferri tegimen': *Ann.* III,43.
- 8 'Plates resistant against *pila* and swords': III,46. Picard attempted to identify the *crupellarius* with a particular statuette of a gladiator equipped with what appears to be segmental armour (PICARD, 1980). For military equipment terminology in Tacitus' writings see COULSTON, forthcoming a.
- 9 *Orig.* XVIII,13,2.
- 10 CICHORIUS, 1896–1900, Tafn. XXII–III and XXVII–VIII. See COULSTON, forthcoming a.
- 11 It is generally thought that Tacitus was publishing the *Histories* in the first decade of the 2nd century AD (WELLESLEY, 1972, 9; MARTIN, 1981, 30), after the conclusion of the Second Dacian War and only a few years before the dedication of Trajan's Column (LEPPER & FRERE, 1988, 15). It is thus possible that Tacitus was describing contemporary captured equipment, rather than armour of the time of which he was writing (COULSTON, forthcoming a).
- 12 Cf. BOWMAN & THOMAS, 1983 and 1994 for Vindolanda; TOMLIN, 1998 for Carlisle.
- 13 And this is an approach that the present author has until now adopted (e.g. BISHOP, 1999b).
- 14 VON GROLLER, 1901, 39–44.
- 15 Most of which is unlocated at the time of writing.
- 16 VON GROLLER, 1901, 95–113.
- 17 VON GROLLER, 1901, 98.
- 18 For coats of plates, see THORDEMAN, 1939–40, 210–25, 322–8, 345–92; EDGE & PADDOCK, 1988, 73–4. Von Groller may have been familiar with the concept of coats of plates, although no mention of this type of armour appears in his text. It is also worth noting that coats of plates had the plates fixed inside the fabric backing, not outside as with von Groller's proposed reconstruction.
- 19 CURLE, 1911, 156–8.
- 20 *Ibid.* 158.
- 21 *Ibid.* 159, Pl.XXIII.
- 22 COUISSIN, 1926, 452–6.
- 23 *Ibid.*, 456–8.
- 24 ROBINSON, 1975, 182–4.
- 25 ALFS, 1941.
- 26 ALFS, 1941, 121–2
- 27 WEBSTER, 1960.
- 28 WEBSTER, 1960, 197 n.1.
- 29 Named after Robert Newstead, the Chester archaeologist (LLOYD-MORGAN, 1987), not the Scottish site.
- 30 WEBSTER, 1969, Figs.15–16.
- 31 Daniels in ALLASON-JONES & BISHOP, 1988, 97.
- 32 These patterns and sketches are now preserved in the archive at Corbridge Roman Site museum.
- 33 His replicas of the types B and C cuirasses are now on display in the Römisch-Germanisches Zentralmuseum Mainz and the Legionary Museum at Caerleon respectively. Intriguingly, his reconstruction of the C variant

- features tie rings of the type found at *Carnuntum* (and now recognised to be part of the Newstead system of fastening girth hoops – see below, p.51), even though no tie rings were found in the Corbridge Hoard.
- 34 ANON, 1969. The new reconstruction marks one of the key differences between the 1969 and 1972 editions of *The Sunday Times* Roman army wallchart.
- 35 I am grateful to Dr Coulston for pointing out that Robinson’s interpretation of simplification in Roman segmental cuirass design may owe much to his knowledge of the simplification of Japanese lamellar armour during the 15th century AD (cf. ROBINSON, 1967, 190–1).
- 36 This reconstruction is now held by the National Museums of Scotland in Edinburgh.
- 37 POULTER 1988, 37.
- 38 Which, in his scheme, were no longer needed for fastening: *ibid.* 35–6.
- 39 *Ibid.* 39–42.
- 40 McCARTHY *et al.* 2001.
- 41 EIBNER 2000.

## Chapter 2: The Evidence

The strands of evidence that allow us to study segmental armour are comparatively limited and have to be used with great caution. Each has its own problems, which will be briefly covered below, but overall they allow a reasonably comprehensive view of the form and manner of use of *lorica segmentata* to be built up.

### ICONOGRAPHIC

Representational evidence for *lorica segmentata* is not abundant and what does exist is not very reliable, by and large. Part of the problem lies in the heavy reliance that has to be placed upon metropolitan propaganda monuments, given the absence of relevant provincial funerary reliefs. Indeed, following it too closely was to prove one of the most common pitfalls in early attempts at reconstruction.

*Lorica segmentata* has become synonymous with Roman legionary troops largely thanks to one particular iconographic source: Trajan's Column. Erected as part of the Forum of Trajan complex in *c.* AD 106–13<sup>1</sup> to commemorate his two Dacian Wars, the spiral relief on the column uses segmental body armour as shorthand to represent citizen troops (both legionaries and praetorians). Some 608 figures are represented wearing this type of defence, 42.5% of the armoured Roman soldiers depicted on the relief (Fig.2.1).<sup>2</sup>

The Column sculptors showed some of the armour in considerable detail, notably depicting fittings on the armour. Plates were typically represented with some sort of border, the shoulderguards having a circular stud at each of their rounded ends (a feature imitated on the Chester soldier: Fig.1.5). It is particularly noteworthy that they made a distinction between girth hoops and breastplates, something later sculptors failed to do, and attempted to provide some indication (albeit wildly inconsistent) of the fittings so familiar from this type of cuirass. These representations were thought sufficiently accurate by Couissin for him to note the variants in his consideration of the armour (Fig.1.3).<sup>3</sup> However, the Column is deceptive and its attention to detail should not be mistaken for accuracy: mistakes like segmental plates sculpted to resemble the texture of mail should counsel caution against investing too much trust in it, and it is probably safest to interpret the Column reliefs as 'impressions', rather than accurate representations, of the sort of segmental armour the sculptors would have seen in Rome.<sup>4</sup>

More or less contemporary with Trajan's Column, and surviving in fragments (often incorporated in later monuments), the so-called Great Trajanic Frieze presents a different, but recognisable image of segmental armour (Fig.2.2), in the same tradition as the images on the Column. However, the cuirass is typically over-simplified: no distinction is made between girth hoops and breastplates, with horizontal bands shown all the way up to the neckline.<sup>5</sup>

The reliefs on the column of Marcus Aurelius (Fig.2.3), erected at some point in the 2nd century AD, are heavily influenced by Trajan's Column and, consequently, greatly simplified in applied detail and of even less use in the study of segmental body armour.<sup>6</sup> The pedestal reliefs of the Column of Antoninus Pius depict *segmentata* rather simplistically (Fig.2.3).<sup>7</sup> Panels of Marcus Aurelius are also preserved on the Arch of Constantine and these show segmental armour, with bands running right up to the neck (Fig.2.4), worn with *pteryges*.<sup>8</sup> A copper-alloy statuette (Fig.2.7) depicting a helmeted soldier wearing *lorica segmentata* (now in the British Museum<sup>9</sup>) is stylistically very close to the Marcus Aurelius panels and, once again, of dubious value (other than as a statement of awareness of this type of armour). The same is true of reliefs on the Arch of Severus in the *Forum Romanum* (Fig.2.5).<sup>10</sup>

The 1st-century AD Rhineland infantry tombstones are of little help, since the few that do depict some sort of armour show mail (although one small frieze does include a diminutive representation of an articulated armguard: Fig.2.8). However, there are some pieces of provincial sculpture that provide tantalising glimpses.

The well-known series of reliefs on column pedestals from Mainz, generally held to be Flavian in date, include one scene of two legionaries advancing to the right (Fig.2.9). One is a standard bearer, but his companion is clearly a legionary infantryman, equipped with the typical curved rectangular shield, carrying a *pilum*, and with his helmet apparently slung around his neck. However, a small portion of his right shoulder is visible and this appears to show three shoulderguard plates above his (short) tunic sleeve. Whether this is indeed what it depicts is open to debate, and the relief has to be viewed in the context of its companion pieces in the group, one of which has a mail-clad legionary, whilst another shows a soldier wearing what appears to be some sort of overgarment but which certainly cannot be interpreted as segmental armour.<sup>11</sup>



*Fig.2.1 Detail of lorica segmentata on Trajan's Column (left) and on one of the Napoléon III casts of the Column (preserving more detail). Photos © J.C.N. Coulston*



*Fig.2.2 Details of lorica segmentata on fragments of the Great Trajanic Frieze. Photos © J.C.N. Coulston*





*Fig.2.3 Lorica segmentata on (left) the pedestal of the Column of Antoninus Pius (the heads and weapons are modern replacements) and (right) the spiral relief of the Column of Marcus Aurelius. Photos © J.C.N. Coulston*



*Fig.2.4 Lorica segmentata from an unknown monument of Marcus Aurelius, incorporated into the Arch of Constantine. Photos © J.C.N. Coulston*



Fig. 2.5 Lorica segmentata on the Arch of Severus. Photo J.C.N. Coulston



Fig. 2.6 Detail of a lorica segmentata-clad defender on the Arch of Severus. Photo J.C.N. Coulston



Fig. 2.7 Antonine statuette in the British Museum shown wearing segmental armour (not to scale).

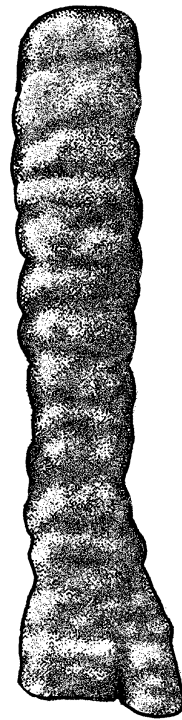


Fig. 2.8 Articulated armguard depicted on the tombstone of Sex. Valerius Severus from Mainz.

In the same vein, a relief from Saintes (France – Fig. 2.10) shows legionaries with similar strips depicted on their shoulders which might be intended to represent *segmentata*, although the piece is so unusual (the texturing of the soldiers' helmets being more reminiscent of cavalry than infantry equipment) that it does not inspire particular confidence in its accuracy.<sup>12</sup>

The best provincial representation of segmental body armour so far found is, without a doubt, the sculpture from Alba Iulia (Romania – Fig. 7.1; Plate 7). This has its own particular problems (since it seems to depict a variant of *lorica segmentata* that combines scale shoulder pieces with breastplates and regular girth hoops: see below p.62). Dating to the late 2nd or early



Fig.2.9 Column pedestal relief from Mainz depicting a segmentata-equipped infantryman with a detail of the exposed shoulder section (inset). Photos M.C. Bishop

3rd century AD (the figure wears his sword scabbard on his left-hand side, so is unlikely to date earlier than the Antonine period<sup>13</sup>), the piece seems more likely to be some kind of devotional statue than a tombstone.<sup>14</sup>

Whilst Trajan's Column uses segmental armour as a shorthand symbol for citizen troops, the contemporary (but provincial) *Tropaeum Traiani* at Adamclisi (Romania)<sup>15</sup> immediately attracts the attention because it completely ignores this type of body armour. Legionaries are shown wearing mail and scale cuirasses (Fig.2.11), but no *segmentata*. There were obviously differences between the metropolitan and provincial perceptions of what a legionary soldier at the time of the Dacian Wars should look like.<sup>16</sup> The dissimilarity between the legionaries of the Column and the *Tropaeum* is further enhanced by the depiction on the latter of limb armour, for the infantrymen not only wear greaves but also articulated armguards on their right (sword) arms.

### ARCHAEOLOGICAL

The key to Robinson's ultimate success in understanding and reconstructing segmental armour lay in his combining his practical knowledge of armour with archaeological artefacts, eschewing the iconographic sources as the starting point. Slavish adherence to interpreting the finds in the light of the representations was always going to be doomed to failure, for it overlooked the range of impulses and trends that dictated and biased metropolitan sculpture.

That being said, in common with the iconography of *lorica segmentata*, the archaeological evidence has its own set of problems and biases that affect the way in which it can be used. Many of these are the same as those for the rest of military equipment,<sup>17</sup> but there are some that remain peculiar to this type of armour. For example, the proportion of *segmentata* that comes from rivers, as opposed to that recovered from excavation on land, is completely different to the same statistic for helmets.<sup>18</sup> Is this because armour was not deposited in rivers, or could it be that it was but is not as likely to survive as helmets? Likewise, the proportion of loose fittings from segmental armour for any given period far outweighs the number of components for either mail or scale, for the same length of time. Could this have been due to the fact that *segmentata* was far and away the most common form of armour, or was it just more prone to falling apart, thus ending up over-represented in the archaeological record? If so, by how much? The answers to such rhetorical questions are, of course, unknowable. However, it is always salutary to remember that, excluding the items in the Hoard, there is only a handful of pieces of *segmentata* from Corbridge.<sup>19</sup>

Given the complex nature of a segmental cuirass, it is not surprising that most of our finds are in the form of isolated components. It is the nature of this armour that some types of fitting are used in more than one place and need not always be diagnostic (a lobate hinge by itself cannot be identified as having belonged to collar plates or upper shoulderguards, or as left-hand side or right-hand side). This inherent difficulty explains



Fig.2.10 Legionaries on a relief from Saintes, possibly showing segmental armour. Photos J.C.N. Coulston

why scholars resorted to trying to interpret the archaeological evidence from the representational sources. A clear understanding of *lorica segmentata* can only be gained from major finds, however, for these provide the relationships that are not obvious from isolated components. Indeed, it might be argued that one core find – the Corbridge Hoard (Fig.5.2) – was necessary not only to understand the Corbridge type itself, but also to inform interpretation of the other variants that have since come to light. We cannot now know whether the 1899 find of large amounts of segmental armour in the *Waffenmagazin* at Carnuntum could have provided that key set of material. The fact that von Groller chose to interpret it using the sculptural evidence suggests it did not.

It must be stressed that the Corbridge Hoard did not provide easy answers for Daniels and Robinson. Although complete, the fragility of this thoroughly oxidised group of disparate objects meant that the laboratory-excavated fragments had to be reconstructed, like a vast jigsaw puzzle, before interpretation could even begin.

Once the Corbridge material had come to light, all other *segmentata*, however different, could be modelled

upon it (whether rightly or wrongly). Corbridge enabled Robinson to reinterpret Curle's discoveries from Newstead, although he was not to know that vital parts of the picture were missing and that, ironically, the Newstead type was closer to the Corbridge than he imagined. Subsequent finds (like the first Carlisle backplate) confirmed this, but it took the discovery of two girth hoop units at Stillfried to provide another missing piece to this particular jigsaw puzzle.<sup>20</sup>

An excellent illustration of the qualitative difference between loose finds of fittings and a core find has been provided in recent years by the objects excavated at the *Varusschlacht* site at Kalkriese.<sup>21</sup> The publication of a breastplate, recognisably belonging to *lorica segmentata*, but equipped with fittings unlike those found with the familiar Corbridge type, elucidated a previously-unsuspected early life for segmental body armour. Almost instantly, it offered an interpretation of a whole class of fittings that had remained poorly understood and allows a partial reconstruction (see below, p.23ff) of a whole new type (strictly two sub-types) of *segmentata*. Without the breastplate, and the other pieces from Kalkriese, other early fittings had been difficult to understand and had often gone



Fig.2.11 Scale- and mail-clad legionaries on the Adamclisi metopes. Photos J.C.N. Coulston (left) & M.C. Bishop (right)

unrecognised. Now it is possible to identify fittings from these early cuirasses on numerous sites, some even reaching Britain after the invasion of AD 43 (see below, p.23): the effects of Kalkriese are far-reaching in Roman military archaeology.

## EXPERIMENTAL

Mention experimental archaeology or reconstruction to an archaeologist and they will invariably point out before too long that the technique can only ever tell you what might have been, not what definitely was.<sup>22</sup> As truisms go, it is hard to gainsay. Nevertheless there is much that it can reveal about a complex artefact like segmental armour, particularly in terms of the way the many components interact, that would otherwise be difficult (or even impossible) to predict, or costly and time-consuming to model using computers. Digital technology certainly has its place (Plate 9), but there will always be a need to construct physical replicas.

It is natural to make a replica in order to understand the archaeological artefact: Daniels and Robinson started with cardboard patterns, and Robinson then moved on to metal reconstructions; he was not afraid to make mistakes (his first attempt at a Corbridge-type cuirass was – as has already been mentioned – still heavily influenced by earlier efforts) and eventually produced replicas of the three types in the Hoard in time for the

Roman Frontiers Congress in 1969. The artefacts obviously dictated the reconstructions, but it is also apparent that the reconstructions helped with the interpretation of the objects. When it is done well, reconstructive archaeology can be a powerful interpretative tool.

It is possible to take the reconstruction of *segmentata* even further beyond merely understanding how components fit together, however. Frequent use, of the sort to which re-enactors subject it, has the potential to provide additional valuable information (Fig.2.12). How does such a complex artefact perform when its component parts move against each other? Are there problems with the components during use? Does it suffer from corrosion when exposed to the elements? These and many other questions (especially those relating to attrition) cannot be answered by simply constructing a cuirass and placing it in a display cabinet. Of course, Roman soldiers wore their armour every day – worked, marched, and fought in it – and no present-day re-enactor is likely ever to impose such a heavy burden upon himself. Moreover, differences in the materials used on the original and the replica could also introduce complicating factors. Nevertheless, so long as we recall that there will always be an order of difference between the artefact and the reconstruction, we must concede that the latter can hint at and possibly even mimic the reality of the former.

It is less clear to what extent mock combat can contribute worthwhile data. This activity, ultimately



Fig.2.12 Members of the Ermine Street Guard wearing lorica segmentata. Photo M.C. Bishop

deriving from groups imitating medieval and early modern combat (albeit with a specially formulated series of rules and conventions),<sup>23</sup> exposes armour and equipment to violent activity more akin to (we assume) ancient combat. At the very least, it accelerates the sort of routine attrition described above, but it may also introduce other sources of damage and failure induced by violent movement and impact. By itself, such data may be thought to be inconclusive and possibly even irrelevant, but its undeniable value lies in its providing hypotheses that can then be tested against the archaeological evidence.

Akin to mock combat are technological tests conducted against plate armour. Assays at penetration using replica catapult bolts or bladed weapons show that it was far from invulnerable.<sup>24</sup> The potential for the combination of the use of authentic materials and the availability of instruments for advanced scientific analysis may make such tests even more informative in

the future and this is a field of experimental archaeology where we may expect advances in due course.

Thus, in conclusion, there would seem to be three degrees of reconstruction of *lorica segmentata*:

1. *construction* can inform general questions about assembly and the relationship of components;
2. *passive use* can provide comparative data about the durability of the components of the cuirass; and
3. *active use* can suggest how *segmentata* might have performed under the ultimate stress, use in the field.

There are no absolutes and there is much that is subjective, but experimental archaeology cannot be ignored or dismissed.

## NOTES

- 1 LEPPER & FRERE, 1988,15–16.
- 2 I am grateful to Dr J.C.N. Coulston for supplying this information.
- 3 COUISSIN, 1926, 456–8, Fig.160–7.
- 4 COULSTON, 1989.
- 5 LEANDER TOUATI, 1987, Fig. No. 22, 26.
- 6 BISHOP & COULSTON, 1993, 23.
- 7 ROBINSON, 1975, 184.
- 8 *Ibid.*, 183–4, Pls.498–9.
- 9 *Ibid.*, 184, Pl.501.
- 10 *Ibid.*, Fig.189.
- 11 Mail-clad legionary: SELTZER, 1988, 239, Nr.259; overgarment: *ibid.*, 243, Nr.266.
- 12 ROBINSON, 1975, Pl.203.
- 13 VOGEL, 1973, Pl. 9, 12, 15, 28–9; BISHOP & COULSTON, 1993, 126.
- 14 COULSTON, 1995, 16.
- 15 Throughout the text, the Romanian spelling Adamclisi has been preferred over the Germanised Adamklissi.
- 16 Although Lepper and Frere (1988, 268) mention the possibility that this reflected the equipment issued to Moesian units, Simkins (1974, 16) and Robinson (1975, 186) both suggested that it was special issue to make up for the perceived deficiencies of *segmentata* on the Dacian front – a view echoed, albeit scarcely wholeheartedly, by Lepper and Frere (*loc. cit.*).
- 17 BISHOP & COULSTON, 1993, 19–32.
- 18 No actual statistics exist, but (at a rough guess) the proportions must be in the region of 1:99 for *segmentata* (the only indisputable piece from a river bed must be the shoulderguard from Xanten – SCHALLES & SCHREITER, 1993, 228, Taf.47, Mil84 – but the Bank of England breastplate (above, p.3) may also have belonged in this very small group, since the Walbrook flowed through the plot: WILMOTT, 1991, 51–4), but closer to 50:50 for helmets. On riverine deposition, see BISHOP & COULSTON, 1993, 37–8 (but see KÜNZL, 1999–2000 for an alternative view).
- 19 A catalogue of the military equipment from Corbridge is in preparation by the author and includes two tie rings (CO23479 and CO23499: see Fig.6.15, 5 & 12) and a vertical fastening hook (CO23612) from Newstead type cuirasses, but only a fragmentary buckle (BISHOP & DORE, 1989, 177, Fig.84,145) from the Corbridge type.
- 20 The Carlisle backplate: CARUANA, 1993; the Stillfried material: EIBNER, 2000.
- 21 For Kalkriese the literature (although prolific) is, in the main, of an interim nature. The *lorica segmentata* finds are briefly covered in FRANZIUS, 1992, 362–4 and 1995, 76, Abbn. 2 and 7, and comparative material from Switzerland and Austria is discussed in DESCHLER-ERB, 1999, 236–7 and UBL, 1999, 247 respectively. The present writer was able to see the Kalkriese breastplate in the autumn of 2001 through the good offices of Drs Moosbauer and Schlüter, although the circumstances of its display meant it was not possible to examine it in any great detail.
- 22 The basic work on experimental archaeology remains COLES, 1979 and most of its tenets hold true.
- 23 Such groups by and large derive from the Society for Creative Anachronism (SCA).
- 24 Catapult bolts: WILKINS & MORGAN, 2000, 93; bladed weapons: SIM, 2000, 40.

## Chapter 3: Early segmental armour

### ORIGINS

The Roman army notoriously exploited the military technology of friends and foes alike. There was little about a 1st century AD legionary that was an original Roman invention, virtually all his equipment being contributed at some stage by one of the subject peoples of the empire and beyond.<sup>1</sup> In fact, even segmental armour had been in use for a considerable time before the Romans adopted it.

Although laminated and lamellar armours are distant cousins of the true segmental armour, the earliest comparable form of articulated plate defence is probably the Dendra cuirass (Fig.3.1). Dating to the 15th century BC, this defence consisted of a series of curved copper-alloy plates which overlapped slightly and which were attached to each other by means of laces tied through holes near the edge of each plate.<sup>2</sup> This method of attachment of the plates was one of its main differences from *lorica segmentata*, since it thereby lacked the flexible skeleton provided by internal leathers. It was also its greatest weakness: if a plate on *lorica segmentata* became detached for some reason, those above and below it remained unaffected; with the Dendra armour, however, a detached plate affected all those below it. Another principal difference lay in the fact that it overlapped upwards, not downwards as was the case with the Roman cuirass, so it lacked the ability to deflect blows downwards and, even worse, ran the risk of damaging the vulnerable ties that joined the components of the armour together. Finally, the torso halves of the cuirass were arranged front and back, not left and right as with *lorica segmentata*.

### LAMINATED ARMOUR FROM OTHER CULTURES

Finds of laminated or segmental armour from peoples of steppe origin such as the Parthians clearly demonstrate that the technology that lay behind *lorica segmentata* – overlapping ferrous plates articulated on internal leather straps – was already old by the time the Romans probably first encountered it. Limb armour of this type, combined with scale, is known from steppe sites from the 4th century BC onwards.<sup>3</sup>

An intriguing depiction on the pedestal reliefs of Trajan's Column shows what appears to be a segmental cuirass which has girth hoops fastened by buckles (Fig.3.2). All of the material on these pedestal reliefs is thought to be accurately modelled on captured Dacian

arms so it is unlikely that a Roman cuirass is intended. This would therefore seem to be evidence for some sort of segmental armour in use by either the Dacians or their allies. It may well make sense to interpret them as Sarmatian armour, akin to that known from Scythian graves or mentioned (in use by the Rhoxolani) by Tacitus (see above, p.1). In the final analysis, the relief is not very informative, but it at least seems to highlight non-Roman use of segmental forms of armour, whatever they were made of.<sup>4</sup>

### CAVALRY & GLADIATOR LIMB PROTECTION

Articulated limb defences were certainly known in the Hellenistic period and, given that trans-Danubian cultural exchange was well established in the classical period,<sup>5</sup> it seems likely that steppe influence is largely responsible for this familiarity. Xenophon<sup>6</sup> describes how cavalrymen of his day (the 5th to 4th centuries BC) could be equipped with an articulated armguard (called the 'hand' – *cheira*) on the left arm instead of a shield and that this was supposed to be of a different form to the protection on the right arm (which should resemble a greave).

An example of the sort of flexible armguard described by Xenophon was excavated from the Hellenistic arsenal at Ai Khanum and dated to c.150 BC.<sup>7</sup> In form it is segmental and very closely resembles Roman military armguards, with a large upper plate and a series of around 35 overlapping curved plates (Fig.3.3).

At some point, this type of defence, supposedly designed for the left arm of cavalrymen, changed to being a right arm defence for gladiators. Gladiatorial reliefs are uncommon before the imperial period, but laminated armguards were certainly in use by gladiators during the first half of the 1st century AD. Unfortunately, our evidence is insufficiently conclusive to allow an earlier dating than this, but as we shall see (below, p.68ff), almost certainly in use by gladiators before it was introduced for Roman infantry use.<sup>8</sup>

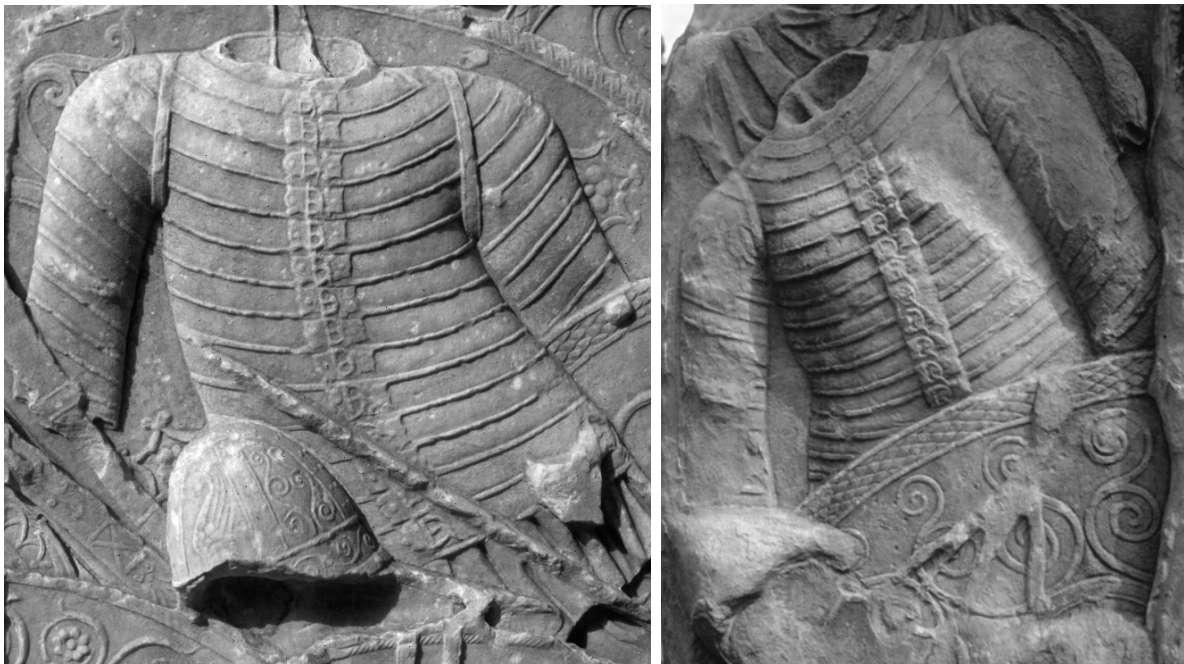
### A PROTOTYPE FOR LORICA SEGMENTATA?

A find from Pergamon, briefly published during the early part of the 20th century but only recently identified, may offer a prototype for Roman segmental





*Fig.3.1 The Dendra Bronze Age cuirass. Photo J.C.N. Coulston*



*Fig.3.2 Segmental cuirasses, probably intended to represent Sarmatian armour, depicted amongst the pedestal reliefs on Trajan's Column. Photos J.C.N. Coulston*



Fig.3.3 Hellenistic armguard from Ai Khanum. Scale 1:4

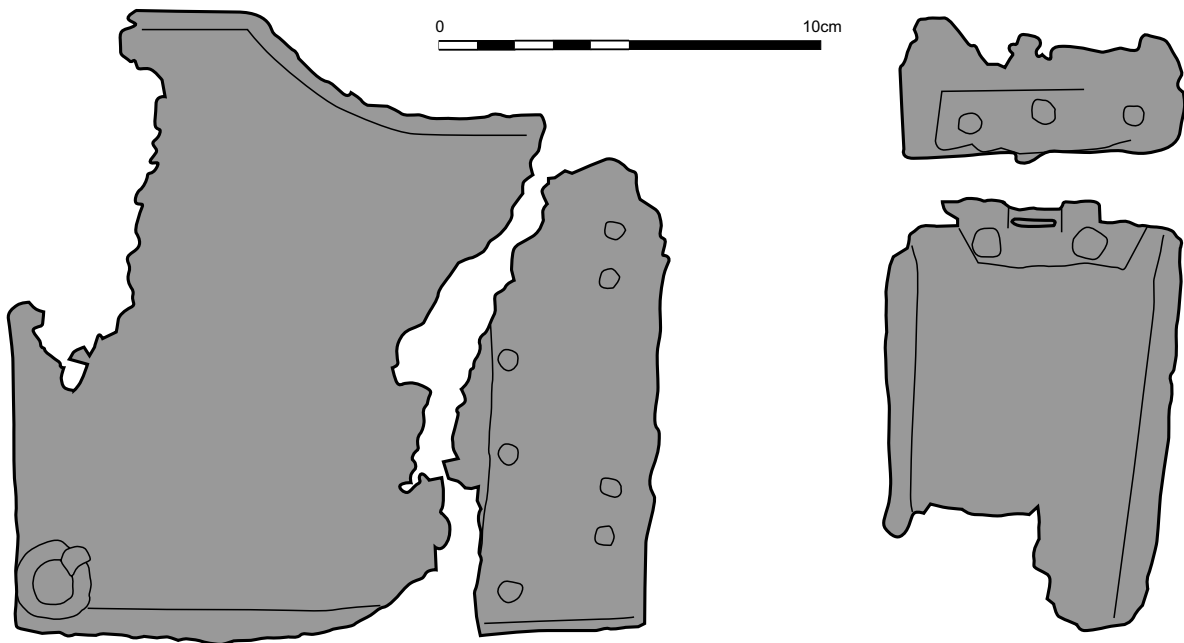


Fig.3.4 Fragments of iron plate armour from Pergamon.

body armour. It was excavated at Pergamon and survives as a series of iron fragments (Fig.3.4).<sup>9</sup> It does not conform to any of the known types of Roman segmental armour and, despite an uncertain provenance, may well be a Hellenistic prototype for segmental body armour. The fragments include

hinges, like *lorica segmentata*, rolled edges to the plates (including a possible cut-out for the neck), but appears to have used a ring on the breastplate to fasten it to whatever lay below it. More finds may serve to shed light on this curious discovery, but there is one further piece of evidence that may be of significance:

a fresco in Nero's *Domus Aurea* in Rome shows a soldier with a spear and circular or oval shield. The figure (which is thought to represent Hector) wears greaves on both shins, a crested Italo-Corinthian helmet, has a *paludamentum* draped about his midriff, and a cuirass that, it has been argued, resembles *lorica segmentata* (Fig.3.5). If it is accepted that Roman wall painting frequently copied Hellenistic models,

then there could conceivably be a connection between the Pergamon artefacts and the Rome painting, but there must always remain the possibility that the figure is nothing more than a palimpsest of Hellenistic and contemporary Roman equipment.<sup>10</sup>

## NOTES

- 1 BISHOP & COULSTON, 1993, 204–5.
- 2 ASTROM, 1977, 28–34, Pls.XII–XX. With pairs of backplates and breastplates, as well as shoulderguards and girth hoops, it bore a passing resemblance to later Roman segmental armour.
- 3 Like Staroe and Chirik-Rabat: NEGIN forthcoming. On the use of segmental armour amongst steppe peoples see VON GALL, 1990, 67–9; MIELCZAREK, 1993, 57–60.
- 4 The sculpture permits no means of assessing the material used for the cuirass, but leather is often suggested (POLLEN, 1874, Fig.5; VON GALL, 1990, 69).
- 5 One need only think of Greek material amongst Thracian treasure finds (VENEDIKOV, 1976, 49–53), or the use of Scythian archers in classical Athens (e.g. Aristophanes *Acharnians* 54–9). On Greco-Scythian contact in general see MINNS, 1913.
- 6 *Art of Horsemanship* XII,5: ‘And as a wound in the left hand disables the rider, we also recommend the piece of armour invented for it called the “hand [*cheira*].” For it protects the shoulder, the arm, the elbow, and the fingers that hold the reins; it will also extend and fold up; and in addition it covers the gap left by the breastplate under the armpit. But the right hand must be raised when the man intends to fling his javelin or strike a blow. Consequently that portion of the breastplate that hinders him in doing that should be removed; and in place of it there should be detachable flaps at the joints, in order that, when the arm is elevated, they may open correspondingly, and may close when it is lowered. For the fore-arm it seems to us that the piece put over it separately like a greave is better than one that is bound up together with a piece of armour.’
- 7 BERNARD, 1980, 452–7 with fig.11.
- 8 For the relationship between gladiatorial and legionary equipment, see COULSTON, 1998a, 4–7.
- 9 It was referred to in a note by Paul Post (POST, 1935–6) which was in turn briefly mentioned by Alfs (ALFS, 1941, 121), but the main (if incomplete) publication is CONZE, 1913, 327 Fig.122. I am grateful to Drs Volker Kästner, Gertrud Platz, and Ilona Trabert of the Berliner Antikensammlung for supplying information on this intriguing find.
- 10 I am grateful to Peter Connolly and Thom Richardson for discussing these unusual pieces. The *Domus Aurea* figure of Hector in the Hall of Stuccoes (IACOPI, 2001, Fig.75) was kindly first drawn to my attention by Graham Sumner. For an interpretation of the soldier as Roman, rather than Hellenistic, see SUMNER, 2002, 22.

## Chapter 4: The Kalkriese Type

### EVIDENCE

In 1994, excavation at the Augustan *Varusschlacht* site of AD 9 at Kalkriese, near Osnabrück (Germany), produced a dramatic piece of evidence which conclusively proved that *lorica segmentata* had been in use in the first decade of the 1st century AD – at least 40 years earlier than had previously been thought.<sup>1</sup> When Robinson identified the Corbridge and Newstead types of the armour as a result of the discovery of the Corbridge Hoard, there had been little hint that earlier forms might remain to be found.

This Kalkriese evidence came in the form of a breastplate and a number of loose fittings (Fig. 4.1). The breastplate shared many characteristics with the Corbridge type – it had vertical and horizontal fastening straps and a hinge to join it to its mid-collar plate, although the fittings were of a completely different form. Its leather fastening straps were riveted directly to the body of the breastplate with large, disc-headed copper-alloy rivets, whilst the hinge fitting was sub-lobate (one end having three points) and attached with four rivets. The horizontal fastening strap still retained its buckle, which was attached directly to it with a pair of rivets. Finally, the whole circumference of the plate was edged with copper-alloy piping, similar to that used on iron helmets. In common with many *lorica segmentata* breastplates, it was slightly convex.

Few of the Kalkriese-type fittings are as distinctive as those of the Corbridge type and those that are had never been found in securely-dated stratigraphic contexts. It was only after the initial publication of the Kalkriese breastplate that it became possible to identify similar items from other sites.<sup>2</sup> Moreover, the other loose fittings from the Kalkriese excavations (Fig. 4.2) made it possible to isolate a second variant, and again comparison with finds from other sites showed that its components had been known – but not recognised – for some time (Fig. 4.3). These two variants are the Kalkriese types A and B respectively and neither of these used the lobate hinges or decorated washers that would become such a characteristic feature of the Corbridge types.

The earliest pieces so far identified come from Dangstetten (Germany) and date to around 9 BC<sup>3</sup> and these appear to have been exclusively of type A (with double-riveted buckles attached to leather straps). Other sites with a known Augustan presence – such as *Vindonissa* (Windisch, Switzerland) and Strasbourg (France) – have produced similar buckles or sub-lobate hinges, whilst fittings belonging to the type B cuirass

have even been found in Britain (at Chichester and Waddon Hill), showing that it continued in use until after AD 43.

At the time of writing, no definite examples of girth hoops have been identified in association with the fittings discussed above (although there are a number of candidates for the role – see p.25) and no site has produced examples of tie loops in an unambiguous context.

### DESCRIPTION

#### Breastplate

- Turned out at the neck; whole plate bound in copper alloy
- Attached to the mid-collar plate with a copper-alloy sub-lobate hinge
- Fastened laterally by a copper-alloy buckle attached to a leather strap riveted directly to the plate on one side and a leather strap riveted directly to the plate on its twin
- Fastened vertically to the girth hoops by a leather strap riveted directly to the plate

#### Mid-collar plate

- Turned out at the neck; may have been bound in copper alloy
- Attached to the back- and breastplate with copper-alloy sub-lobate hinges

#### Backplates

- Uncertain, but probably three on either side, arranged vertically and joined by leathers secured by copper-alloy rivets
- Top plate probably turned out at the neck; possibly bound in copper alloy
- Attached to the mid-collar plate with a copper-alloy sub-lobate hinge
- Possibly fastened laterally by a copper-alloy buckle attached to a leather strap riveted directly to the plate and a leather strap riveted directly to the plate on its twin, both attached to the plate with two copper-alloy rivets
- Probably fastened vertically to the girth hoops by the internal leathers

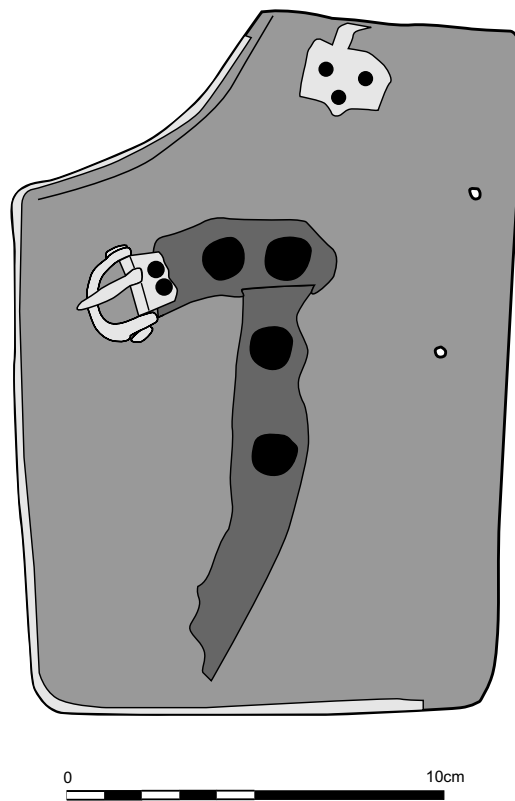


Fig. 4.1 Breastplate from Kalkriese. Scale 1:2

### Upper shoulderguard

- One in three parts, joined by copper-alloy sub-lobate hinges

### Lesser shoulderguards

- Four: two long, two shorter
- Three leathers (front, top, and back) running to breast-, collar-, and backplates, attached to the plates with copper-alloy rivets

### Girth hoops

- Probably eight of them, top and bottom plates possibly edged in copper alloy
- All the same depth, in the region of 55mm, except the topmost which is shaped to fit the arm and narrowed to about 40–45mm, and rolled or thickened on the top edge at that point
- Upper five possibly fastened by buckles, lowest two probably left free to be secured by belt
- Uppermost hoops fasten to back- and breastplates by means of two internal iron hingeless buckles and one external hingeless(?) buckle respectively
- Three leathers running vertically on each half (front, side, back) secured to each plate by two copper alloy rivets at each of the three points

The description of the Kalkriese type must depend largely on the few recovered pieces, prime amongst which is the iron breastplate from Kalkriese itself (Fig. 4.1). This is one of the finest examples of a breastplate of any type to survive and is key to understanding how this variant worked. Measuring 135mm at its broadest point (just below the neck opening), and tapering to 120mm at its lower edge, the plate (which varies in thickness from 1mm to 3mm) is slightly convex and 188mm high. Near its top edge is a sub-lobate hinge (attached by two rivets) where one would expect to find a lobate hinge on the Corbridge type (see below, p.32), obviously intended to join it to a mid-collar plate. The edge of the curved neck opening has been turned out and the whole plate, which has rounded corners, given an edging of fine copper-alloy piping. The horizontal fastener consists of a leather strap, attached directly to the plate by means of two disc-headed copper-alloy rivets, to which a copper-alloy buckle has in turn been attached with two small rivets. The vertical fastener consists of another leather strap, also attached to the breastplate with two disc-headed rivets, and presumably designed to fasten to a buckle attached to the uppermost girth hoop of the cuirass. There are

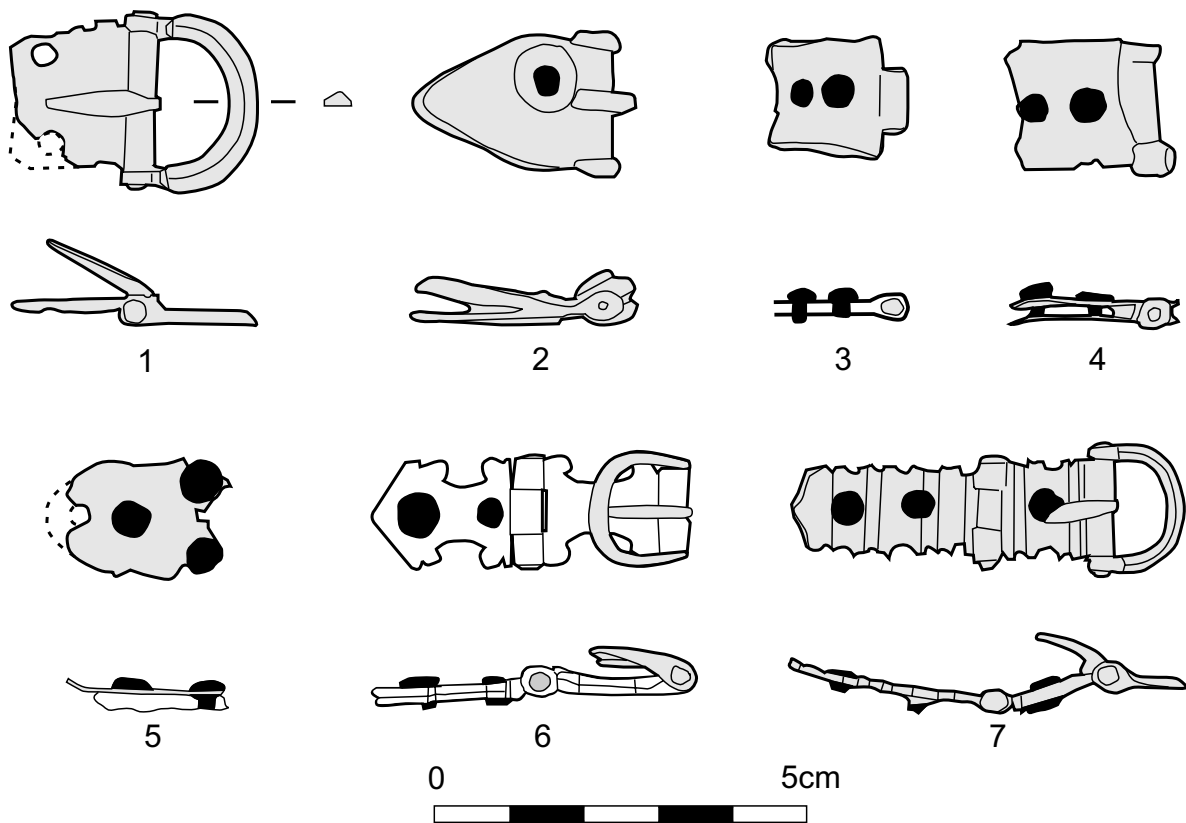


Fig. 4.2 Loose segmentata fittings from Kalkriese. 1–2 hingeless buckles, 3–5 hinged strap fittings, 6–7 hinged buckles. Scale 1:1

two holes near the outer edge of the plate, one of which must certainly have been used to attach the internal leathers which secured the shoulderguards in place.<sup>4</sup>

Sub-rectangular, or sub-lobate, hinges are thus the prototypes for the Corbridge lobate hinge. The form with the pointed terminals can be seen not only on the Kalkriese breastplate, but also on a small fragment of plate from Waddon Hill (England). There was also apparently a variation on this basic design, shown by pieces from Strasbourg and Chichester.<sup>5</sup> This variant features two semicircular projections as terminals, rather than the three points of the Kalkriese breastplate (Fig. 4.4).

A 96mm-long fragment of plate from *Vindonissa*<sup>6</sup> can be identified as part of an upper shoulderguard of the Kalkriese type (Fig. 4.5), although it is not clear which variant is concerned. This plate tapers towards one end and has a sub-lobate hinge of the same type found on the Kalkriese breastplate attached by two rivets at its broader (108mm) end. A central leathering rivet betrays the fact that this is part of an upper shoulderguard (all the other shoulderguard plates necessarily having their rivets near the inner edge. This plate, like the Kalkriese breastplate, lacks any decorative bosses.

The presence of hinged fasteners amongst the Kalkriese material (Fig. 4.2) shows that the shortcom-

ings of the riveted-strap method of fastening shown on the breastplate had already been recognised by the Romans. Although they resemble the hinged strap and buckle fittings of the later Corbridge type, they are more elaborately decorated (with cut-out edges), and such fittings can be identified from a number of other sites such as *Vindonissa*, Kaiseraugst (Switzerland), and Magdalensberg (Austria; Fig. 4.3).<sup>7</sup>

No incontrovertible examples of girth hoops of the Kalkriese type have been recognised, so it is not known how these were fastened. There is a fragmentary plate from *Vindonissa* (Fig. 4.6) – with copper-alloy edging and four surviving rivets – that may bear interpretation as such a girth hoop, whilst a plate from Dangstetten (with its putative vertical edge rolled and a central rivet hole close behind it) may equally be an example of a girth hoop.<sup>8</sup> One thing seems certain – they cannot both have belonged to lower units, but we must wait for more conclusive finds before we can be sure which (if either) is the genuine item.

No pre-Claudian sites with examples of the Kalkriese armour have as yet produced examples of what can be identified as tie loops or decorated bosses so these were probably only introduced with the Corbridge type of cuirass.

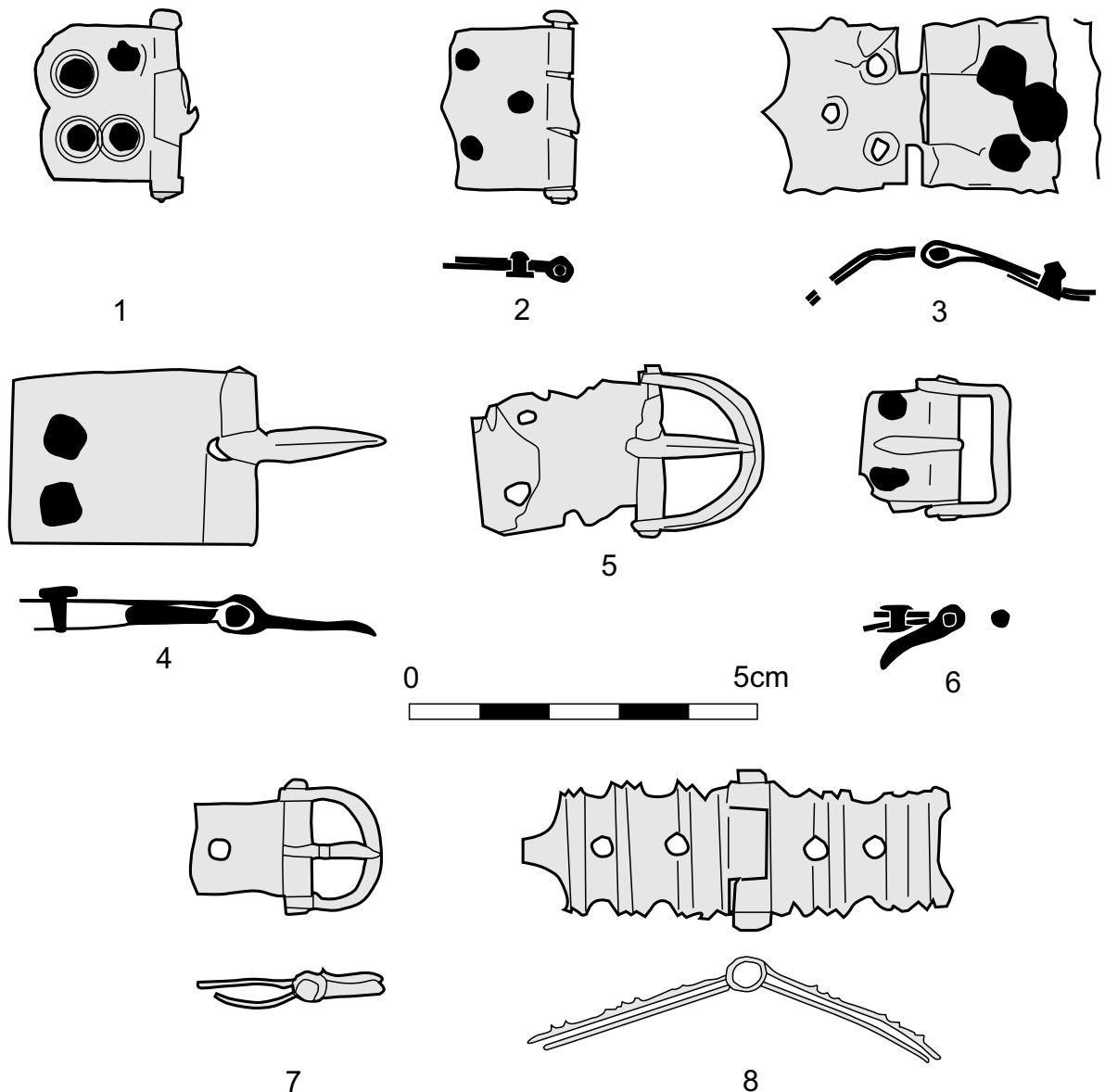


Fig. 4.3 Kalkriese-type fittings from other sites. Sub-lobate hinges (from 1. Iruña, 2. Augst, 3. Oberwinterthur), hingeless buckles (from 4. Vindonissa, 5. Augsburg-Oberhausen, 6. Augst, 7. Dangstetten), and a hinged strap fitting (8. from Vindonissa). Scale 1:1

### RECONSTRUCTION

The Kalkriese type is the least completely understood of the various *lorica segmentata* cuirasses, so in order to reconstruct it (Fig. 4.7; Plate 9), a great deal of surmise is required, based mainly on what we know of the later Corbridge type. Throughout, it has to be assumed that the Corbridge variant was, wherever possible, an improvement over the Kalkriese types.

The fact that the breastplate will have been fastened (by means of a sub-rectangular hinge) to a mid-collar plate seems certain, and it is not unreasonable to deduce that this plate will in turn have been hinged to at least one, and probably up to three (by analogy with

the Corbridge type) backplates. Internal leathers will have joined the breastplate, mid-collar plate, and one of the backplates to the shoulderguard assembly. The upper shoulderguard was evidently in three parts, joined by two more sub-lobate fittings and the whole tripartite assembly had gently curved sides, making it broader in the middle (i.e. at the top) than at the ends. The lesser shoulderguards will presumably (again, by analogy with the Corbridge type) have been four in number and attached to the three internal leathers coming from the upper shoulderguard.

The girth hoops were probably seven or eight in number, but all other detail is – for now – conjectural.



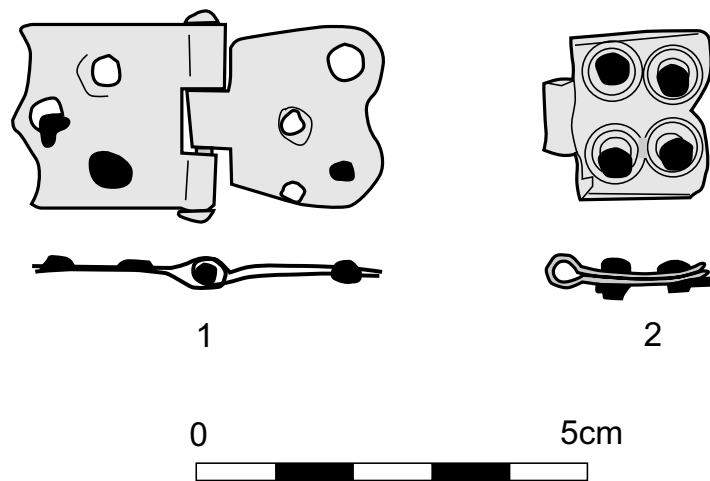


Fig. 4.4 Sub-lobate hinges from Strasbourg and Chichester. Scale 1:1.

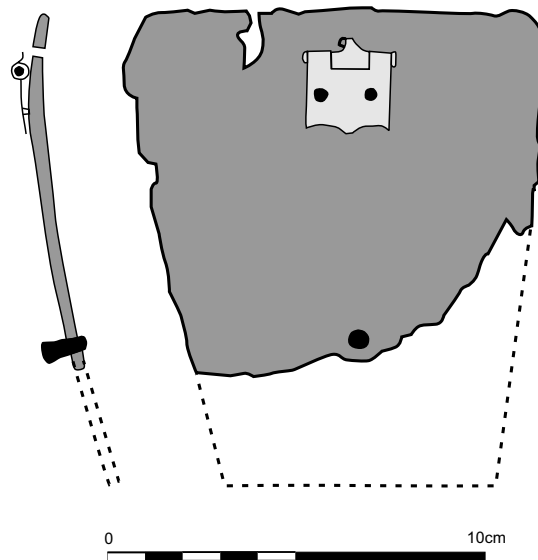


Fig. 4.5 Upper shoulderguard from Vindonissa. Scale 1:2

The question of how the girth hoops were attached to each other can be tackled by a process of deduction: whatever means was used, it was presumably sufficiently inferior to the tie loops used on the Corbridge type to justify its replacement (remembering that no tie loops have yet been associated with Kalkriese-type armour). The two most likely methods may well be:

- a) following the Corbridge analogy of tying plates together, holes piercing the ends of the girth hoops being used to tie the ends of the girth hoops (Fig. 4.8a);
- b) by parallel with the cuirass depicted on the pedestal reliefs of Trajan's Column (see above, p.18), fastened down the front and back by means of buckles on one side, and straps on the other (Fig. 4.8b).

The first option seems so completely impractical that it could not have worked for anything more than a very short time, as the plates would rapidly cut through whatever was used (presumably leather) to tie them. Ironically, given earlier abortive attempts to reconstruct *lorica segmentata* (see above, p.4), the second of these alternatives has more in favour of it, not least the fact that it at once seems workable, yet also inferior to the eventual tie-hook solution adopted for the Corbridge type. Presumably the Type A would simply have used straps riveted to the plates, whilst the Type B may have improved upon this by using fixed buckles (examples of which are known from Kalkriese and contemporary sites: Fig. 4.2). There is one plate<sup>9</sup> that might possibly be appropriate to this interpretation (Fig. 4.6): edged on one side with copper-alloy binding (and thus perhaps either a top

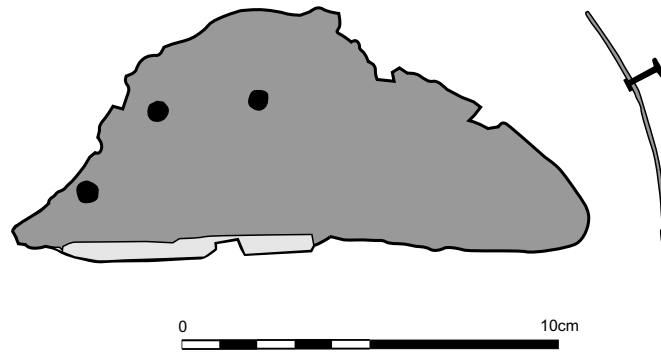


Fig.4.6 Possible Kalkriese-type girth hoop fragment from Vindonissa. Scale 1:2

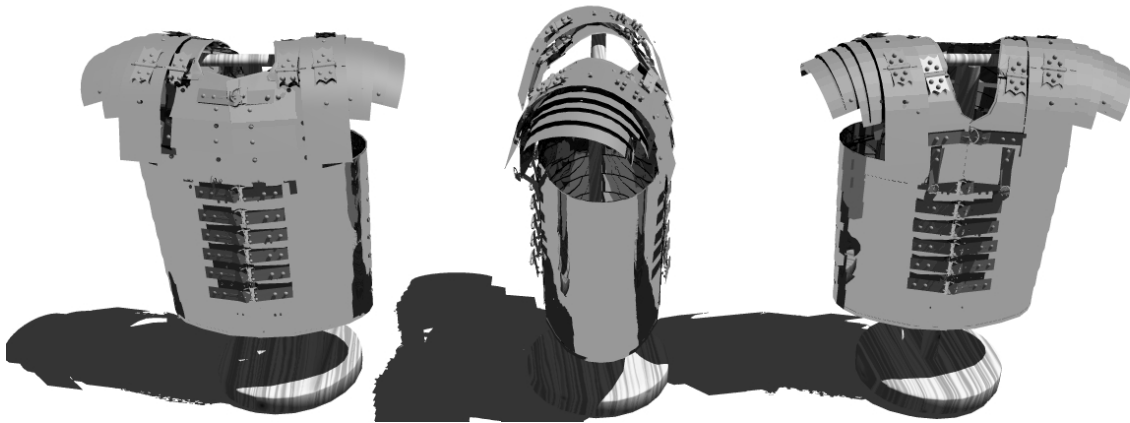


Fig.4.7 Speculative reconstruction of the Kalkriese type of lorica segmentata showing rear (left), side (centre), and front (right) views of the type A cuirass

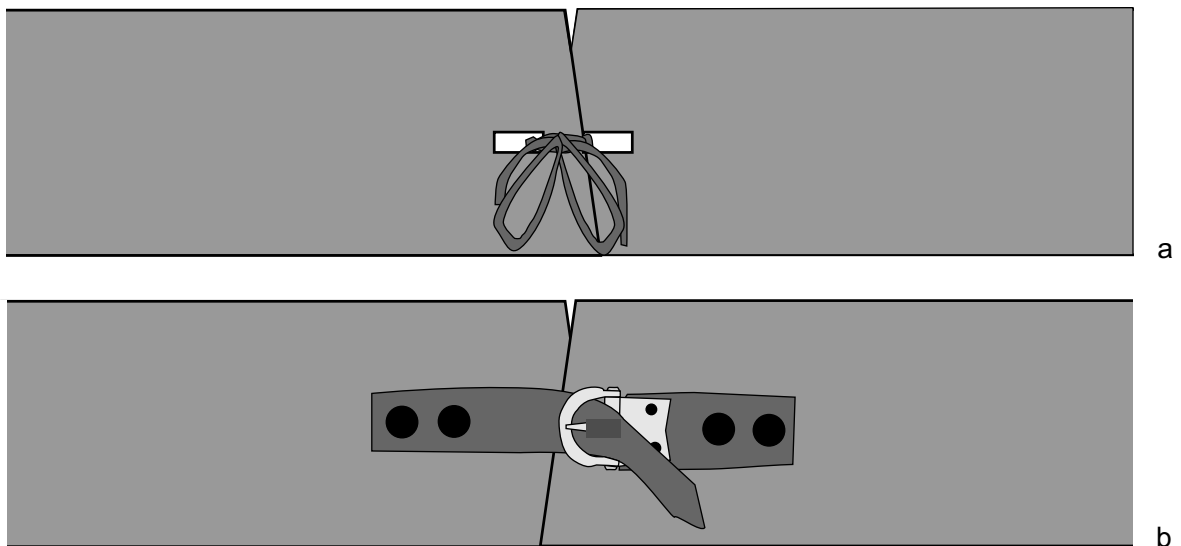


Fig.4.8 Possible girth hoop fastening techniques for the Kalkriese type a) tying the plate ends together b) using buckles. Not to scale

or bottom girth hoop), it has four rivet holes, two close (18mm) together near the bound edge (which might thus be interpreted as leathering rivets on a top girth hoop) and two holes further (30mm) apart, near the centreline of the 66mm-high plate, which could be seen as the means of attaching a leather

strap to the plate (the rivets on the Kalkriese breastplate are 25mm and 20mm apart, centre to centre).

**COMPONENT LIST**

<b>Type:</b>	<b>A</b>	<b>B</b>
breastplates	2	2
mid-collar plates	2	2
backplates	?6	?6
horizontal fastening leathers	2	–
vertical fastening leathers	4	–
hinged buckle fittings	–	3
hinged buckle fitting rivets	–	12
hinged strap fittings	–	3
hinged strap fitting rivets	–	12
hingeless buckles	7	–
strap rivets	20	–
buckle rivets	14	–
upper shoulderguard plates	?6	?6
lesser shoulderguard plates	?8	?8
upper unit leathering rivets	30	30
upper unit leathering roves	30	30
upper unit leathers	6	6
sub-lobate hinge-halves	16	16
sub-lobate hinge fastening rivets	32	32
lower unit halves	14/16	14/16
lower unit fastening buckles?	20/24	20/24
lower unit leathers	6	6
lower unit leathering rivets	72	72
Totals	?297/303	?280/286

**NOTES**

- 1 For the Kalkriese excavations in general, see SCHLÜTER, 1992; 1999; SCHLÜTER & WIEGELS, 1999. For the breastplate in particular, see FRANZIUS, 1995, Abb.2. There had certainly been earlier hints of Augustan *lorica segmentata* (cf. FINGERLIN, 1970–1, Abb.11,8; HÜBENER, 1973, Taf.13,7), but nothing conclusive. Date of discovery is recorded on [www.geschichte.uni-osnabrueck.de/projekt/12/12f.html](http://www.geschichte.uni-osnabrueck.de/projekt/12/12f.html) (checked 10.7.02).
- 2 UBL, 1999, 247; DESCHLER-ERB, 1999, 236–7; BISHOP, 1998, 10–11.
- 3 FINGERLIN, 1986, Abbn.268.1, 285.5, 448.1; 1998, Abb.681.2.
- 4 It is possible that the plate had been reathered at some point and a second hole pierced to attach the new leathering. To judge from the Type B fittings from the same site, and the fact that the earliest datable find is some 18 years older, the plate was not new when deposited.
- 5 Strasbourg: FORRER, 1927, Taf.LXXVII,25–6; Chichester: DOWN, 1989, Fig.27.5,80.
- 6 UNZ & DESCHLER-ERB, 1997, Taf.30,615.
- 7 Vindonissa: UNZ & DESCHLER-ERB, 1997, Taf.32,731; Kaiseraugst: DESCHLER-ERB, 1999, Tafn.13,164, 191–2; 14,234–5, 237–44; Magdalensberg: DEIMEL, 1987, Taf.76,27.
- 8 Vindonissa: UNZ & DESCHLER-ERB, 1997, Taf.30,619; Dangstetten: FINGERLIN, 1986, 136, Abb.371,10, Taf.2:371,10.
- 9 UNZ & DESCHLER-ERB, 1997, Taf.30,619.

## Chapter 5: The Corbridge Type

### EVIDENCE

The Corbridge type of *lorica segmentata* is the most completely understood of all the variants, thanks mainly to the remains of parts of as many as twelve cuirasses preserved in the Corbridge Hoard, discovered in 1964.<sup>1</sup>

The first recorded excavated examples of the type were found in the *Carnuntum Waffenmagazin* deposit, where a range of parts from both lower and upper units was discovered. This was followed by a (distorted) breastplate from the Bank of England site (Fig.5.1) in London and a significant deposit of components (both upper and lower) from Ribtissen (Germany). However, it was the discovery of complete sections of armour in the Corbridge Hoard that has defined our understanding of segmental body armour (Fig.5.2), not only in terms of how it and its various sub-forms worked, but also some indication of how much maintenance it required.

Subsequent finds have added little to what could be seen in the Corbridge find, British pieces from Chichester, St Albans, and Longthorpe showing something of the range of shapes and sizes that were possible, but only a substantial portion of cuirass from Gamala (Israel) has shown any deviation from the general form. Lost during the Flavian assault on the town, the Gamala cuirass incorporated a unique system of sliding rivets to join the backplates, rather than the more normal internal leathers.<sup>2</sup>

It is the Corbridge type that has produced the most by way of loose fittings, although as the timeline shows (Fig.10.1) it was in service for only slightly longer than the Kalkriese type, and about the same length of time as the Newstead form. As will be discussed in greater depth later (below, p.92), this may have had more to do with the fragility of this particular type than its widespread use.

### DESCRIPTION

#### Breastplate

- Rolled or thickened at the neck; no binding
- Attached to the mid-collar plate with a copper-alloy lobate hinge
- Fastened laterally by a hinged copper-alloy buckle on one plate and a hinged copper-alloy strap fitting on its twin, both attached to the plate with two copper-alloy rivets
- Fastened vertically to the girth hoops by one hinged copper-alloy strap fitting

#### Mid-collar plate

- Rolled or thickened at the neck; no binding
- Attached to the back- and breastplate with copper-alloy lobate hinges

#### Backplates

- Three on either side, arranged vertically and joined by leathers secured by copper-alloy rivets
- Top plate rolled or thickened at the neck; no binding
- Attached to the mid-collar plate with a copper-alloy lobate hinge
- Fastened laterally by a hinged copper-alloy buckle on one plate and a hinged copper-alloy strap fitting on its twin, both attached to the plate with two copper-alloy rivets
- Fastened vertically to the girth hoops by the internal leathers

#### Upper shoulderguard

- One in three parts, joined by copper-alloy lobate hinges

#### Lesser shoulderguards

- Four: two long, two shorter
- Three leathers (front, top, and back) running to breast-, mid-collar-, and backplates, attached to the plates with copper-alloy rivets

#### Girth hoops

- Eight (A) or seven (B/C) of them, usually overlapping left over right
- All the same depth, in the region of 55mm, except the topmost which is shaped to fit the arm and narrowed to about 40–45mm, and rolled or thickened on the top edge at that point
- Upper five or six fastened by copper-alloy tie-loops, lowest two left free
- Uppermost hoops fasten to back- and breastplates by means of two internal iron hingeless buckles (A) or two external hooks (B/C) and one external hinged buckle (A) or one external hook respectively
- Three leathers running vertically on each half (front, side, back) secured to each plate by two copper alloy rivets at each of the three points

The Corbridge type has five plates comprising each collar section: a breastplate, mid-collar plate, and three backplates. The first two of these, together with the upper backplate, have a carefully-finished neck opening, usually either upset or rolled. Lateral fastening was accomplished by means of hinged buckles and hinged strap fittings (on the breastplates and upper backplates: Fig.5.3a), whilst the vertical fasteners differed between the various sub-types identified by Robinson. Type A used a hinged strap on the breastplate, which was paired with a hinged buckle on the front of the upper girth hoop (Fig.5.3b), and used the internal leathers on the backplates to attach to two hingeless buckles inside the rear of each upper girth hoop (Fig.5.3c). Types B and C used loops (copper-alloy in the case of B, iron for C) to receive hooks attached to the upper girth hoop (Fig.5.3d). The reason for the change from leather to copper alloy for the vertical fasteners may be because stretching of the leather suspending the girth hoops from the shoulder units (a technique that had also been used on the Kalkriese type) was perceived as a problem and that the metal hooks presented the best, if not an ideal, solution.<sup>3</sup> Modern reconstructions have shown that it is possible for the hooks to become disengaged whilst in use.<sup>4</sup>

The breast- and backplates show some degree of individualisation in the placing of leathering rivets, the addition of decorative bosses (Fig.5.3e), and the arrangement (and especially sharing) of rivets for the various fittings, as well as in sizing (Figs.5.4). There is also some inconsistency in the arrangement of lateral fasteners (Table 5.1), suggesting that there was no one

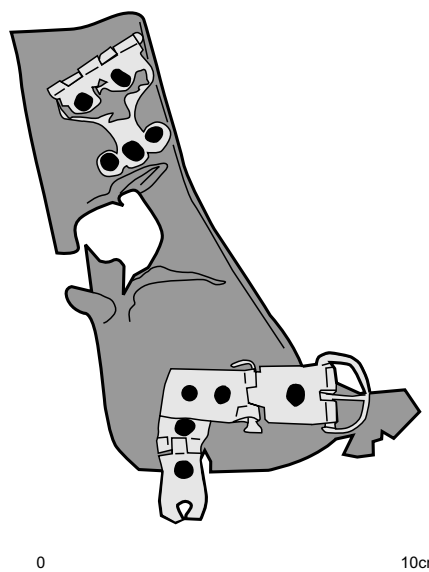


Fig.5.1 The Bank of England breastplate. Scale 1:2

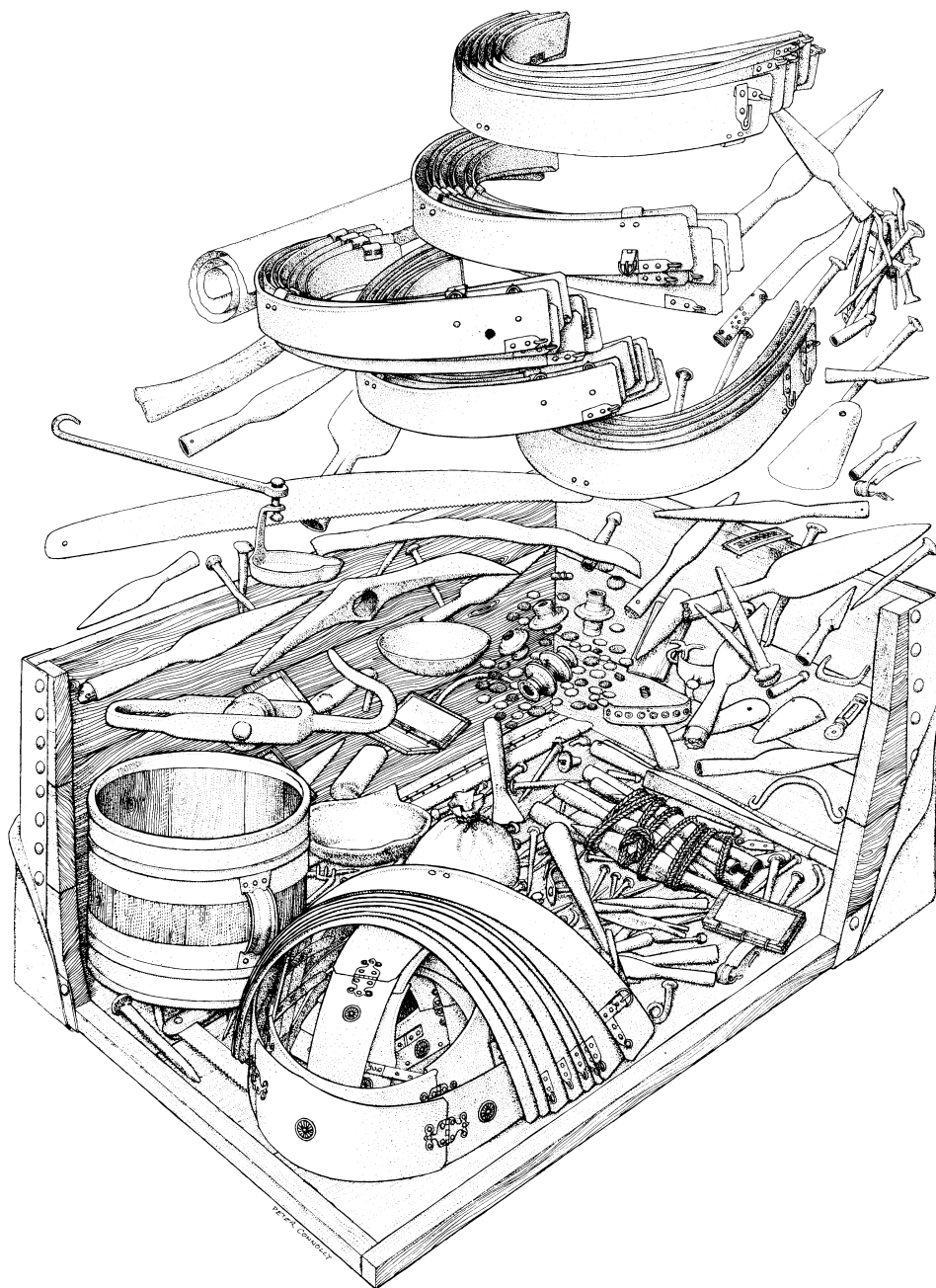
preferred side for attachment of the hinged buckle for either the breast- or backplates.

Both the breast- and backplates were attached to the mid-collar plate by means of copper-alloy lobate hinges (Fig.5.3f). Although this was theoretically a flexible joint, in practice it did not strictly need to be (see below, p.85) and a number of the Corbridge plates show signs of repairs whereby neighbouring plates were riveted directly together (Fig.5.5). The mid-collar plate was fixed to a lateral internal leather with a single copper-alloy rivet (without a decorative boss).

Each set of collar plates was attached by means of three leathers to the upper shoulderguard, which sat above the collar assembly. The upper shoulderguard

Site	Surviving Half	Buckled Side (Breastplate)	Buckled Side (Backplate)	Reference
Corbridge 1	right	right	left	ALLASON-JONES & BISHOP, 1988, 23, Fig.26
Corbridge 2	right	left	left	<i>ibid.</i> , 29 Fig.31
Corbridge 3	left	left	left	<i>ibid.</i> , 29, Fig.34
Corbridge 4	left	left	?	<i>ibid.</i> , 34, Fig.39
Corbridge 5	left	left	?	<i>ibid.</i> , 39, Fig.43
Corbridge 6	right	?	right	<i>ibid.</i> , 43, Fig.49
Vindonissa	right	right	–	UNZ & DESCHLER-ERB, 1997, Taf.31,636
Bank of England	right	right	–	WEBSTER, 1960, Pl.LIV
Longthorpe	right	–	left?	FRERE & ST JOSEPH, 1974, 46, Fig.25,16

Table 5.1 Corbridge type breast- and backplate lateral fastening

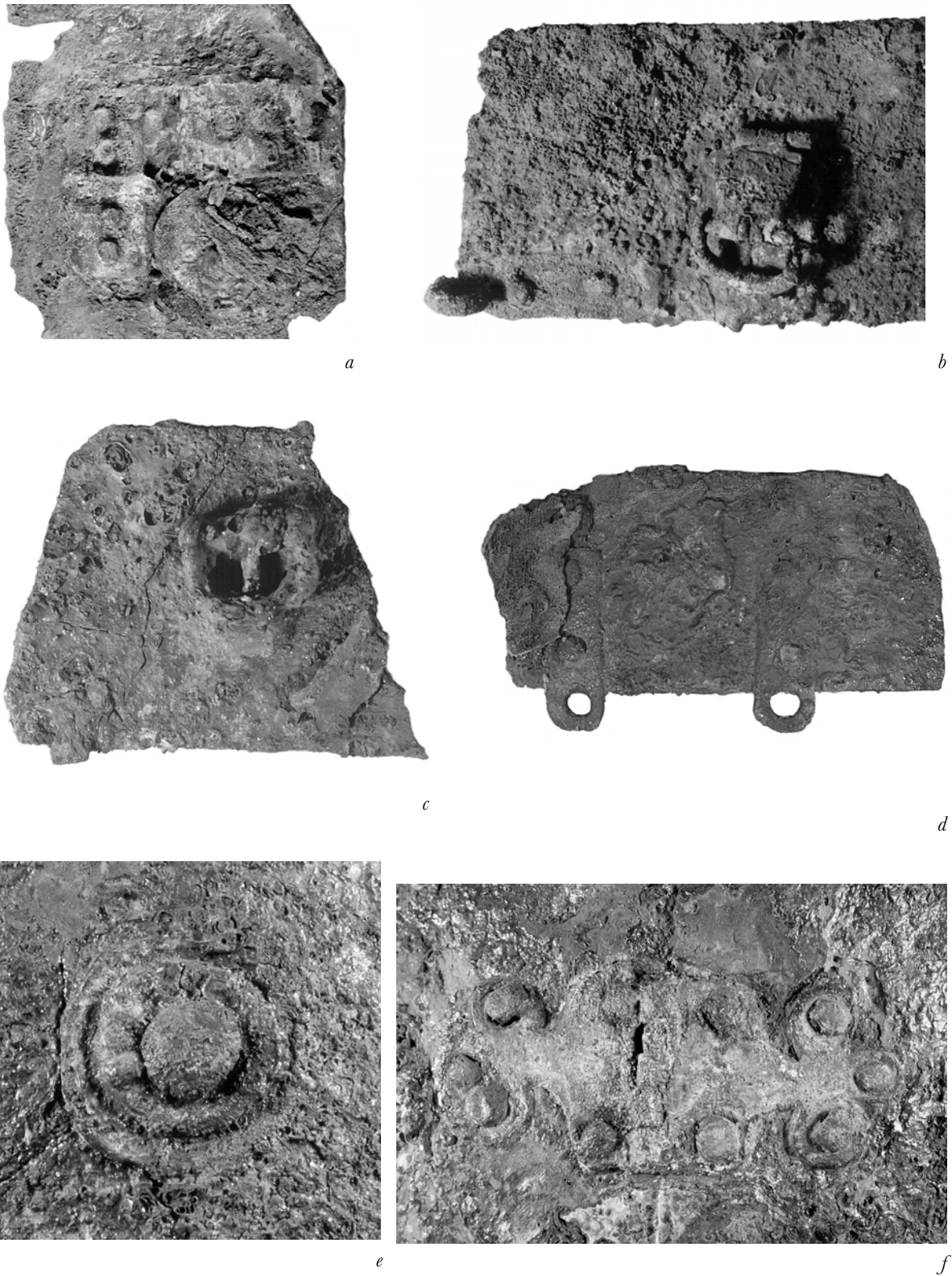


*Fig.5.2 Reconstruction of the Corbridge Hoard (illustration Peter Connolly)*

consisted of three large plates, again joined to each other by means of lobate hinges, and with their centrally-placed leathering rivets usually adorned with decorative bosses. They differed in form between the various sub-types, although understanding of these differences is complicated by the fact that there had evidently been some switching of shoulderguards amongst the Corbridge Hoard cuirasses.<sup>5</sup> The Type A upper shoulderguard was quite narrow (between 72mm and 84mm) with slightly curving sides, the central plate being broader than those to the front or rear (which tapered from 72mm to 60mm on Cuirass 2).

Type B/C plates, on the other hand, had a more distinctive shape. The front and back plates tapered slightly (from 76mm to 66mm on Cuirass 5), but the central plate broadened to a point (up to 94mm wide) which, to judge from the evidence of the same Hoard cuirass, faced inwards.<sup>6</sup>

Sets of four lesser shoulderguards were attached by the three leathers to the upper shoulderguard and ranged between 50mm and 56mm in width (sets tending to be of the same width). These were riveted to the leathers along their inner edges, with one rivet for each leather and each set of rivets was protected from above



*Fig. 5.3 Details of Corbridge Hoard armour showing a) a lateral fastening, b) an external vertical fastening buckle, c) internal hingeless buckles, d) vertical fastening loops from the Type C backplate, e) a decorative leathering rosette washer, f) a lobate hinge. Photos M.C. Bishop*



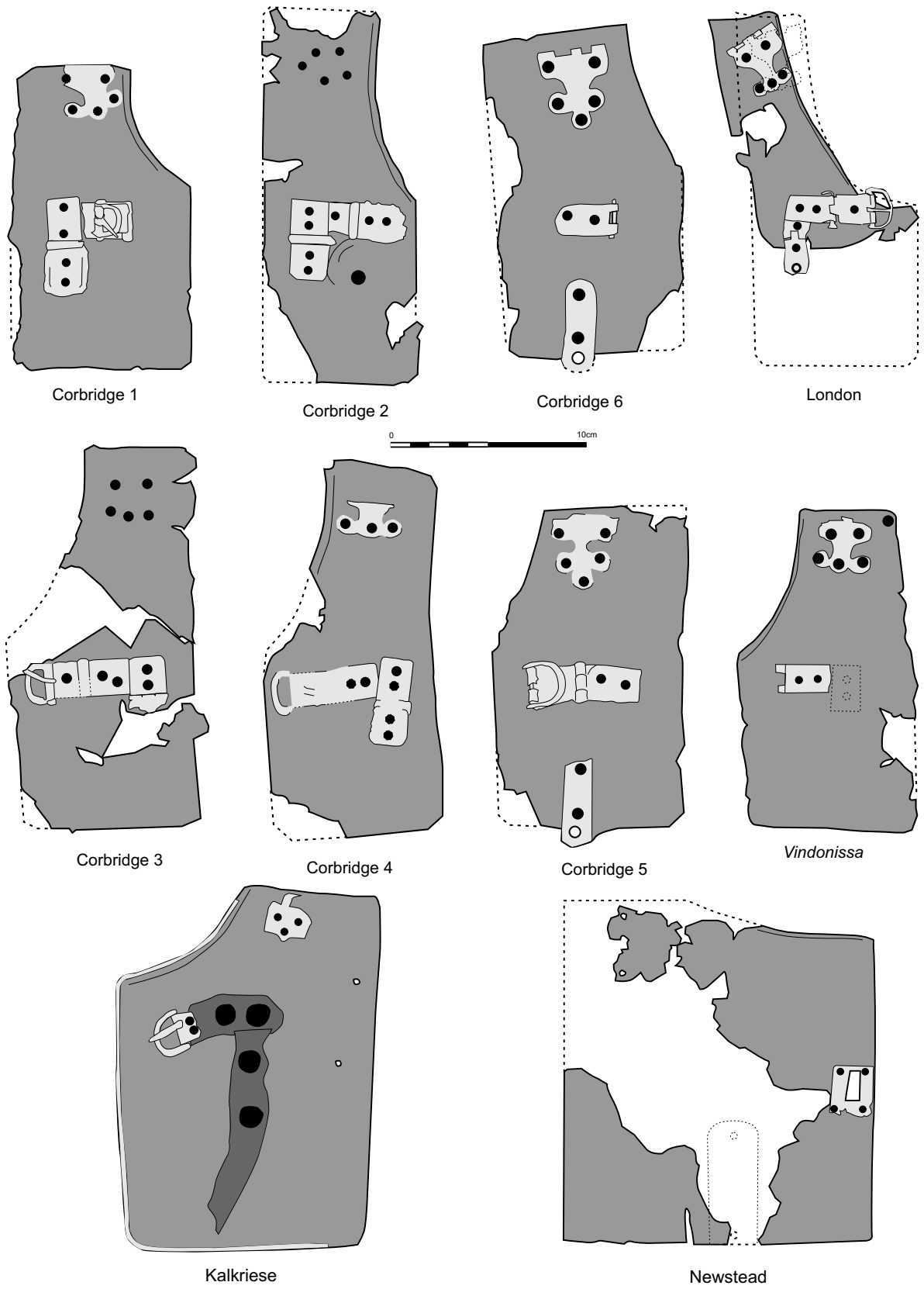


Fig.5.4 Corbridge-type breastplates (with Kalkriese and Newstead examples for the purposes of comparison). Scale 1:3

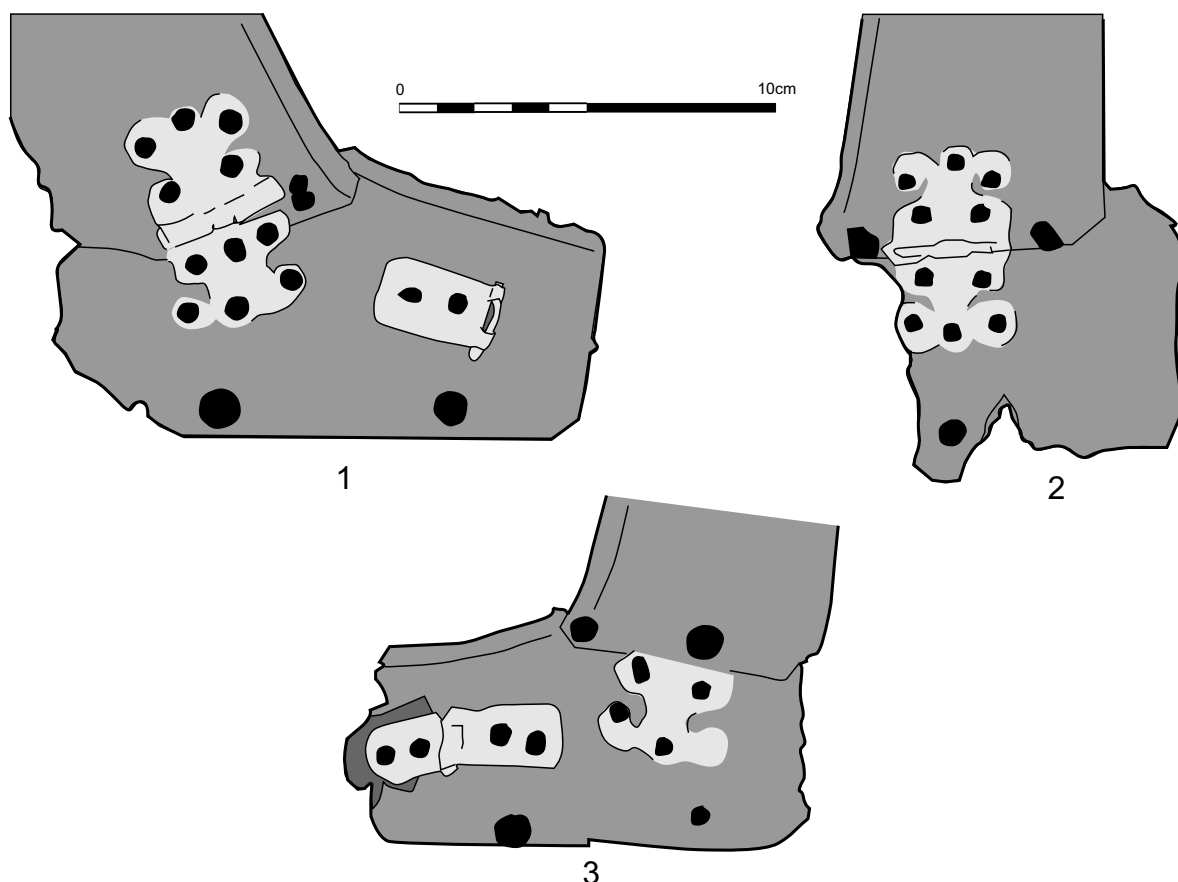


Fig. 5.5 Riveted repairs between collar plates and backplates from the Corbridge Hoard: 1. Cuirass 4, 2. Cuirass 2, 3. Cuirass 1. Scale 1:2

by the neighbouring plate. Most of the sets of lesser shoulderguards in the Hoard were very fragmentary, but it seems that the inner two plates were longer than the outer two, rather than there being a gradual reduction of length over the four of them.<sup>7</sup>

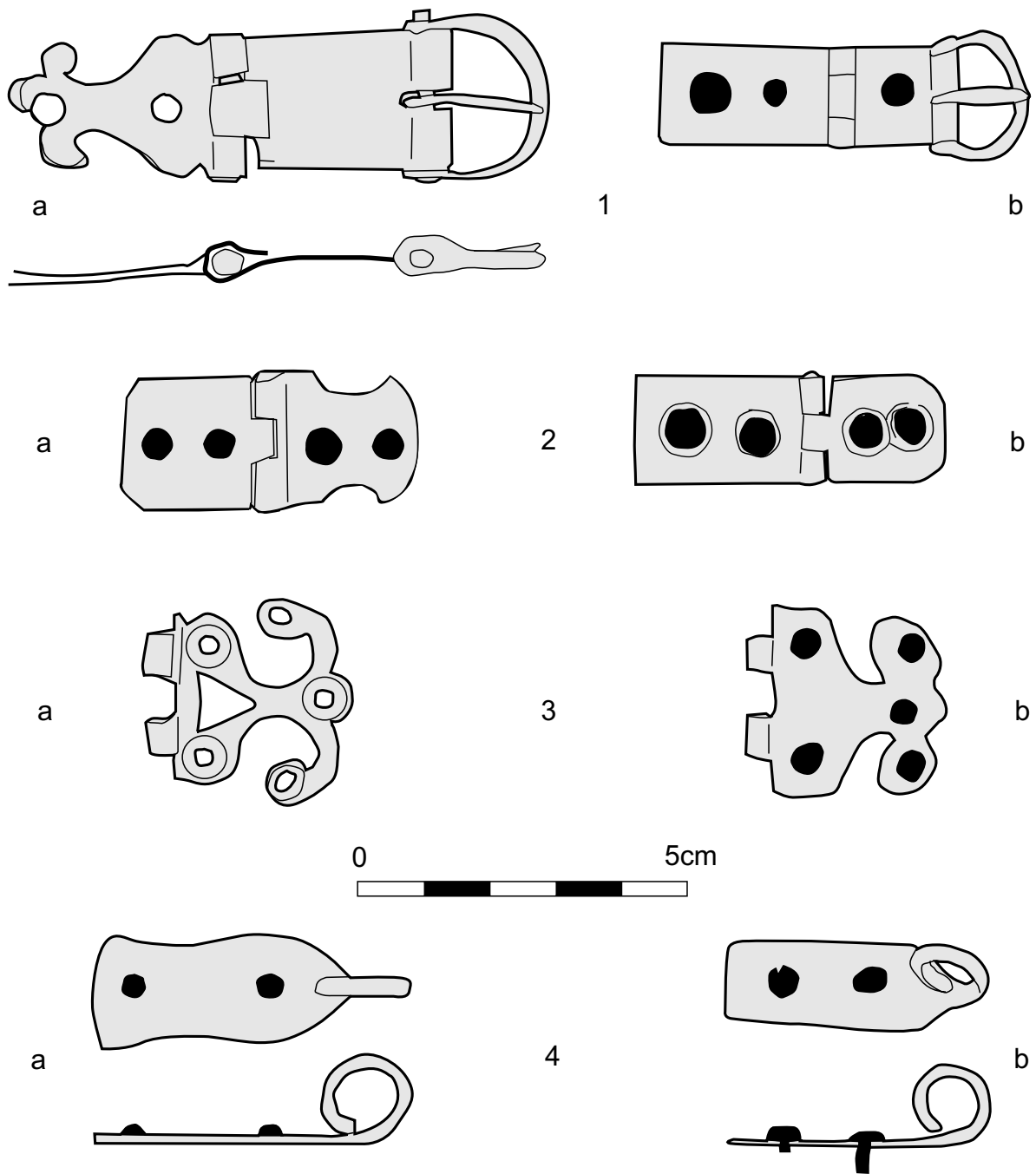
The few examples of plates belonging to upper units that can successfully be measured generally have a thickness of at least 1mm.<sup>8</sup> In at least one case, extra thickness was given to a mid-collar plate by doubling it.<sup>9</sup> Girth hoops, on the hand, seem to have been thinner (those from *Vindonissa* being 0.7mm<sup>10</sup>), which will have had implications for the overall weight of the cuirass if this were generally applied.

It is probably worth emphasising that what are perceived as differences between sub-types may in fact, like some supposed helmet types,<sup>11</sup> be due to differences between armourers. This is especially true of the difference between subtype B (with copper-alloy vertical fasteners) and C (where the same items were positioned slightly differently and made of iron).

The cuirasses in the Corbridge Hoard had either seven or eight girth hoops (so 14 or 16 plates), the lowest two of which did not have fasteners. The others all

had pairs of tie loops, one at either end of each plate. These tie loops were of copper alloy (*orichalcum* whenever they have been analysed: Plate 1), attached to the girth hoop by means of two rivets, and were set back from the edge of the plate, near its lower edge. They were usually mounted horizontally, although some were set at a slight angle for no obvious reason. They were secured by means of a leather lace tied across two neighbouring loops. Robinson pointed out that a single lace (as proposed by von Groller) run through all adjacent loops would permit too much movement in a cuirass; a further argument against von Groller's suggested method is obviously that one cut would loosen all girth hoops in one go.<sup>12</sup>

The upper girth hoops were slightly scalloped along the top edge, corresponding with the armpit area, and the upper edges were thickened by upsetting or rolling. The same was done to the lower edge of the bottom plate of each set of girth hoops and Robinson (almost certainly correctly) deduced that this was for the comfort of the wearer, helping prevent exposed sharp edges digging in.<sup>13</sup> Type A cuirasses had their upper and lower units joined by means of buckles and straps,



*Fig. 5.6 Decorated shapes of fittings, rarer (a) and more common (b). Scale 1:1*

B/C using hook and eye vertical fasteners. For the type A, the front fasteners (one on either top girth hoop) were of copper alloy and usually hinged, whilst the rear fittings were internal (and the hingeless buckle fittings entirely of iron).<sup>14</sup>

**THE FITTINGS**

The copper-alloy fittings that adorned the cuirass consisted of hinged buckles, hinged strap fittings,

lobate hinges, tie loops, embossed washers, and vertical fastening hooks. These were not only found in a range of forms, but also were decorated in a variety of ways. They are also the most common archaeological manifestation of this type of armour and it is certainly tempting to see them as the major weakness of the cuirass (see below, p.84). Each element of the body of the hinged fittings (the hinged strap and buckles, from the breast- and backplates, and lobate hinges) was

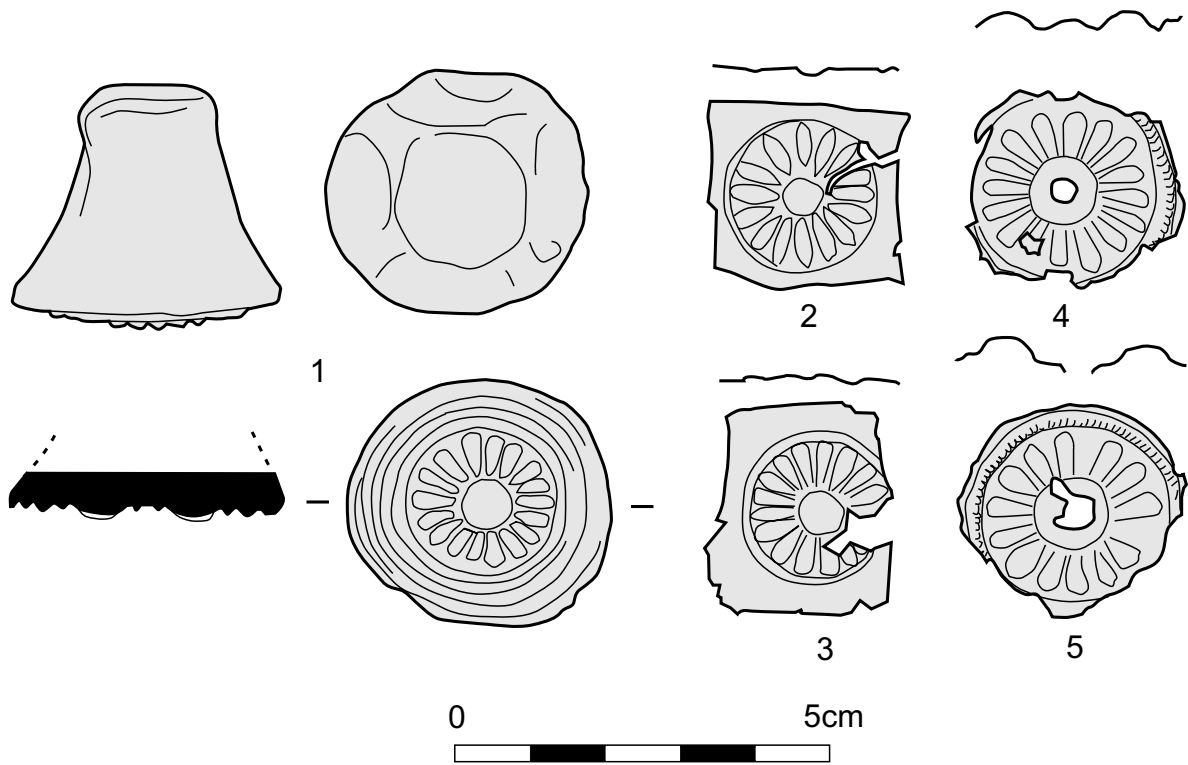


Fig. 5.7 A stamp for embossing decorative washers (1), half-finished washers (2–3), and the finished product (4–5). Scale 1:1

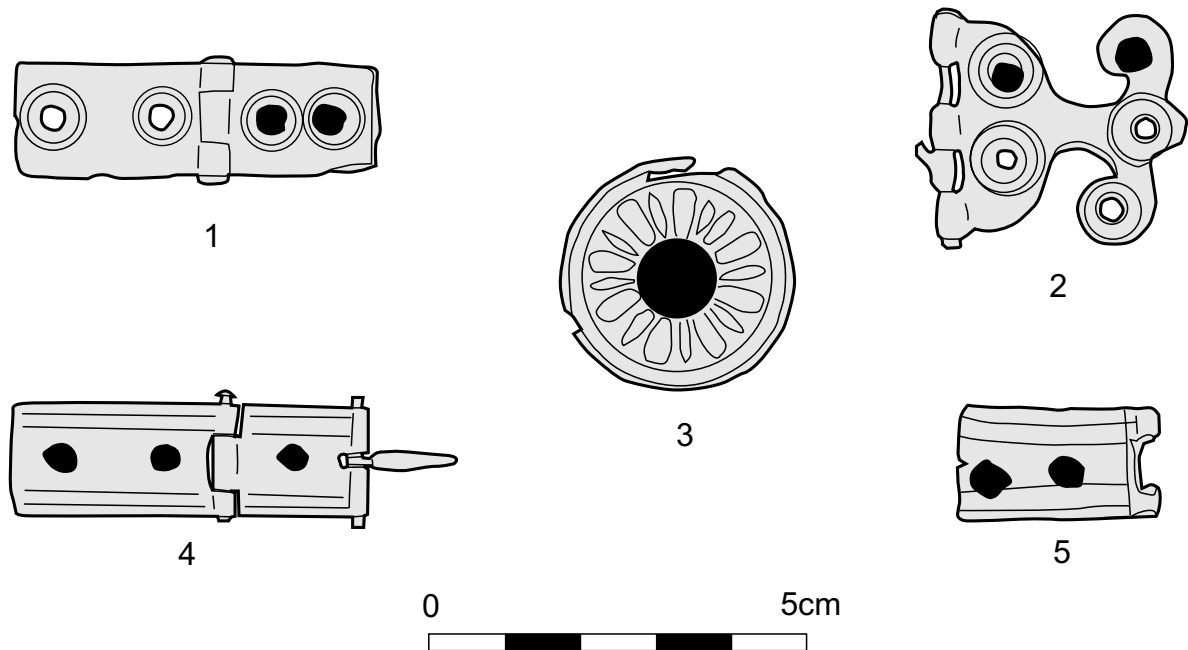
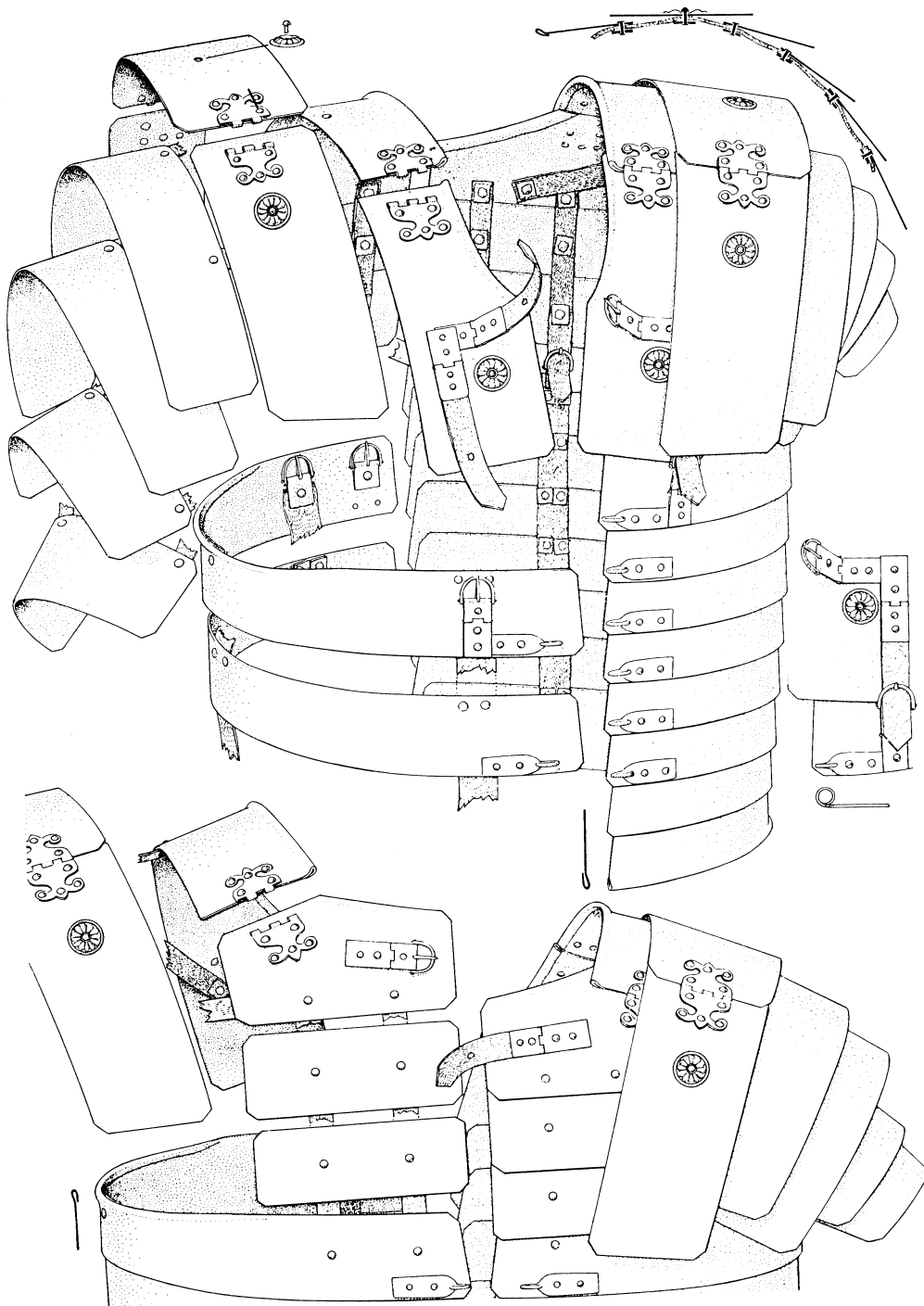


Fig. 5.8 Types of decoration applied to Corbridge-type fittings, stamped (1–2), embossed (3), and scored (4–5). Scale 1:1

usually made from a doubled-over sheet of copper alloy (folded longitudinally about the hinge). Occasionally, single-thickness sheet is found or, more commonly, partially doubled-over fittings (with, perhaps, just an essential doubling, such as the

loop for a hinge). Tie loops and vertical fastening hooks, on the other hand, were made either from rod flattened out at one end, or sheet rolled up at the other.<sup>15</sup>



*Fig.5.9 Reconstruction of the Corbridge type A cuirass (Peter Connolly)*

Decoration took a variety of forms. First there was elaboration of the basic shape. Here we might include particularly well-proportioned or triangular-pierced lobate hinges, ‘coke bottle’-shaped tie loops, or even hinged fittings with fixed lobate components (Fig. 5.6). Robinson felt that some sort of typological evolution was visible in lobate hinges,<sup>16</sup> but many of the supposed differences could be re-

gional and his suggestion that those hinges with triangular apertures were the earliest form would appear to be countered by the fact that this trait was later continued in the larger hinges of the Newstead type (see below, p.50). Thus, without clear dating evidence, statements about the likely evolution of the forms of fittings on purely subjective or aesthetic grounds tend to be a waste of time.

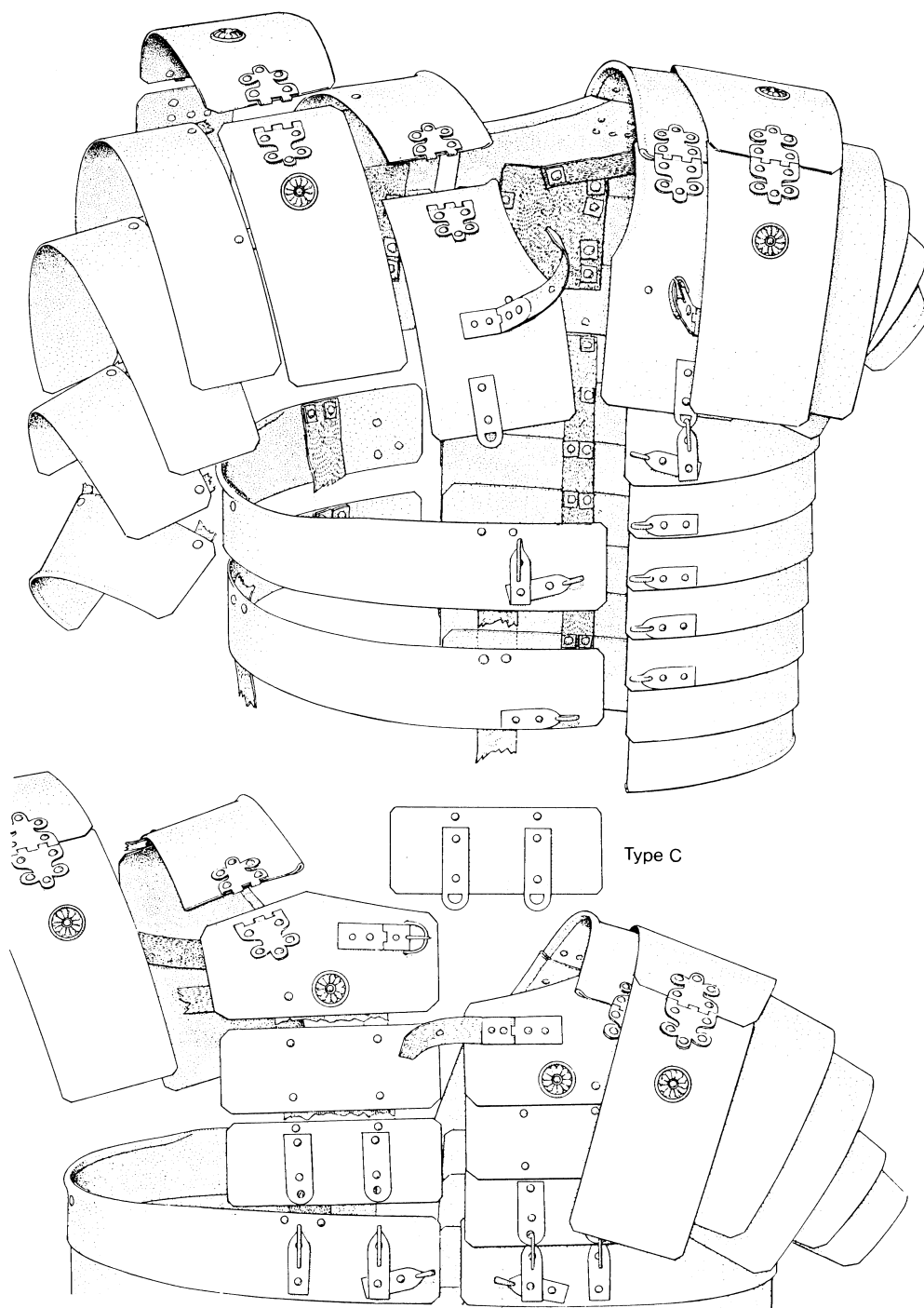
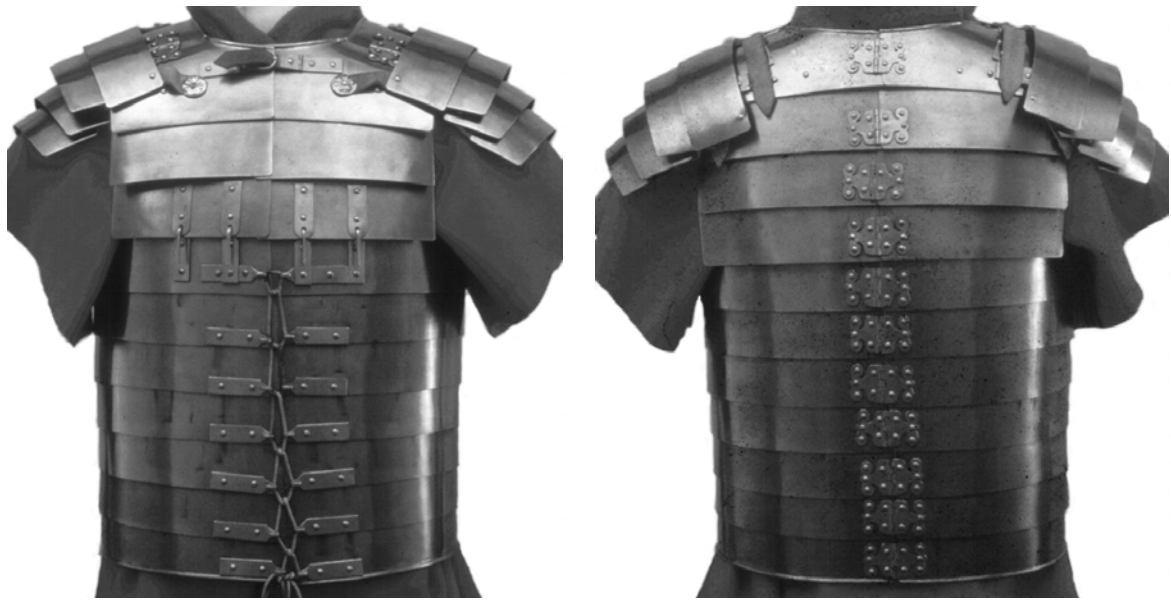


Fig.5.10 Reconstruction of the Corbridge type B and C cuirasses (Peter Connolly)

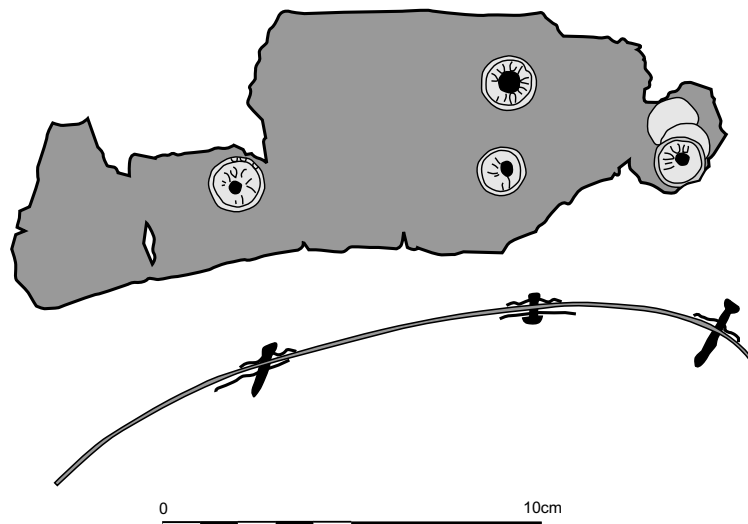
The second type of decoration was moulded (or, strictly speaking, beaten) during fabrication, and this mainly concerns the rosette patterns on decorated washers (Fig.5.7). Most examples of these decorative bosses consisted of a slightly domed disc with embossed petal relief, usually with a small raised (often beaded) border, but the bosses on the type B/C cuirasses in the Corbridge Hoard had broad flat borders.<sup>17</sup>

Finally there are a range of decorative marks applied after construction but (presumably) before the items were attached to the cuirass for which they were intended. This last group includes stamped concentric rings around rivet holes and parallel scored lines on hinged strap and buckle fittings (Fig.5.8).

The rivets of the copper-alloy fittings seem usually to have had small domed heads when new, but could be



*Fig.5.11 Robinson's early attempt at reconstructing the Corbridge Hoard finds*



*Fig.5.12 Upper shoulderguard (with unusual paired riveting) from Chichester. Scale 1:2.*

replaced by a variety of forms (see below, p.85). Likewise spindles for buckles and hinges were neatly finished with small domed terminals when new. Roves were very rarely used on the Corbridge Hoard sets (in the few instances where they were found they were square): the normal practice seems to have been to peen the rivet to a broad flat head once it had passed through the internal leather, but examples of Corbridge type armour from Chichester show the use of ovoid roves.<sup>18</sup>

**RECONSTRUCTION**

The Corbridge Hoard provided all the information Daniels and Robinson needed to reconstruct the

Corbridge type of cuirass, arguably best known from Peter Connolly's reconstruction drawings<sup>19</sup> (Figs.5.9–10). Even so, Robinson's early efforts were overly influenced by the mistaken attempts of earlier, less fortunate reconstructors (Fig.5.11). The painstaking reconstruction of the artefacts from the Corbridge Hoard was by no means an easy task, and it is clear from the correspondence between Daniels and Robinson that the process of discovery and understanding was a gradual one.<sup>20</sup> Nevertheless, at the end of it, there was little about the cuirass units in the chest that was not clear or at least permit of an educated guess.

However, it is easy to lose sight of the fact that the Corbridge finds were *not* the result of a pattern that

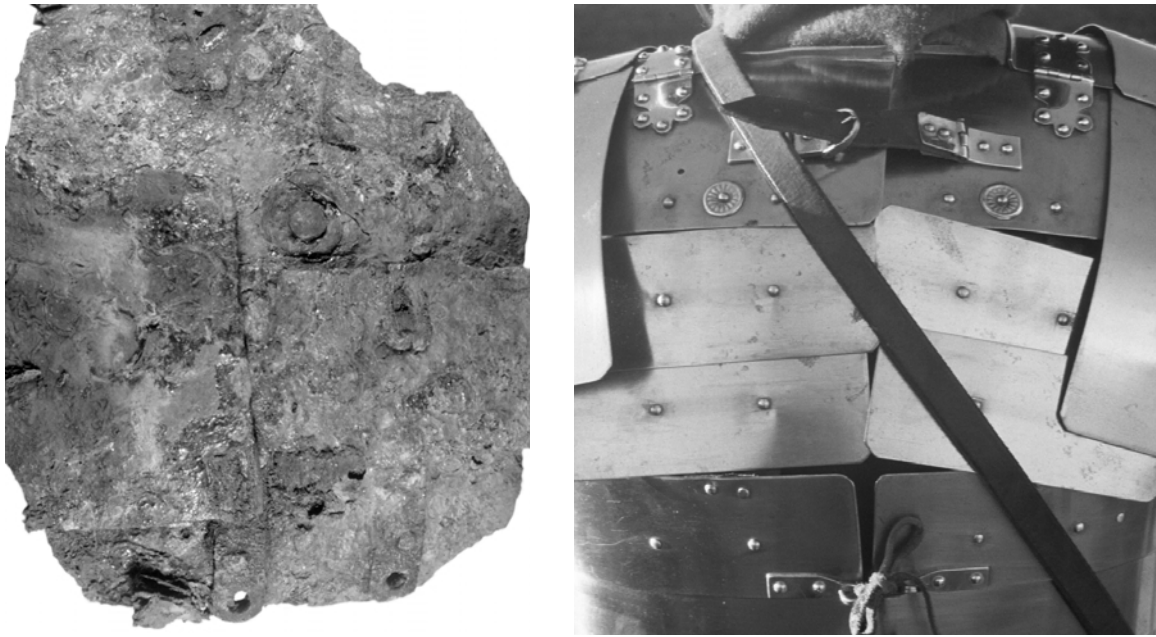


Fig. 5.13 Wrongly overlapping backplates on a) the Corbridge Hoard (Cuirass 5) and b) a modern reconstruction. Photos © M.C. Bishop

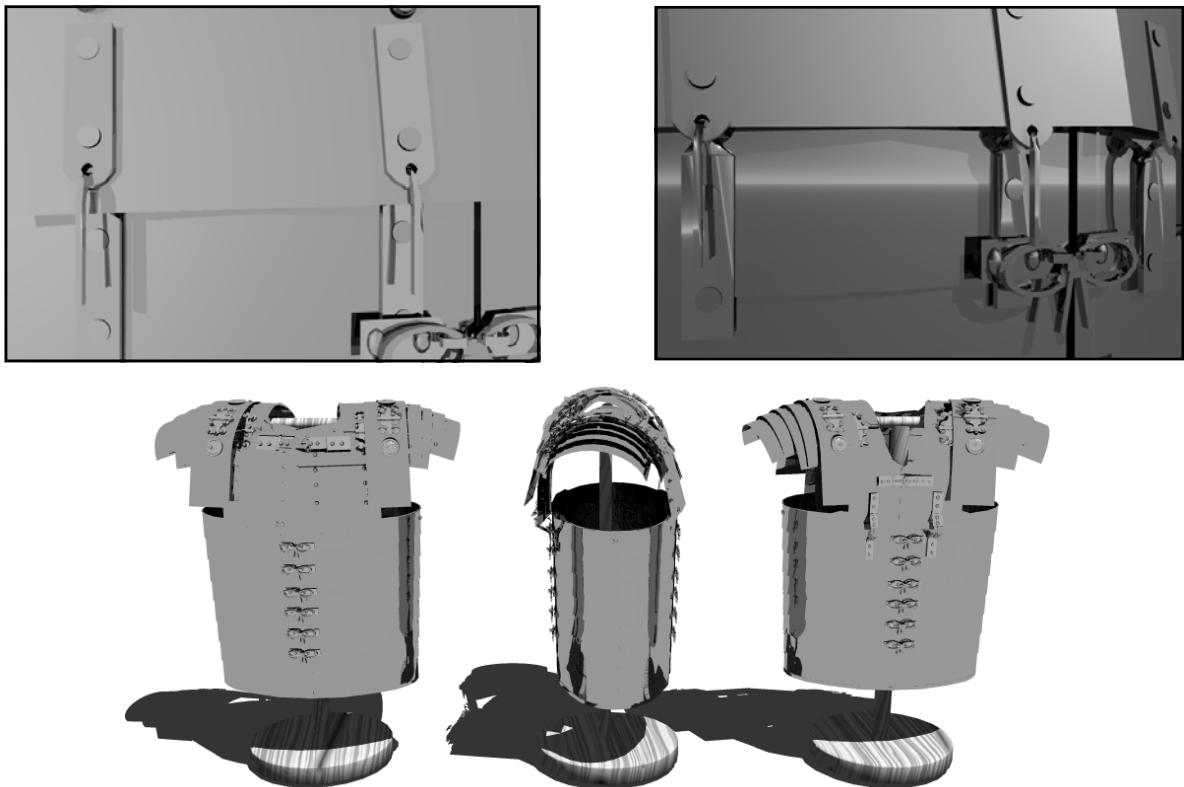


Fig. 5.14 Reconstruction of the Corbridge type A cuirass, with details of B (top left), and C (top right) variants

was distributed to army units across the empire for slavish copying, with even the pieces in the Hoard showing marked variety amongst them. Once other finds are studied, it is clear that the Corbridge type, as

such, was in fact quite a broad category. An upper shoulderguard from Chichester, for example, shows a curious use of double riveting to secure the leathers,<sup>21</sup> and this is quite clearly a manufactured feature, not a



botched repair (Fig.5.12). Likewise pieces from Chichester show a penchant for oval or lenticular internal leathering washers, whilst at Corbridge (where used) they are exclusively square or rectangular.

One of the weaknesses of the Corbridge type of armour was the use of three overlapping backplates. The Corbridge Hoard showed how at least one cuirass had the central plate overlapping the top of not only the plate below it, but also the one above, a rather hazardous flaw. Modern reconstructions of the Corbridge armour are also prone to this same problem (Fig.5.13). This was far from the only complicating factor with the cuirass and more detailed discussion of the problems particular to the Corbridge type can be found below (p.81ff).

The positioning of tie loops on the girth hoops – frequently some distance from the vertical edge of a plate, implies that some overlap of girth hoops was intended (up to 48mm in some cases) and thus suggesting that a degree of rigidity in the girth hoops was being sought. Many modern reconstructions are worn fairly loosely (even allowing some gape between neighbouring halves of a hoop), but our archaeological evidence suggests that this was not the case in the Roman army.<sup>22</sup>

From Robinson onwards, modern reconstructions have encountered difficulty with the unsatisfactory manner in which the armour sits on the shoulders of the wearer. The natural shape of the human neck and shoulders, with the trapezium muscles forming an angle between the two, means that *lorica segmentata* worn

without any support on the naturally-sloping shoulders will force its breastplates to meet at an angle. This would impose a strain on the copper-alloy hinged buckle and hinged strap lateral fasteners if they were mounted perpendicular to the vertical edges of their plates. That is not evidenced by the artefacts recovered from the archaeological record. Therefore we must conclude that the cuirass was not permitted to repose at this angle and that padding of some kind must have been worn beneath the shoulders in order to raise the shoulderguards and, in so doing, correct the angle between the breastplates (see below, p.79).

The major innovations of the Corbridge type over that of its predecessor, the Kalkriese form, are now obvious, but have not always been so. Decorated bosses have long been known on both Imperial-Gallic helmets and Corbridge-type armour, but it was not clear if both adopted these at the same time, or if one did so before the other. The absence of decorated bosses on examples of Kalkriese armour suggests that this particular feature was borrowed for body armour from helmets.<sup>23</sup> Lobate hinges were not used before the Corbridge type of armour, the forms of hinges on Kalkriese armour being discussed above (p.23). Finally, hinged buckle and strap fittings were much less elaborate on the Corbridge type of cuirass. No examples of tie loops are known from Kalkriese type armour and it is conceivable that these were another innovation of the Corbridge type (see above, p.27).

## COMPONENT LIST

Type:	A	B/C
breastplates	2	2
mid-collar plates	2	2
backplates	6	6
upper shoulderguard plates	6	6
lesser shoulderguard plates	8	8
upper unit leathering rivets	36	36
upper unit leathering washers	36	36
upper unit leathering roves	36	36
upper unit leathers	6	6
lobate hinge-halves	16	16
lobate hinge fastening rivets	80	80
hinged buckle fittings (A)	4	–
hinged buckle fittings rivets (A)	16	–
hinged buckle fittings (B/C)	–	2
hinged buckle fittings rivets (B/C)	–	8
hinged strap fittings (A)	4	–
hinged strap fittings rivets (A)	16	–
hinged strap fittings (B/C)	–	2
hinged strap fittings rivets (B/C)	–	8
hingeless buckles (A)	4	–

hingeless buckle rivets (A)	4	–
vertical fasteners female (B/C)	–	6
rivets to secure vertical fasteners (B/C)	–	6
girth hoop halves (A)	16	–
lower unit tie loops (A)	24	–
girth hoop halves (B/C)	–	14
lower unit tie loops (B/C)	–	20
lower unit leathers	6	6
lower unit leathering rivets (A)	96	–
lower unit leathering rivets (B/C)	–	84
vertical fastening hooks male (B/C)	–	6
rivets to secure vertical fastening hooks (B/C)	–	12
Totals	424	408

## NOTES

- 1 But see p.88 below, where the whole question of half-matching is discussed.
- 2 Chichester: DOWN, 1978, 299, Fig.10.36; 1981, 163, Fig.28,2–4; St Albans: NIBLETT, forthcoming; Longthorpe: FRERE & ST JOSEPH, 1974, 46–7, Fig.25,16; Gamala: Guy Stiebel pers. comm.
- 3 S. Richards, pers. comm. This is a good example of how the construction and testing of replicas can suggest simple solutions to design changes.
- 4 C. Haines, pers. comm.
- 5 ALLASON-JONES & BISHOP, 1988, 100.
- 6 *Contra* ROBINSON, 1975, Pls.491-3 and Fig.180. Cf. ALLASON-JONES & BISHOP, 1988, 39, Fig.45. The upper shoulderguard of Cuirass 6 appears to have been transplanted to Cuirass 1.
- 7 *Contra* ALLASON-JONES & BISHOP, 1988, 100.
- 8 The Bank of England plate, for example, is 1mm thick (pers. obs.).
- 9 The plate comes from Chichester (DOWN, 1978, Fig.10.36) and there is another double-thickness plate published from the same site (DOWN, 1989, Fig.29.3,23).
- 10 I am grateful to E. Deschler-Erb for checking this information for me.
- 11 See BISHOP 1987, 112–14.
- 12 Corbridge leather tie: ROBINSON, 1975, 181; ALLASON-JONES & BISHOP, 1988, 51. Single tie: VON GROLLER, 1901, Textfig.24; arguments against: ROBINSON, 1974, 11.
- 13 ROBINSON, 1975, 177.
- 14 The most obvious examples of internal hingeless iron buckle fittings are to be found on Cuirasses i–iv of the Corbridge Hoard (ALLASON-JONES & BISHOP, 1988, 43–8), together with an example from Ribbissen (ULBERT, 1970, Taf.4,77).
- 15 Single thickness hinged components: UNZ & DESCHLER-ERB, 1997, Taf.33,746 (*Vindonissa*); VON GROLLER, 1901, Taf.XVIII,40–1, 44; (*Carnuntum*); HOFFILLER, 1912, Sl.11,2 (Sisak). Tie loop from rod (unfinished): SCHÖNBERGER, 1978, Taf.21,B117 (Oberstimm); from sheet: ALLASON-JONES & BISHOP, 1988, Fig.94,232 (Corbridge).
- 16 ROBINSON, 1975, 177, Fig.182.
- 17 Other examples of bosses with broad borders include one from *Vindonissa* (UNZ & DESCHLER-ERB, 1997, Taf.31,656).
- 18 Corbridge Hoard: ALLASON-JONES & BISHOP, 1988, Fig.49; Chichester: DOWN, 1978, Fig.10.36,iii–iv. There are some roves amongst the *Carnuntum Waffenmagazin* material, but none that are on indisputably Corbridge type armour. Roves are best viewed with the benefit of 20/20 hindsight: they were seldom spotted during the preparation of the Corbridge Hoard report, largely because the underlying leather (which is, of course, mineral-replaced, and thus looks like iron) tends to mimic the shape of an overlying rove. Connolly's drawings of Robinson's reconstructions (this volume, Figs.5.8–9) suggests they were universally employed, but the Corbridge Hoard clearly shows them to be exceptional, not the norm. Again, their use was possibly down to the whim of the individual armourer.
- 19 Reproduced here in the slightly modified form as incorporated in the Corbridge Hoard report (ALLASON-JONES & BISHOP, 1988, Figs.23–4).
- 20 ALLASON-JONES & BISHOP, 1988, 97–100.
- 21 Although see below, p.72 for Michael Simkins' ingenious alternative explanation for this piece.
- 22 ROBINSON (1975, 177) comments on this overlap. It varies between 26mm and 48mm (measured from the vertical edge to the back of the loop) on the lower units of the Corbridge Hoard on Cuirasses i, ii, & v, all of which are right-hand side sets: this implies that all of the lower units in the Hoard indicate that the left side overlapped (i.e. sat on top of) the right (not right over left, as Robinson thought: *loc. cit.*). However, a plate from *Carnuntum* (VON GROLLER, 1901, Taf.XVIII,35 is from a left-hand set and its loop is set in 16mm implying a right-over-left overlap in this case. It is difficult to divine hard-and-fast rules with so little data from which to work: there may be no greater significance than that the preference of the armourers at Corbridge was different to their counterparts at *Carnuntum*.
- 23 External leather riveting washers appear to be purely decorative in purpose and absent on all Kalkriese, some Corbridge, and most Newstead examples where such rivets are identifiable.

## Chapter 6: The Newstead Type

### EVIDENCE

The Newstead form of segmental body armour was first recognised (and, indeed, named) by Robinson,<sup>1</sup> as a result of his work on the Corbridge Hoard.<sup>2</sup> Until then, it had always been assumed by scholars that there was just one type and every effort went into reconstruction using components from all the possible variants unwittingly. However, detailed study of the Corbridge find, feasible thanks to the comparatively well-preserved nature of the armour in the chest, made it obvious that the pieces found at Newstead at the beginning of the 20th century did not belong to the same type, hence Robinson's coinage of a new name for this form.

It is now known that the first fragments of Newstead-type armour were found as far back as 1899, when the *Waffenmagazin* was excavated in the legionary base at *Carnuntum* (Fig.6.1).<sup>3</sup> Although there has been much debate about the nature and date of that assemblage, it has many characteristics of the Antonine period, not least the presence of both Corbridge- and Newstead-type cuirasses (although the identification of the Newstead components was unclear until the first Carlisle plate was found more than 90 years later – Appendix A). Convincing arguments as to the date of the find must depend upon a) the assumption that the integrity of the deposit was largely intact and b) external reference to comparable well-dated objects. Nevertheless, the 2001 Carlisle find of Corbridge and Newstead-type material in contemporary contexts does little to detract from an Antonine date.<sup>4</sup> At *Carnuntum*, the Newstead-type cuirasses were represented by large (up to 74mm wide) lobate hinges and girth hoops fastened by cast copper-alloy rings. A large floral boss, 28mm in diameter and mounted on an iron plate, may also represent the decorative head of a leathering washer.<sup>5</sup>

The type-find itself was discovered in 1905 when James Curle was excavating in the well within the headquarters building at Newstead.<sup>6</sup> Amongst material that included fragments of helmets and armguard (see below, Chapter 8) were the components of one upper (right-hand) unit of a segmental cuirass (Fig.6.2). Once again, there was every indication of an Antonine date for the deposit, which seems to have occurred upon the abandonment of the base.<sup>7</sup> Although now incomplete (the upper shoulderguard and portions of the lower shoulderguards are missing), most if not all of this unit appears to have been present when deposited. Although fragmentary, the backplate can be

reconstructed as having been 230mm high and at least 146mm wide (probably nearer 180mm originally). The breastplate is more problematic, but it was at least 160mm high and probably close to that in width. Both the backplate and breastplate were about 1mm thick and rather crudely manufactured (few genuinely straight edges were evident). So far as it was possible to tell, the lesser shoulderguards were 75mm, 65mm, 55mm, and 50mm wide respectively, and equally roughly made.

Soon after this, various fragments (including girth hoops and pieces of what was probably a backplate) were found during excavation of a burnt deposit near the *praetorium* at Zugmantel (Germany) in 1906 (Fig.6.3).<sup>8</sup> This material was known to Robinson and provided his evidence for the deepening of the lowest girth hoop, since this is the only find so far to include indisputable remains of this type of plate. The broadest of these, 110mm high, has a rolled edge and thus almost certainly represents a lowermost plate. The deposit – which it is assumed dates to the abandonment of the site in AD 259/60 – included not only portions of overlapping girth hoops, but also part of what was probably a backplate. Instead of the more usual copper-alloy-lined rectangular aperture, this had a hexagonal (or, more correctly, sub-rectangular) mount near one edge, secured by four rivets and with a hole punched through both the fitting and the underlying iron plate, as well as a large (35mm diameter) flat-headed copper alloy stud, apparently a decorated leathering rivet. A length of the rolled edge of the neck-opening survives at the top of the backplate.

Parts of another upper unit were found in 1917 on the Weinberg at Eining (Germany) (Fig.6.4).<sup>9</sup> Consisting of a backplate (245mm high and 170mm wide), mid-collar plate, and lesser shoulderguards (as well as a few possible fragments of armguard), the find was in good condition when recovered, in many ways comparable to that of the Newstead armour. Apart from slight differences in size, the two sets of armour are remarkably similar, not only in form but also in content.<sup>10</sup> Significantly, this find does not appear to have been known to Robinson (or Curle or Poulter). This is the latest of the Newstead-type finds of *lorica segmentata*, coming from a temple site with an inscription that provides a *terminus post quem* of AD 229.

No further noteworthy finds occurred until 1989 at Carlisle, when a fragmentary backplate was identified (Fig.6.5). Found in a 4th-century (and thus probably residual) context near Tullie House Museum, this plate

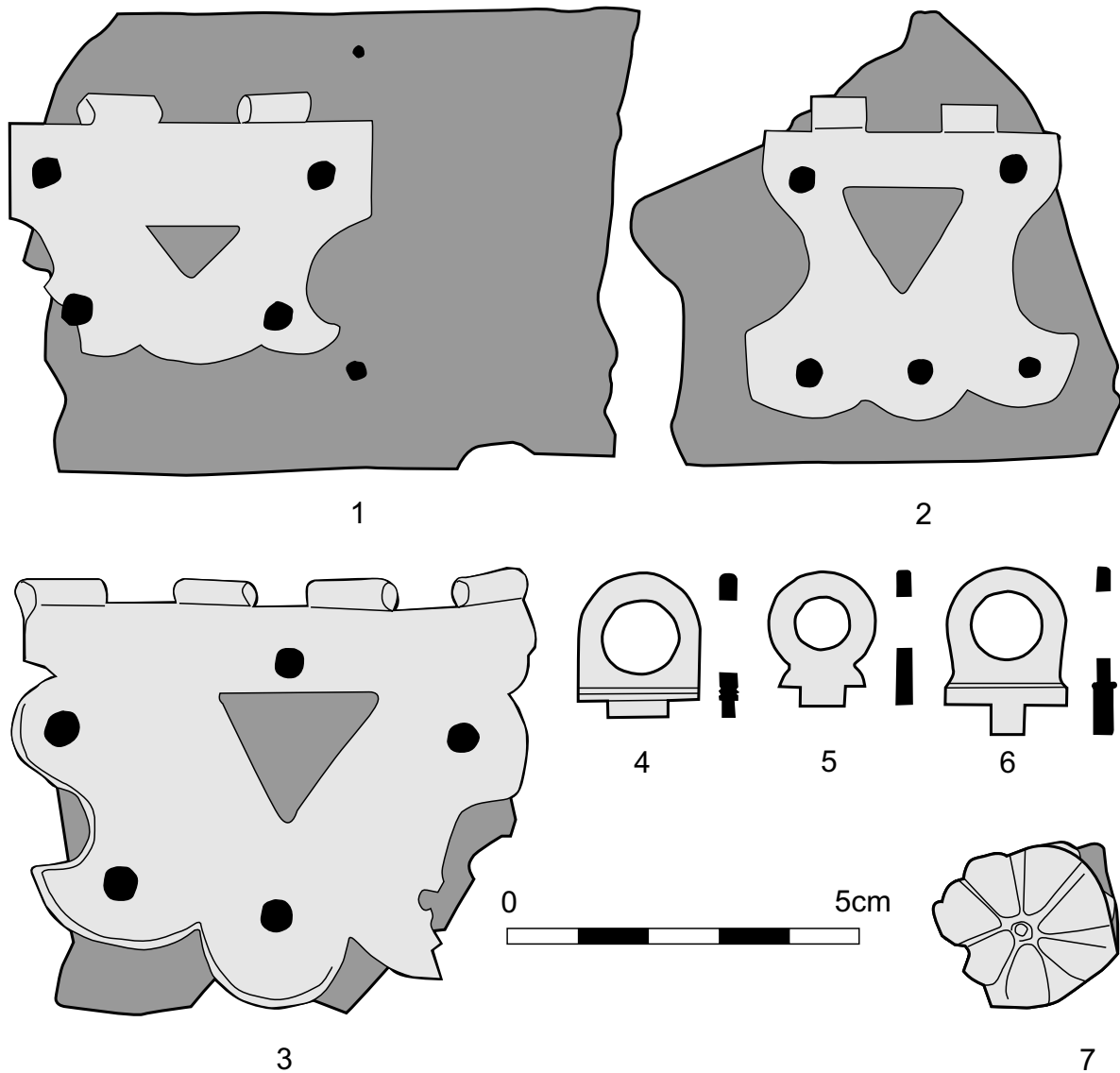


Fig. 6.1 Finds of Newstead-type components (1–3 lobate hinges, 4–6 girth hoop tie rings, and 7 a boss) from Carnuntum. Scale 1:1

occasioned some interest when it was first published, not least because it bore a large lobate hinge of the same type found in the *Waffenmagazin* at *Carnuntum*. Identifying the object as a backplate, Caruana suggested that it had originally been riveted and then subsequently fitted with the lobate hinge it still retains.<sup>11</sup>

During the second half of the 20th century, finds of segmental armour began to be made north of the Danube, in contexts deriving from the mid-2nd-century Marcomannic Wars, most notably from Iža (Slovak Republic).<sup>12</sup> Although limited in number, they contained recognisable fragments of Newstead-type armour.

In 2001 a further discovery was made at Carlisle. Although to some extent overshadowed by the more spectacular finds<sup>13</sup> of sections of scale armour and

complete articulated armguards (see below, Chapter 8), the military equipment from the area around the headquarters building of the *castra* included a more complete backplate and what appeared to be part of an upper shoulderguard. Once again, the find dated to the first half of the 2nd century AD and contained pieces of both Corbridge and Newstead types.

The years 2000–1 also saw important finds of Newstead-type armour from Stillfried,<sup>14</sup> in the form of two non-matching half-sets of girth hoops, and León (Spain),<sup>15</sup> including fragments of girth hoop and at least one lobate hinge.

Finally, a single unattached lobate hinge of the kind found at *Carnuntum* was recovered during one of the various excavations at Great Chesters (England) between 1894 and 1952.<sup>16</sup>

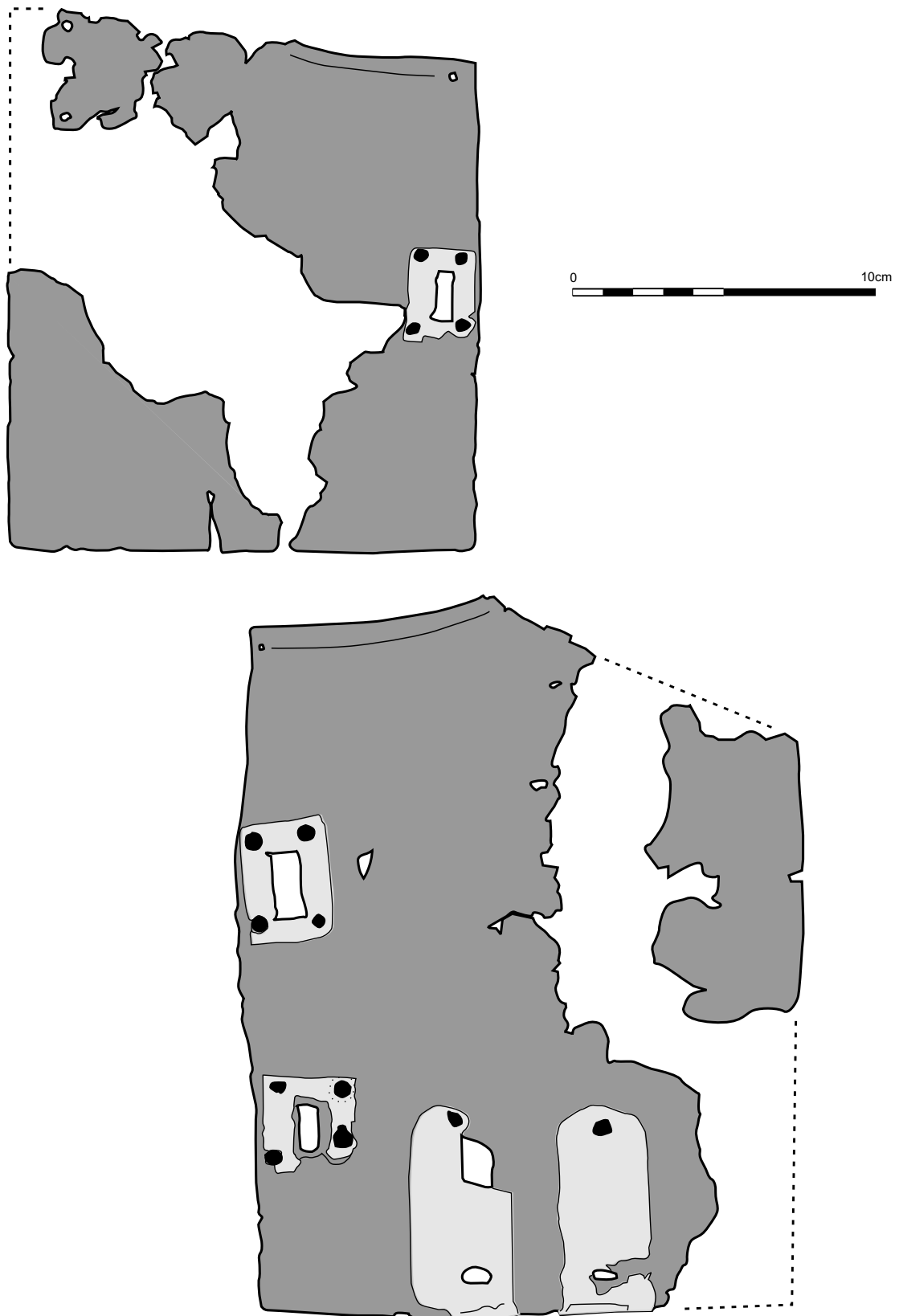


Fig.6.2 The Newstead breast- and backplates (cf. Fig.1.2). Scale 1:2

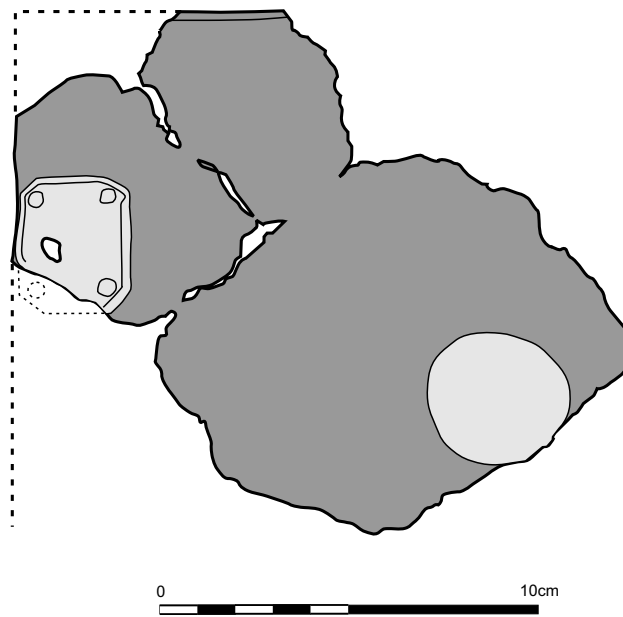


Fig. 6.3 Part of a breastplate from Newstead-type armour from *Zugmantel*, with rolled edge to neck opening (top), octagonal male lateral fastener (centre left), and disc-headed leathering rivet (bottom right). Scale 1:2

The finds of Newstead-type armour so far known are almost exclusively 2nd- or 3rd-century in date, with the Eining find appearing to date after 229<sup>17</sup> and the *Zugmantel* pieces before AD 259/60. The Carlisle and *Carnuntum* assemblages, since they contain both forms, indicate an indeterminate period of overlap in use of the Corbridge and Newstead types during the first half of the 2nd century.

## DESCRIPTION

### Breastplate

- Rolled or turned out at the neck; pierced once, but no binding
- Attached to the mid-collar plate with a large lobate hinge
- Fastened laterally by a turning pin attached to one plate passing through a rectangular opening on its twin
- Fastened vertically to the girth hoops by one hole enclosed within a decorative copper alloy fitting (similar to that found on the Corbridge B/C cuirass)

### Mid-collar plate

- Rolled or turned out at the neck; not pierced, no binding
- Attached to the back- and breastplate with large lobate hinges

### Backplate

- Rolled or turned out at the neck; pierced once, but no binding
- Attached to the mid-collar plate with a large lobate hinge
- Fastened laterally by two turning pins attached to one plate passing through rectangular openings on its twin
- Fastened vertically to the girth hoops by two holes enclosed within decorative copper alloy fittings (similar to those found on the Corbridge B/C cuirass)

### Upper shoulderguard

- One in three parts, joined by lobate hinges

### Lesser shoulderguards

- Four: two long, two shorter
- Three leathers (front, top, and back) running to breast-, collar-, and backplates

### Girth hoops

- Seven or eight of them, overlapping right over left
- Ranging from 50-65mm
- Upper six or seven fastened by cast copper-alloy tie rings on one side passing through slots on the other, lowest two left free to be secured by belt
- Uppermost hoops fasten to back- and breastplates by means of two and one hooks respectively

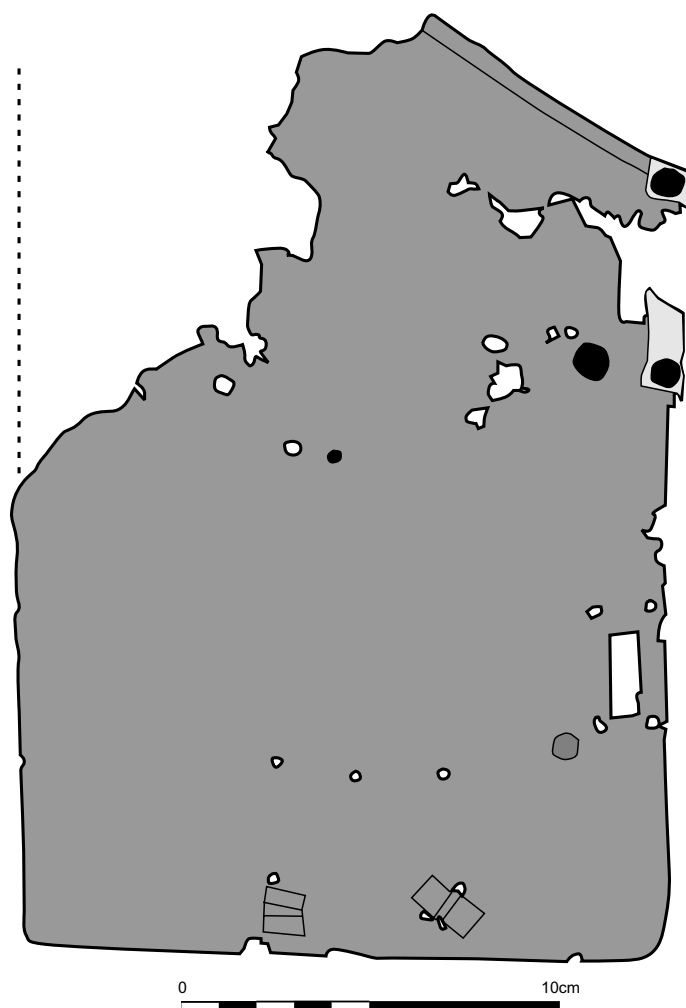


Fig.6.4 Backplate with out-turned neck opening and replacement vertical fastenings from Eining. Scale 1:2

- Three leathers running vertically on each half (front, side, back)

Absolute certainty over the form of the Newstead type cuirass is not currently possible. Unlike the Corbridge type, no one find has been made that provides all the answers. However, enough is now known to offer a reasonably coherent attempt to understand the armour (Figs.6.6) and this can be seen as superseding the present author's previous work on the subject.<sup>18</sup>

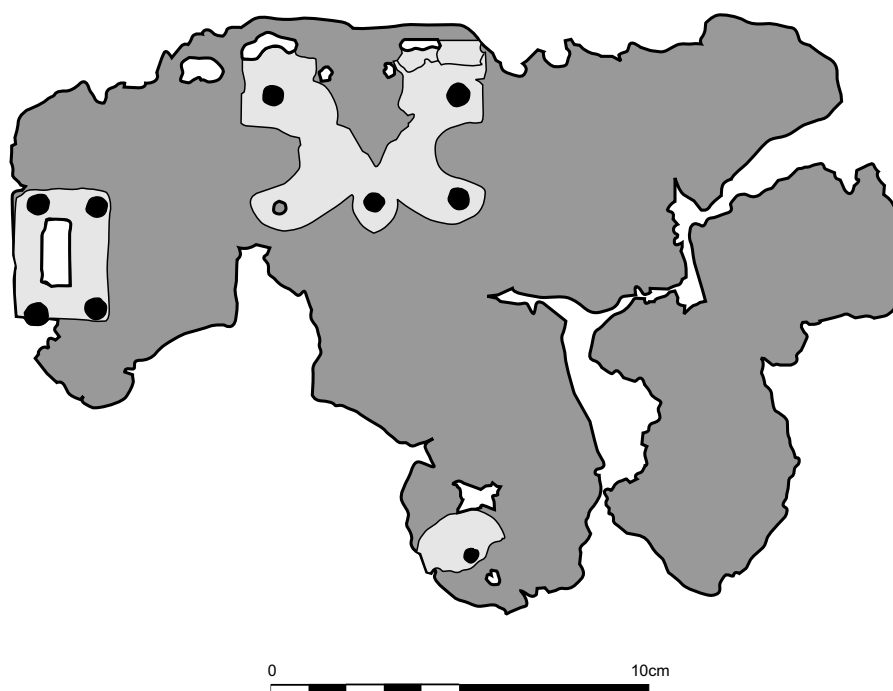
The collar unit consisted of three plates on either side of the neck: the breastplate, the mid-collar plate, and the backplate. The first two fulfilled much the same function as their predecessors on the Corbridge type, but the single backplate replaced the earlier three backplates articulated on leathers (see above, Chapter 5). All three collar plates had an out-turned or, occasionally, a rolled edge at the neck opening.

One breastplate had a single rectangular aperture (surrounded by copper-alloy edging secured by four riv-

ets) in the centre of the edge facing its neighbour, whilst its twin had a subrectangular copper-alloy plate (also held in place by four rivets) around a turning-pin.<sup>19</sup> At the base of each breastplate was an elongated copper-alloy fitting with a rounded top riveted in place and its bottom wrapped under the lower edge of the iron plate. Both this and the underlying iron plate were pierced once by punching (see below, p.95) to receive the front girth hoop attachment hook. A leathering rivet, possibly in the form of a large flat-headed stud, was present near the centre of each breastplate and a large lobate hinge near the top, next to the neck opening. The neck opening was pierced on one plate near the front, above the rectangular aperture.

The inner edge of the mid-collar plate was shaped to the neck, whilst the outer was, to all intents and purposes, straight. The plate was thus broader at the ends than in the middle. A single leathering rivet was located near the centre of the plate, towards the outer edge. At either end were the lobate hinges that joined the plate to the breast- and backplates.





*Fig.6.5 Simplified drawing of the first Carlisle backplate showing large lobate hinge in situ. Scale 1:2*

The backplate was higher than the breastplate and had two rectangular apertures with copper-alloy edging near the side facing its neighbour. Its twin had two subrectangular copper-alloy plates, each around a turning-pin. At the base of each backplate were two elongated copper-alloy fittings, each with a rounded top riveted in place and its bottom once again wrapped under the lower edge of the iron plate, pierced to receive two rear girth hoop attachment hooks. A leathering rivet was present near the centre of each backplate and a large lobate hinge near the top, next to the neck opening. The neck opening was pierced on one plate near the rear edge, above the rectangular aperture.

There were four lesser shoulderguards in each shoulder assembly, two inner larger ones, and two outer smaller ones, each with three leathering rivets near its inner edge (again in imitation of the Corbridge B/C). The upper shoulderguard was probably formed from three plates, resembling the Corbridge examples in that the central plate expanded towards a point.<sup>20</sup> These three plates were almost certainly joined by lobate hinges, with leathering rivets in the middle of each. Both shoulder assemblies were attached to three internal leathers at least 20mm wide (suggested by the width of surviving washers on the Newstead find).

The lower assembly consisted of between seven and eight girth hoops, in two halves. Each of the girth hoops (except the lowest) on one side had a cast copper-alloy ring at the front and the back; the

corresponding plates on the other half had a horizontal rectangular aperture, through which the cast ring fitted. The rectangular aperture was protected by a copper-alloy plate attached to the outside (although, unlike the breast- and back-plates, this fitting did not pass inside the plate) and the Iža girth hoop shows that this plate could in fact cover the whole of the end of the hoop.<sup>21</sup> The girth hoops were carried on three internal leathers (at least 28mm wide to judge from the Carnuntum finds), attached to them by pairs of rivets near the top of each plate. One of the Stillfried half-sets had rectangular roves that secured both leathering rivets once they had passed through the leather. The topmost girth hoop had an upset (thickened) edge which, in at least one case, was bound in copper alloy in the same region that used to be upset and reduced in height on the Corbridge armour. The upper girth hoops were attached to the breastplate by one fastening hook, and to the backplate by two. These vertical fasteners were attached to the inside of the girth hoop and just the hook passed through a hole in the plate, the front fastener being located at the front leathering point. The lowest two plates in each case lacked tie rings, following the precedent set by the Corbridge varieties of the cuirass (presumably being held in place by the wearer's waist belt), and were upset with copper-alloy binding along its lower edge (a feature also noted on a fragmentary over-compressed set from Iža:<sup>22</sup> Fig.6.7). One unusual aspect of the Stillfried half-sets was their use of an inverted vertical



*Plate 1: Corbridge-type hinged fitting and tie loop of orichalcum from Castleford, found uncorroded in a midden deposit. Note the golden finish and slightly more coppery rivet, as well as the junction visible on the loop where the sheet has been rolled. Scale 1:1. Photo West Yorkshire Archaeological Services*



*Plate 2: Trajan's Column (Scene XXVI) showing a legionary wading a river with his armour, sword, and tunic on his shield. Photo J.C.N. Coulston*



*Plate 4: The cut-down Corbridge-type A breastplate found at the Bank of England, London, in 1936. The waterlogged conditions have preserved the original colour of the orichalcum fittings. Note the replacement hinge spindle on the lateral hinged buckle, the dishing around the punched rivet holes, and the rather crude lobate hinge. Scale 1:1. Photo J.C.N. Coulston*



*Plate 3: Underside of the left upper unit of a re-enactors' Corbridge type B cuirass showing replacement leathers. Note how one large sheet of leather has been used for the three backplates, in imitation of Corbridge Hoard Cuirass 5. Photo M.C. Bishop*



*Plate 5: Detail of re-enactor's Corbridge type A cuirass. Photo M.C. Bishop*





Plate 6: Detail of lobate hinges and decorative boss on the upper shoulderguard of a Corbridge type B re-enactors' cuirass. Photo M.C. Bishop



Plate 7: The Alba Iulia figure showing a legionary with a curved rectangular shield, laminated armguard, and composite Alba Iulia-type cuirass. The body armour is depicted with four girth hoops, scale shoulders, and a pair of breastplates. Photo M.C. Bishop

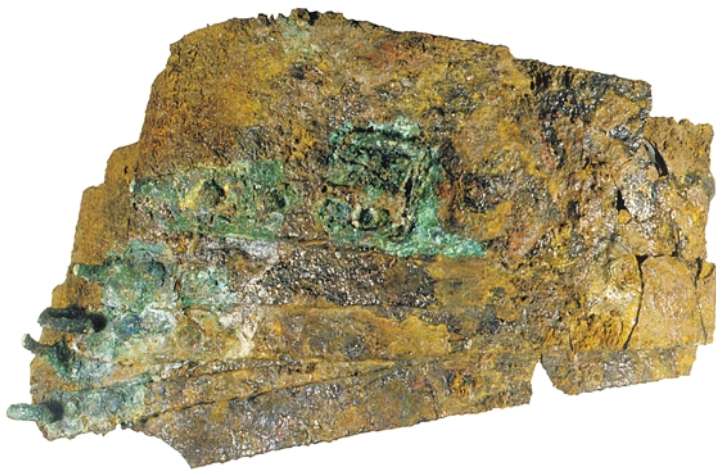


Plate 8: Overcompressed set of seven (of an original eight) girth hoops from the type A Cuirass iv in the Corbridge Hoard. The topmost plate has a flexed vertical fastening buckle just to the right of the tie loop. Scale 1:2. Photo M.C. Bishop

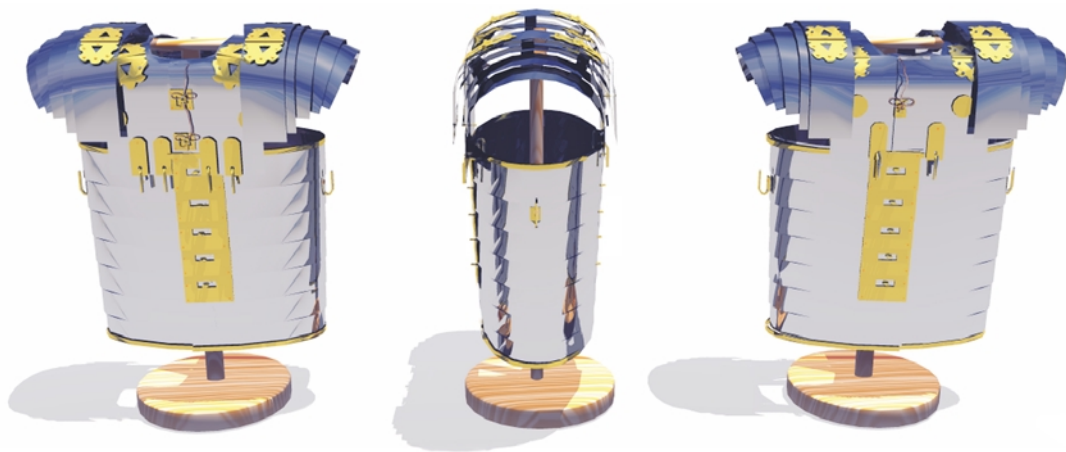


Plate 9: Digital reconstruction of the Newstead type of lorica segmentata incorporating information from the finds at Carnuntum, Newstead, Eining, Zugmantel, Iža, and Stillfried

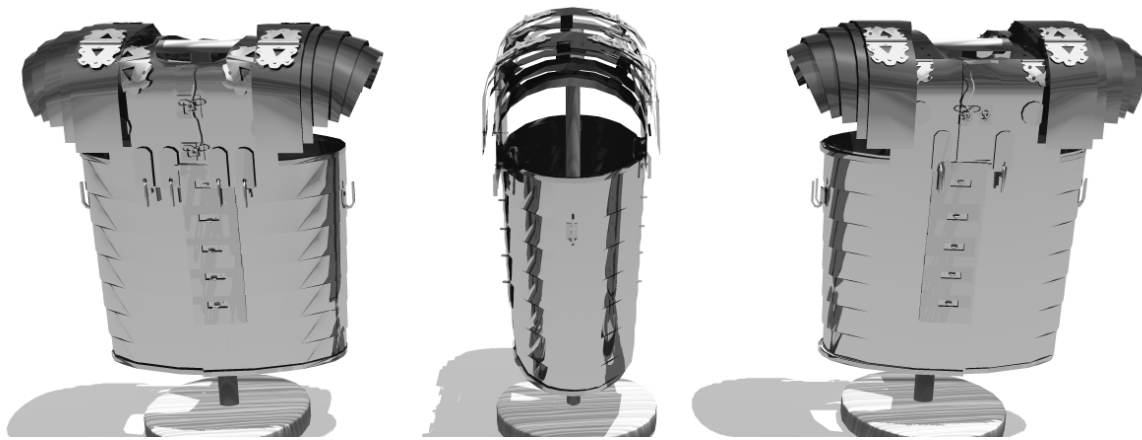


Fig. 6.6 Speculative reconstruction of the Newstead type cuirass

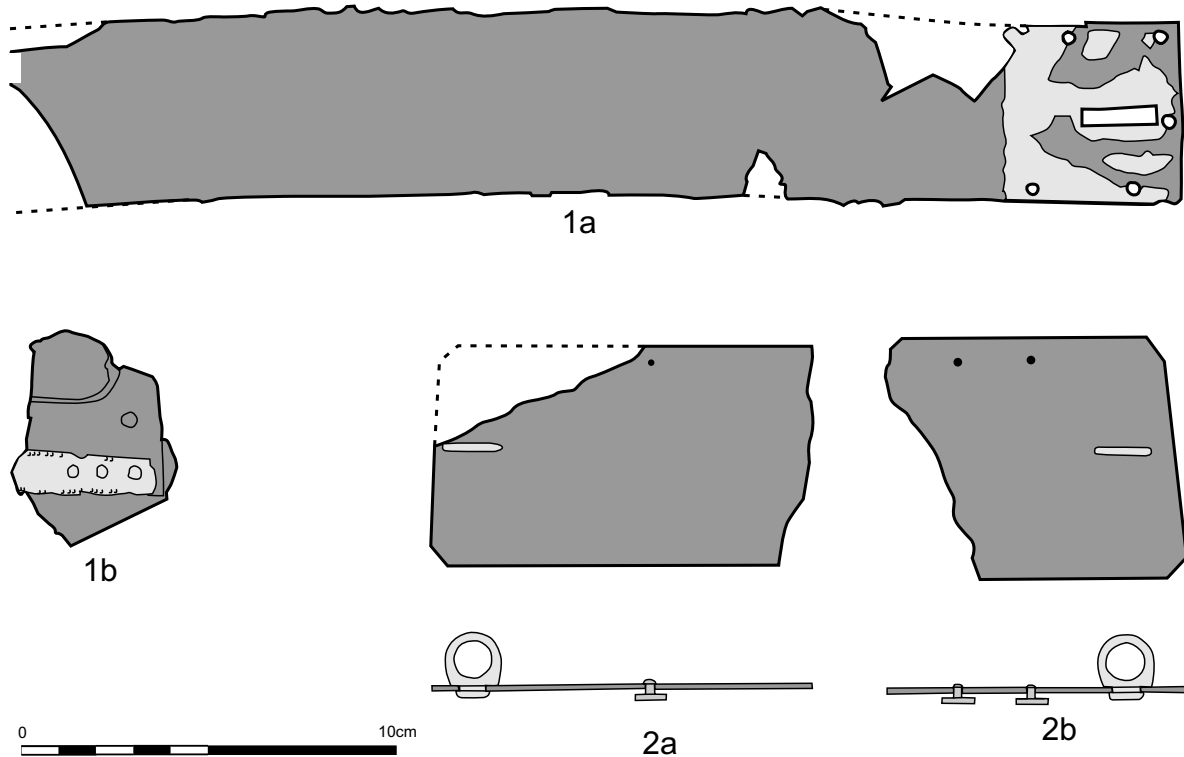


Fig. 6.7 Girth hoop fragments from 1) Iža and 2) Carnuntum. 1a) Slot intact with copper-alloy covering plate; 1b) over-compressed with copper-alloy binding on the lowest plate; 2) Plates with tie rings in situ. Scale 1:2

fastener in the middle of one of the upper girth hoops, on the wearer's side.<sup>23</sup> They also overlapped right over left, unlike the Corbridge Hoard sets (see above p.45).

The set of girth hoops from Zugmantel may represent a variant on the Newstead type with fewer plates, getting progressively broader towards the bottom, or they may have belonged to an Alba Iulia type cuirass (see below p.64) – insufficient survives for any certainty on this matter.

## RECONSTRUCTION

There have been three main attempts to reconstruct the Newstead-type cuirass: those of Curle, Robinson, and Poulter.<sup>24</sup> Of these, Curle's was hardly a serious analysis of the problem, whilst Poulter's offered some adjustments to what remains the definitive reconstruction until recently, that of Robinson. The present writer has attempted a review of the available evidence and proposed a revised reconstruction that incorporates the material now available.<sup>25</sup>

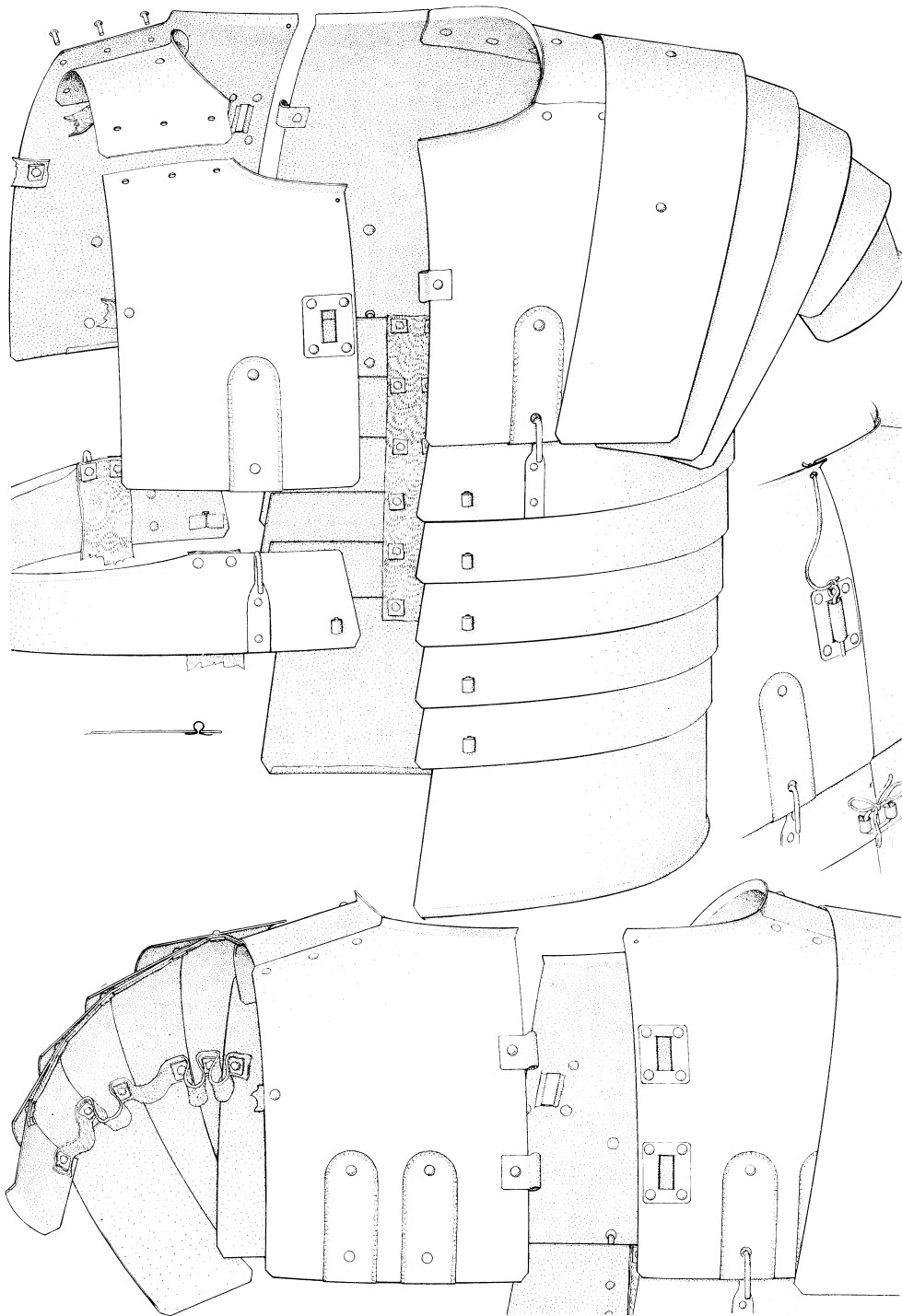


Fig. 6.8 Peter Connolly's line drawing of Robinson's first proposed reconstruction of the Newstead type (from ROBINSON 1975, Fig.181)

James Curle, for all his archaeological virtues, did not possess an innate understanding of Roman military equipment. He misinterpreted the orientation of the main Newstead fragments, thinking the backplate was a breastplate and that it sat with the two rectangular slits on the lower edge. Given the contemporary understanding of segmental body armour, this is

hardly surprising. Although Curle was aware of von Groller's discoveries in the *Waffenmagazin* at *Carnuntum*, as published<sup>26</sup> the fragments did not provide sufficient information to allow a more accurate reconstruction.

Robinson's working reconstruction of the Newstead cuirass, together with Peter Connolly's line drawing (see Fig.6.8),<sup>27</sup> have become familiar as the first

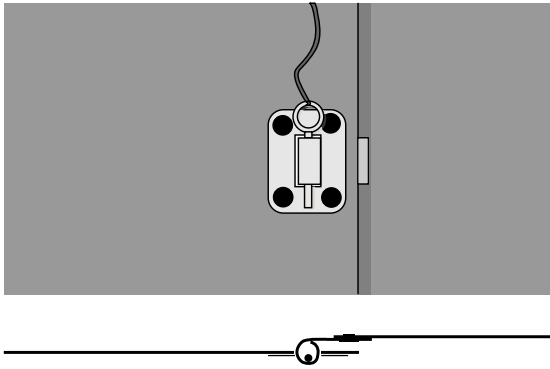


Fig. 6.9 Robinson's proposed method (loop and pin) of securing the Newstead-type breast- and backplates compared with Poulter's (strap and buckle). Not to scale

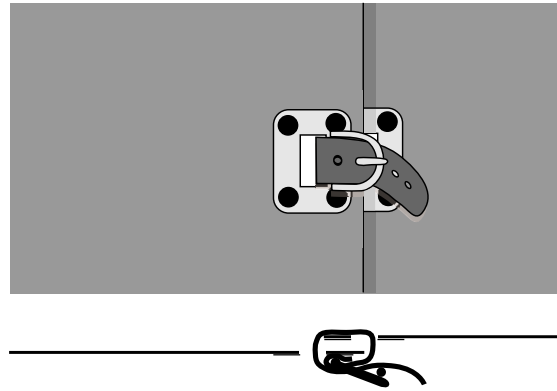


Fig. 6.10 Poulter's proposed method (strap and buckle). Not to scale

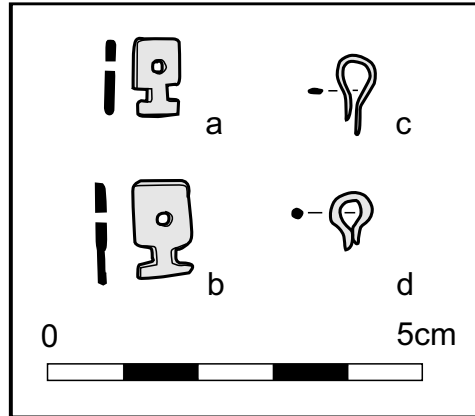


Fig. 6.11 'Sports' breastplate with turning pins from Manching together with examples of turning pins (a, b) and split pins (c, d) from Alba Iulia (Porolissum). Scale 1:2 (inset 1:1)

systematic attempt to reconstruct the Newstead find in its own right (although an earlier drawing did appear in Robinson's 1972 paper),<sup>28</sup> eschewing the usual practice of amalgamating it with inappropriate Corbridge elements. Nevertheless, Robinson seemed only too aware of the shortcomings of his reconstruction, albeit fairly certain of a general trend towards simplification in the overall design (see above, p.4).

There are a number of problems with this that require addressing. Some have attempted to approach these before, but it is fair to say that no completely satisfactory solution to all the problems has yet been produced.

### The Breast- and Backplate Fastenings

Robinson's solution to the fastening of the breast- and backplates – using a tube attached to one plate passing through the rectangular opening on its twin, secured with a locking pin (Fig. 6.9) – was not universally accepted. In 1988, Andrew Poulter reverted to Robinson's original method of fastening, using buckles and straps (Fig. 6.10).<sup>29</sup> His reasoning was based on the observation that it would not have been practical for a soldier to fasten his own cuirass using Robinson's preferred system. He also suggested that the small hole near the top in each of the back- and breastplate were used for fastening a copper-alloy edging strip around the neck opening.

There are problems with Poulter's reconstruction, however, the greatest of which is the complete absence of any signs of wear around the apertures on both the

Newstead and Eining cuirasses. A more plausible means of fastening the plates was already known in a different context, for turning pins survive on 'sports' and combat armour breastplates (Fig.6.11).<sup>30</sup>

With the small holes below the neck opening once again unexplained, it can be seen that the turning pin method of fastening is not only better supported by the evidence, but also more logical. The final piece of evidence may be provided by one of the Zugmantel fragments. Identifiable as part of a backplate, it possesses what looks like the companion fitting to the rectangular aperture found on the Newstead, Eining, and Carlisle plates. This consisted of a rectangular (albeit with clipped corners, making it almost hexagonal) copper-alloy plate with a central hole for another, possibly rotating, fitting.

This does not mean that Robinson's proposed method of joining the breastplates of scale or mail shirts can be adopted for fastening the breast- and backplates of *lorica segmentata* without further question. The system he suggests for securing the turning pins – a long pin that passes through both and is attached to the collar by a thong<sup>31</sup> – would certainly work for the backplate with two horizontal fastenings, but for the breastplate with only one it would prove more cumbersome. Moreover, no such pins are readily identifiable in the archaeological record. It might therefore make more sense to see each turning pin (one on the front and two to the rear) held in place with its own split pin (examples of which are known from Roman military sites<sup>32</sup>), still attached to the collar by means of a thong. Without being secured by something like a split pin, experiment has shown that turning pins would gradually rotate and slip out of place.<sup>33</sup>

One final alternative means of fastening should be considered, and that is by means of a tie ring like those used on girth hoops. The form of the copper-alloy plates around the slots on the girth hoops of the Stillfried armour, being virtually identical to the Newstead breast- and backplate slots, might be thought to imply a similar type of fitting used with both slots: a tie ring.

Contrary to what Poulter thought, no examples of the Newstead type of armour have revealed indisputable traces of copper-alloy binding of the neck opening, although ironically this is a feature of the Augustan Kalkriese type of *lorica segmentata*.<sup>34</sup>

### The Girth Fastenings

Robinson used the fragment of plate that he thought represented a girth hoop to provide his proposed method of fastening the lower halves of the cuirass.<sup>35</sup> There is no guarantee that the plate concerned – which has a tubular fitting protruding – is actually a

girth hoop, and it is quite clear that the main deposit of armour is a shoulder element consisting of back-, collar-, and breastplates, together with lesser shoulderguards. Moreover, Robinson's preference for the tubular fitting was without published archaeological parallel.

Finds from the *Waffenmagazin* at *Carnuntum* (Appendix A) had included an alternative method of fastening girth hoops (Fig.6.1), using cast copper-alloy rings (which are comparatively common finds),<sup>36</sup> although doubt has been cast upon the efficacy of these objects for such a role.<sup>37</sup> Since it seems unlikely that Robinson was correct in identifying the tubular fitting as a girth hoop fastening, the cast rings must have been part of the system used. There is at least one example of such a ring from Newstead. Stratified examples from Caerleon mostly came from Phase IV (c. AD 160–c. 275) at the Roman Gates site, although some finds come from the earlier Phase III (c. AD 100–60).<sup>38</sup>

In her discussion of the Caerleon finds, Janet Webster has identified four categories of such rings, and noted that they either have short or long shanks. She suggested that those with a longer shank may be explained by the girth hoop leathering having been rearranged to be located closer to the ends, so that it could be pierced and secured by these items. This was clearly not the case on the published *Carnuntum* plates, as pairs of leathering rivets were still in place on plates fastened with cast rings, nor is it true of the Stillfried plates; moreover, *lorica segmentata* requires internal leathers to be attached near the upper edge of its girth hoops in order for it to function, and the loops are attached half way up the plate. Nevertheless, Webster would appear to be correct in her assertion that the fittings with the longer shanks had been used and subsequently distorted by extraction, as the fragmentary piece discussed above would appear to provide evidence for this (Fig.6.12).<sup>39</sup>

The solution to this problem lies in the fact that the tubular fitting is a temporary repair inserted through a hole intended for one of these cast loops.<sup>40</sup> Similar tubular fittings are also used on the Eining backplate – almost certainly as a makeshift repair – to receive the vertical fastening hooks.

The true means of fastening girth hoops did not become apparent until the discovery of a complete set of girth hoops from Stillfried.<sup>41</sup> This find demonstrated quite clearly that one half set of girth hoops was equipped with cast loops (which were tinned), but the other had small horizontal rectangular slots through which these loops fitted, the slot being surrounded with a rectangular copper-alloy plate (with a rivet in each corner) similar to the slot guards on the breast- and backplates.<sup>42</sup> At least one other girth plate of this kind

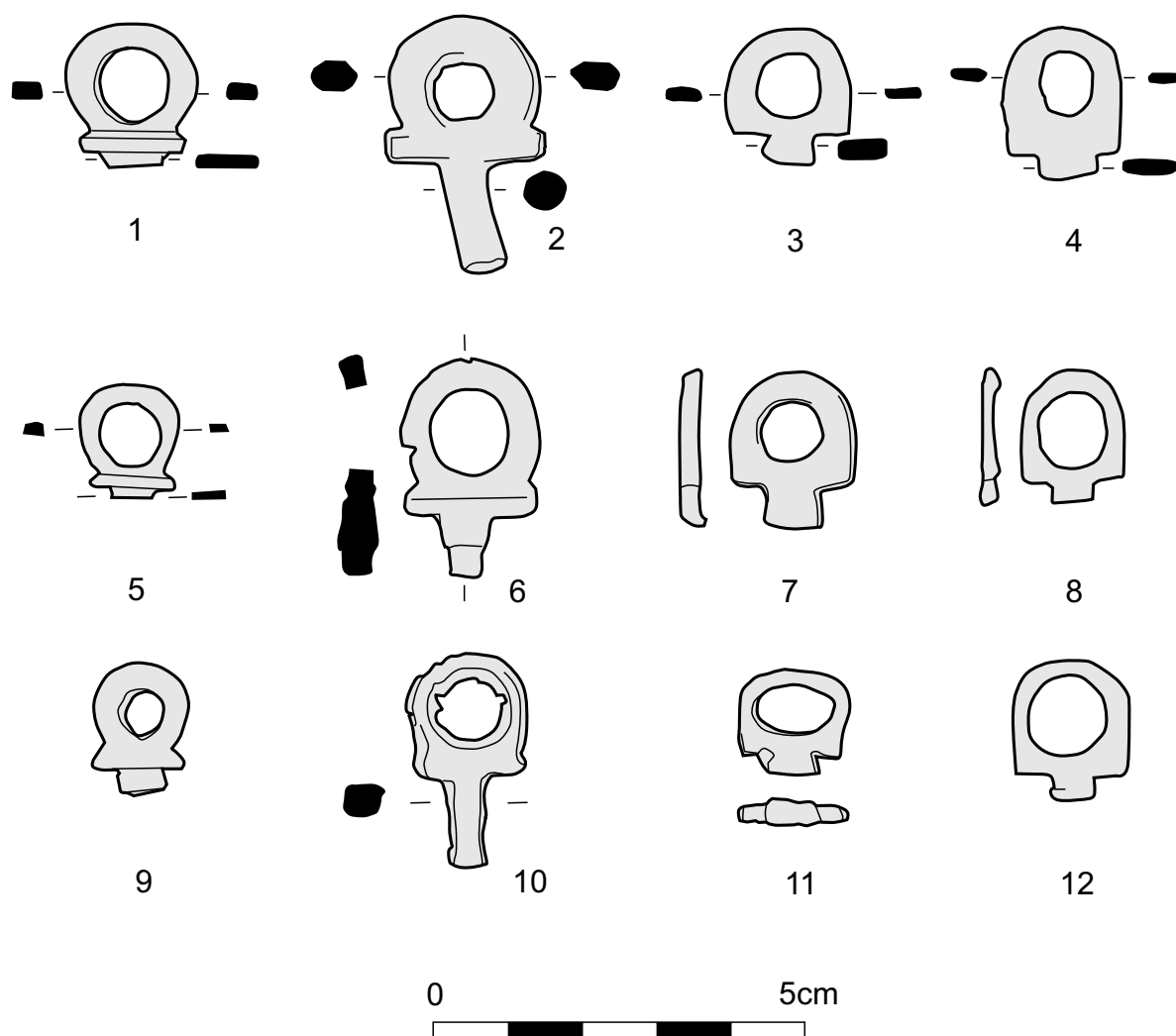


Fig. 6.12 Range of tie rings from various sites. 1–4 Caerleon, 5 & 12 Corbridge, 6 Carlisle, 7 Dalton Parlours, 8 South Shields, 9 Chester, 10 Manchester, 11 Aldborough. Scale 1:1

was known – but not recognised – before the Stillfried find, and that came from Iža to the north of the Danube (Fig. 6.7). This plate has a larger pierced copper-alloy sheet completely obscuring the end of the iron plate, but the principle is the same. The use of tie rings on the Stillfried cuirass, secured to their girth hoops using square roves, passing through slots, presumably meant girth hoops were, like the upper elements of the cuirass, fastened with the aid of split pins, although once again no examples have yet been found *in situ*.

This method of fastening the girth hoops – overlapping their ends – would have lent the cuirass a degree of rigidity in the region of the torso that has not been apparent in many reconstructions of the Corbridge type of armour. It could well be that other types of cuirass were designed to fasten as securely as the Newstead type, or it might be that this is one of the innovations of this particular form of the cuirass.

The Stillfried find also shows how (in contrast with the Corbridge type B/C cuirass) vertical fasteners were attached to the inside of the upper girth hoop and the hook element passed through a hole in the plate to the outside, the single hook at the front coinciding with a pair of leathering rivets. Copper-alloy binding was used for the bottom edge of the lower hoop and (on one of the half-sets) the top edge of the top hoop, both areas usually thickened on the Corbridge type (and, indeed, on the Zugmantel set of hoops), whilst the upper hoop was not narrowed beneath the armpit, but was the same height for its entire length. Fragments of copper-alloy bound Newstead-type girth hoops are also known from León.<sup>43</sup>

### Riveted Plates?

As part of the trend toward simplification that Robinson thought he could detect, he believed the



Newstead cuirass employed single-plate, not hinged, upper shoulderguards, and that the breast-, collar-, and backplate were riveted together and not articulated. He felt that this was understandable, given the number of repairs to such hinges evident in the Corbridge Hoard armour (including the riveting together of plates) and because these hinges were not strictly necessary to the successful functioning of the armour.<sup>44</sup> Careful inspection of the Newstead armour itself cannot support his interpretation, as all of the key areas that would carry evidence of such riveting have been damaged, although there is one possible exception (on the breastplate). Here, a plate of appropriate thickness can be restored as belonging to the upper part of the object, but it is equally

open to interpretation as the rivet holes for a lobate hinge or as the riveting together of mid-collar- and breastplate. Thus it adds little to the debate. Similar damage to this area is also present on the Eining cuirass and only the pieces from the Carlisle armour preserve this region. The discovery of what is probably an upper shoulderguard at Carlisle in 2001 showed that Robinson's suggestion for a single-piece plate was wrong, in the case of the Newstead type.

Many details concerning the Newstead type of armour remain to be refined and our knowledge of the form will doubtless continue to improve with new finds like that from Stillfried. Nevertheless, understanding of this cuirass has already improved significantly since its original identification by Robinson.

## COMPONENT LIST

breastplates	2
mid-collar plates	2
backplates	2
upper shoulderguard plates	?6
lesser shoulderguard plates	8
shoulder leathering rivets	18
shoulder leathering washers	18
shoulder leathers	6
lobate hinge-halves	16
lobate hinge fastening rivets	80/120
rectangular female fasteners	3
rectangular female fastener rivets	12
rectangular male fasteners	3
rectangular male fastener rivets	12
turning pins	3
split pins	3
thong to secure split pins	2
leathering rivet boss	?4
vertical fasteners female	6
rivets to secure vertical fasteners	6
girth hoop halves	12
girth hoop fastening loops	20
girth hoops leathers	6
girth hoop leathering rivets	72
vertical fastening hooks male	6
rivets to secure vertical fastening hooks	12

## NOTES

- 1 ROBINSON 1972, 33–5; 1974, 11; 1975, 180–1, Fig.181.
- 2 See above, Chapter 5.
- 3 VON GROLLER, 1901, 39–45.
- 4 At the time of writing, the dating for the deposit is still not finalised and will be subject to review (McCARTHY *et al.*, 2001).
- 5 Lobate hinges: VON GROLLER, 1901, Taf.XIX,57–9. Girth hoops: *ibid.* Taf. XVIII, 27–8. Boss: *ibid.* Taf.XIX,66.
- 6 CURLE, 1911, 104–39.
- 7 Thus probably some time between the 160s and 190s (see HARTLEY, 1972, 40–1), and possibly even as late as 208–10 (*ibid.* 42).
- 8 Inv. Nr. ZM1425. Cf. *Saalburg Jahresbericht 1906*, 7; *ORL B8*, Taf. XIV,50. The pieces were found together with fragments of a tinned copper-alloy greave and a complete mail shirt, Inv. Nr. ZM 1424. A more detailed publication of the Zugmantel *lorica segmentata* will appear in due course (BISHOP, in preparation a).
- 9 REINECKE, 1927, 161.
- 10 I am grateful to Prof Dr Thomas Fischer for making photographs of this cuirass available and for discussion on the subject, and to Dr Christof Flügel for his help during my visit to München to examine the armour.
- 11 CARUANA 1993.
- 12 This may also be the case with the Stillfried find, although this is not apparent from the brief published account of the material (EIBNER, 2000, 33), where a Trajanic or Hadrianic date is suggested. Like Mušov (TEJRAL, 1994, 299–300), Stillfried was one of the Roman advance bases during the Marcomannic Wars (FRIESINGER & KRINZINGER, 1997, 295) and the coincidence between the form of the armour and this role for the site is, perhaps, significant.
- 13 McCARTHY *et al* 2001; RICHARDSON, 2001.
- 14 EIBNER 2000.
- 15 Pers. comm. J. Aurrecoechea.
- 16 ALLASON-JONES 1996, Fig.12,50.
- 17 T. Fischer, pers. comm.; cf. REINECKE 1927, 160.
- 18 BISHOP, 1999b.
- 19 It is tempting to use the method of closure of the Stillfried girth hoops – a fixed tie ring passed through the aperture – but on balance the similarities between the Newstead type breast- and backplates and the mail and scale breastplates with surviving turning pins are too convincing to overlook.
- 20 This detail appears to be confirmed by the recent find from Carlisle but no certainty will be possible until further work has been carried out on the material.
- 21 RAJTAR, 1994, Abb.7,1. There is a possible example of a girth hoop fragment with a similar rectangular aperture from Chichester (DOWN, 1981, Fig.8.28,3).
- 22 RAJTAR, 1994, Abb.7,2.
- 23 I am grateful to Dr Ernst Künzl and Sebastian Keil for allowing me to examine the Stillfried fragments, and to Martin Wieland and Sebastian Keil for the opportunity to see KEIL, 2001. The interpretation of this fitting depends upon the position of the plate bearing it (the fitting is on a fastened girth hoop, so not from the lowest two). If low down, it could have been designed to hold the belt in place, but since, as reconstructed, it is from higher up (third or fourth girth hoop) this would be unlikely.
- 24 See above, Chapter 1. Curle: CURLE, 1911, 157–8, Pl.XXII; Robinson: ROBINSON, 1975, 180, Pls.I and Fig.181; Poulter: POULTER, 1988.
- 25 BISHOP, 1999b.
- 26 VON GROLLER, 1901.
- 27 First published in Robinson's *The Armour of Imperial Rome* and based on an unpublished reconstruction of the shoulder sections built by Robinson (I am grateful to Peter Connolly for this information).
- 28 ROBINSON, 1972, Fig.5.
- 29 POULTER, 1988, 37.
- 30 ROBINSON, 1975, Pls.454–5; GARBSCH, 1978, Taf.8,1; JUNKELMANN, 1996, Abb.134.

- 31 ROBINSON, 1975, 161. Objections to this method of securing turning pins are, of course, equally applicable to scale (and mail) breastplates, although it has generally been accepted for these by scholars without further question (cf. GARBSCH, 1978, Abb.2; JUNKELMANN, 1996, 140).
- 32 E.g. GUDEA, 1989, Pl.CCXL,39–52.
- 33 Matthew Amt, pers. comm.
- 34 BISHOP, 1998, 10. The Eining backplate does have a piece of copper-alloy sheet riveted to the corner of the neck flange, but this appears to be part of a repair to the upper rectangular aperture, which is located unusually high on this particular plate (BISHOP, forthcoming).
- 35 ROBINSON, 1975, 181.
- 36 VON GROLLER, 1901, Taf.XVIII,27–8.
- 37 In a well-argued paper presented by Peter Price to the Second Roman Military Equipment Seminar at Sheffield in 1984, which was not, unfortunately, subsequently published.
- 38 Newstead: FR3453 cited in ALLASON-JONES & MIKET, 1984, 208; Caerleon: EVANS & METCALF, 1992, 118 Figure (Nos.45–68).
- 39 Webster in EVANS & METCALF, 1992, 116–19. Stillfried plates: pers. obs. October 2001.
- 40 Cf. a tubular fastening on a breastplate in the Guttman Collection (JUNKELMANN, 2000, Abb.109).
- 41 EIBNER, 2000.
- 42 Pers. obs. October 2001.
- 43 Pers. comm. J. Aurrecoechea.
- 44 ALLASON-JONES & BISHOP, 1988, 102.

## Chapter 7: The Alba Iulia type

### EVIDENCE

This form of the cuirass is known only from the high-relief sculpture (Fig.7.1) found at the legionary base of Alba Iulia in Romania (see above, Chapter 2).<sup>1</sup> No known archaeological examples have been identified. However, it appears to have been constructed from components that may indeed already have been found, but just not recognised as having belonged to segmental body armour. Given the shortcomings of most (but by all means not all) representational evidence,<sup>2</sup> the description and reconstruction offered here must be viewed as tentative and will inevitably (it is to be hoped) be subject to review and revision as a result of any further evidence that comes to light.

### DESCRIPTION

This account necessarily has to depend entirely upon the Alba Iulia sculpture and, as such, leaves much to be desired. The same shortcomings that apply with any iconographic evidence mean that the accuracy of the representation is, at best, questionable. However, the accuracy of details on similar sculptural works likely to have been produced by members of the frontier armies (such as tombstones, the Mainz pedestal reliefs, or the Adamclisi metopes) mean that this is at least worthy of consideration.

As with the other forms of segmental armour, there are four principal components to this cuirass: two upper and two lower units. The two upper units seem to have been made of scale armour fastened together by means of a pair of breastplates. There appear to have been no true shoulderguards, although the sculpture is damaged in this region. The torso sections are shown as being made up of four girth hoops each, although the manner in which these were fastened together is not depicted on the relief, so some stylisation is evident here and may be repeated elsewhere. The cuirass is depicted worn over a tunic and with a laminated armguard,<sup>3</sup> but without *pteryges*.

This much is evident from the one piece of iconographic evidence to survive. To attempt a reconstruction, we need to employ logic (there are certain things that we can arguably take for granted, such as the articulation of the girth hoops on three internal leathers each) and informed guesswork (necessary when we try to reconstruct the method of attaching the shoulderguards to the girth hoops).

### RECONSTRUCTION (FIG.7.2)

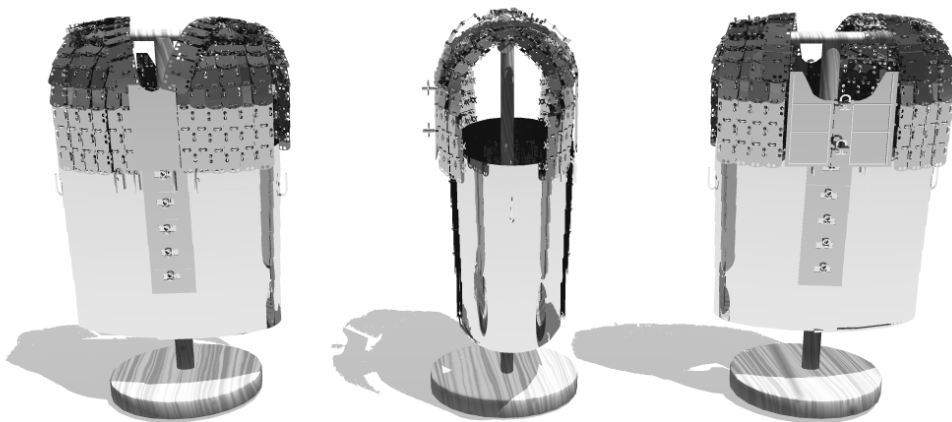
Since scale armour was used for the upper portions of the cuirass, the first detail that needs to be clarified in order to attempt a reconstruction is the type of scale used. Before the 2nd century AD, *lorica squamata* is normally found in its flexible form, whereby each scale overlaps and is fastened to its neighbour on the row by means of a twist of wire, and then sewn with textile cord to a flexible backing of fabric or leather. The 2nd century saw the introduction of a semi-rigid form, and in this not only is each scale wired to its neighbour horizontally, but also vertically. This latter form seems to have been used with breastplates, so it must represent a good candidate for the form of scale used.<sup>4</sup>

As for the material, iron tended to be used for larger scales, copper alloy for smaller, but the sculptural evidence cannot be of any help to us here and any decision has to be made on arbitrary grounds. Surviving scale sizes range between 11mm wide and 29mm high to 34mm wide and 70mm high for semi-rigid scale.<sup>5</sup> For a man with a chest measurement of 1400mm, and allowing for a fairly arbitrary 10% overlap vertically and 25% horizontally,<sup>6</sup> some 1100 of the smallest, or 150 of the largest, scales would probably be necessary for the top part of the cuirass. A wide range of scales were found in the *Waffenmagazin* at *Carnuntum* (Fig.7.3) and many of these were iron. Similarly, a fan-shaped set of semi-rigid scale recently found at Carlisle would be appropriate for one of the shoulders of such a cuirass.<sup>7</sup>

Breastplates have long been associated with sports armour,<sup>8</sup> although there is good reason to suggest that they were used with combat equipment too.<sup>9</sup> A number are known with legionary attributions, suggesting that they were not just used by cavalry, as was once thought. All seem to have been decorated in some way, usually with a combination of mythological and martial themes. Such breastplates would usually be attached to mail or their scales by means of flat-headed rivets (up to four of them) decorated with incised concentric rings. They were fastened by turning-pins, examples of which survive *in situ*, which were in turn secured by one or more split pins (Fig.6.11). By analogy with segmental cuirasses, it is possible that these breastplates were used in combination with backplates: two principal forms of 'breastplate' are generally recognised, symmetrical (Fig.7.4,1) and asymmetrical (Fig.7.4,2-3).<sup>10</sup> The purpose of pairs of breast- and backplates may have been to enlarge the neck opening



*Fig.7.1 The Alba Iulia sculpture.*



*Fig.7.2 Speculative reconstruction of an Alba Iulia type cuirass.*

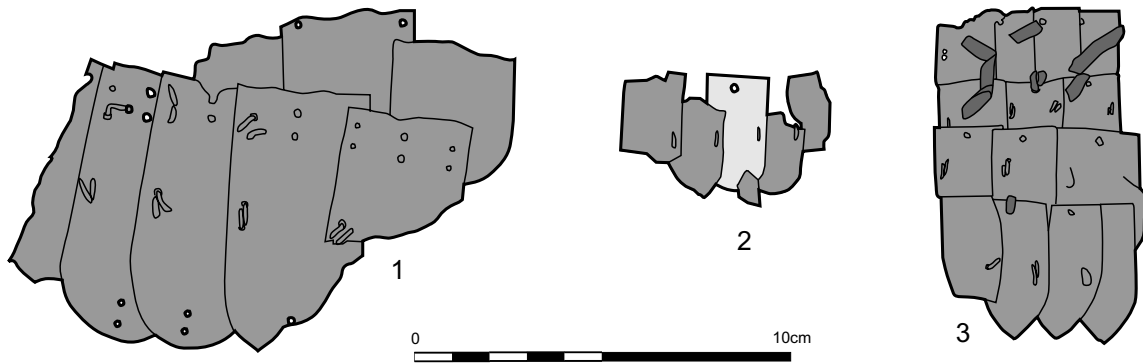


Fig. 7.3 A range of scales from the Waffenmagazin at Carnuntum. Scale 1:2

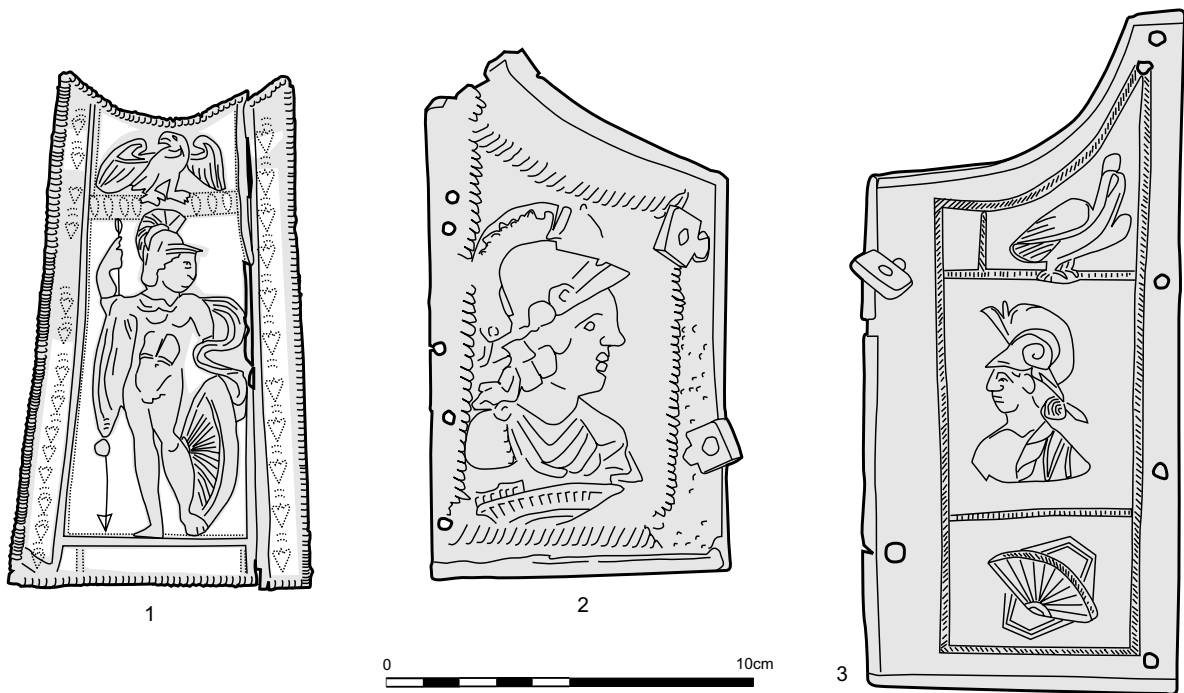


Fig. 7.4 Possible back- (1) and breastplates (2 & 3) used with mail and scale cuirasses, and hence also for the Alba Iulia type of segmental body armour. Scale 1:2

to allow the cuirass to be put on and taken off and then reduce and fasten it by closure. Given the diminished amount of movement within semi-rigid scale, this would have been a necessary measure.

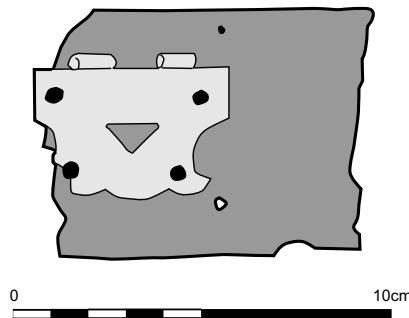
The plate girth hoops need not have looked very different to those of the Newstead type of cuirass (see above, Chapter 6). Although the sculpture depicts only four hoops, a minimum of six seems more likely.<sup>11</sup> As with the Newstead cuirass, they will probably have been fastened laterally by means of cast tie rings. It is possible that the Zugmantel girth hoops (Fig. 7.5), which differ somewhat from the Stillfried examples,<sup>12</sup> insofar as they broaden towards the bottom, may belong to this type of cuirass (although it is equally likely that they are just another variant of the Newstead type).

A major puzzle that remains to be solved is the question of the manner in which the upper elements were attached to the lower. A large lobate hinge mounted vertically on what appears to be a girth hoop was found at *Carnuntum* (Fig. 7.6)<sup>13</sup> and this could plausibly be interpreted as indicating a method of vertical attachment using external straps and buckles, similar to that used on the Corbridge type A cuirass. This seems unlikely, given the preference for hook-and-eye vertical fasteners found on the Corbridge B and C and Newstead types of segmental cuirass which may have been devised precisely to avoid the problems inherent in a strap system.<sup>14</sup>

Instead of using a detachable fastening, it is possible that the scale upper portions were permanently attached to the upper girth hoop in some way. Again, this



*Fig. 7.5 Over-compressed girth hoops from Zugmantel (viewed from the inside). Scale 1:2*



*Fig. 7.6 Lobate hinge (possibly mounted vertically) on a girth hoop. Scale 1:2*

does not seem very likely, as it would hamper the ability to break a cuirass into its four constituent units (always one of the strong points of segmental armour, both from the point of view of serviceability and of storage).

An alternative solution might have been to have used internal straps and buckles, like those found at the back of the Corbridge type A armour. Little or nothing would be visible externally, as is indeed the case with the Alba Iulia relief, although such a deduction would almost certainly be placing too much reliance on iconographic evidence. At least one example of scales

mounted on leather is known from *Vindonissa*<sup>15</sup> and even semi-rigid scale armour must have been used with some sort of undergarment, similar to that to which normal scales were sewn. It is therefore possible that the scales of the Alba Iulia type of cuirass were attached to a fabric or leather backing to which straps were sewn, enabling the top and bottom parts to be joined.

Ultimately, the means by which the upper elements were attached to the lower can only be speculated about and further finds will be necessary before any more detailed conclusions can be reached.

**TABLE OF LIKELY COMPONENTS**

scales	
wire ties for scales	
tie rings	
breastplates	2
backplates	2
turning pins	3
split pins	3
thong to secure split pins	2
leathering rivet boss	?4
vertical fasteners female	6
rivets to secure vertical fasteners	6
girth hoop halves	12
girth hoop fastening loops	8
girth hoop fastening socket surrounds	8
girth hoop fastening socket surround rivets	36
girth hoops leathers	6
girth hoop leathering rivets	36/72
vertical fastening hooks male	6
rivets to secure vertical fastening hooks	12



## NOTES

- 1 COULSTON 1995.
- 2 BISHOP & COULSTON, 1993, 19–32.
- 3 See below, p.68.
- 4 For semi-rigid scale, see BISHOP & COULSTON, 1993, 117.
- 5 Small scale size: GARBSCH, 1978, 79; large scale size: VON GROLLER, 1901, Taf.XVI,6.
- 6 The Hrusiča scales have something in the region of (very roughly) 13% overlap vertically and 28% horizontally (GARBSCH, 1978, Taf.35,2).
- 7 McCARTHY *et al.*, 2001, Fig.3; RICHARDSON, 2001, 188–9, Figs.2–3. Some 60 scales survive in this section, where each of the three rows is composed of different-sized scales, showing the difficulty of such rough-and-ready calculations. Nevertheless, the principle of ‘the smaller the scale, the more you need’ holds true.
- 8 GARBSCH, 1978, 7–8.
- 9 BISHOP & COULSTON, 1993, 117.
- 10 Not all symmetrical plates were fastened, some just being in one piece and riveted down their two vertical edges (cf. JUNKELMANN, 1996, Abb.145). The suggestion of these having been attached to fabric corselets (*ibid.* Abb.150) is unsupported by the evidence (particularly since they apparently employ the same type of rivets used to attach them to mail or scale) and not wholly convincing.
- 11 Seven is the least definite number of girth hoops amongst the Corbridge Hoard (Cuirasses v and vi, the type B/Cs) and the find from Stillfried, whilst Zugmantel has a minimum of five.
- 12 Zugmantel: BISHOP, in preparation a; Stillfried: pers. obs. 2001.
- 13 VON GROLLER, 1901, Taf..XIX,57.
- 14 See above, p.32.
- 15 Pers. obs. Vindonissa-Museum, October 2001. Most scale seems to have had a fabric backing (BISHOP & COULSTON, 1993, 141).

## Chapter 8: Other segmental armour

### ARMGUARDS

In military use in the Roman period, the armguard (*manica*<sup>1</sup>) was most commonly found protecting the sword arm of an infantryman. In this, they to some extent mimicked the use of limb protection in the arena, although it is clear that gladiators wore articulated metal defences on either (or even both<sup>2</sup>) arms, according to their style of fighting, and that they could be of scale or mail, as well as plate. Before their adoption by the Romans, such arm defences had been associated with protecting the arms of armoured cavalymen and this is a use which would continue with the spread of armoured cavalry in the later imperial period.

### Evidence

Our evidence for the *manica* in a military context is both iconographic and archaeological. No Roman written accounts survive which describe the use or form of this item of equipment, although it is not impossible that new sub-literary evidence will come to light at some point in the future.

The armguard is most famously shown in use amongst legionary troops on the metopes from the *Tropaeum Traiani* at Adamclisi.<sup>3</sup> Here most of the citizen troops<sup>4</sup> engaged in combat are wearing such a defence on the sword arm (Fig.2.11). Indeed, this famously led Richmond to deduce that the armguard had been introduced specifically for these campaigns, in order to counter the Dacian *falx*. Some commentators think it curious that the picture of Roman soldiers presented by the Adamclisi metopes differs so radically from that of Trajan's Column, but it has been pointed out that this may be due to stylisation on the metropolitan propaganda monument.<sup>5</sup> On the metopes, armguards are shown with up to 16 plates (or 'lames').

Other sculptural representations of military armguards occur on the tombstones of Sex. Valerius Severus and G. Annius Salutus, both from Mainz (Fig.2.8).<sup>6</sup> Legionaries of the *legio XXII Primigenia*, their tombstones probably date to the middle of the 1st century AD (c.43–70), *XXII Primigenia* being based in Mainz during this period.<sup>7</sup> Both reliefs form part of decorative borders of weaponry that surrounds the main text of their tombstones, a style of monument that is found elsewhere. The armguard of Severus is shown with eleven plates and a hand-shaped section (with four more) that does not appear to be matched by

the reliefs on the Adamclisi metopes. Although it can scarcely be claimed that these are intended to be accurate depictions of armguards, there is no doubting that they are meant to represent *manicae*.

The last example amongst the sculptural sources is the 2nd- or 3rd-century relief from Alba Iulia (Fig.7.1), already discussed (above, p.62ff) under the context of the cuirass shown on the figure. The soldier (again thought to be a legionary by dint of his curved rectangular shield<sup>8</sup>) is shown wearing a segmental armguard on his sword arm, some six plates being visible on the figure.

Finally, copies of illustrations associated with manuscripts of the *Notitia Dignitatum* show segmental limb defences on the seals of the *magistri officiorum*.<sup>9</sup>

Military depictions of segmental armguards are, therefore, comparatively rare. These can arguably be supplemented by the many gladiatorial reliefs which show armguards. Although a proportion of these may be intended to show padded organic defences,<sup>10</sup> it is clear – particularly from coloured mosaics – that many do indeed show metallic *manicae*.<sup>11</sup>

The archaeological evidence is, thankfully, both more abundant and more informative than the iconographic. The excavation of the *Waffenmagazin* at Carnuntum was the first time that fragments of armguard were identified as such by its excavator, Max von Groller. In his publication of the find,<sup>12</sup> von Groller noted that as many as ten fragments of arm defence were found in the building.<sup>13</sup> The pieces illustrated by him (only a small proportion of the original discovery, it seems: Fig.8.1) provide enough information for comparison with other subsequent finds.

The next major find, although for a long time its true nature was not recognised, came from one of the rooms of the *principia* at Newstead (Fig.8.2).<sup>14</sup> Robinson interpreted the curved copper-alloy plates as having belonged to a cuisse or thigh-guard, even reconstructing it as such.<sup>15</sup> Nevertheless, it is clear that the plates belonged to an armguard. This find was supplemented by pieces belonging to an iron *manica*, found in the same deposit (the well in the headquarters building) as the Newstead *lorica segmentata*.<sup>16</sup>

Since the identification of first the *Carnuntum* and then the Newstead finds it has been possible to identify other examples of plates, notably from Richborough,<sup>17</sup> Corbridge,<sup>18</sup> Eining,<sup>19</sup> and León.<sup>20</sup> Discoveries at Carlisle have revealed possible complete examples (Fig.8.3) and an almost complete armguard has been reported from *Ulpia Traiana Sarmizegetusa* (Romania).<sup>21</sup>

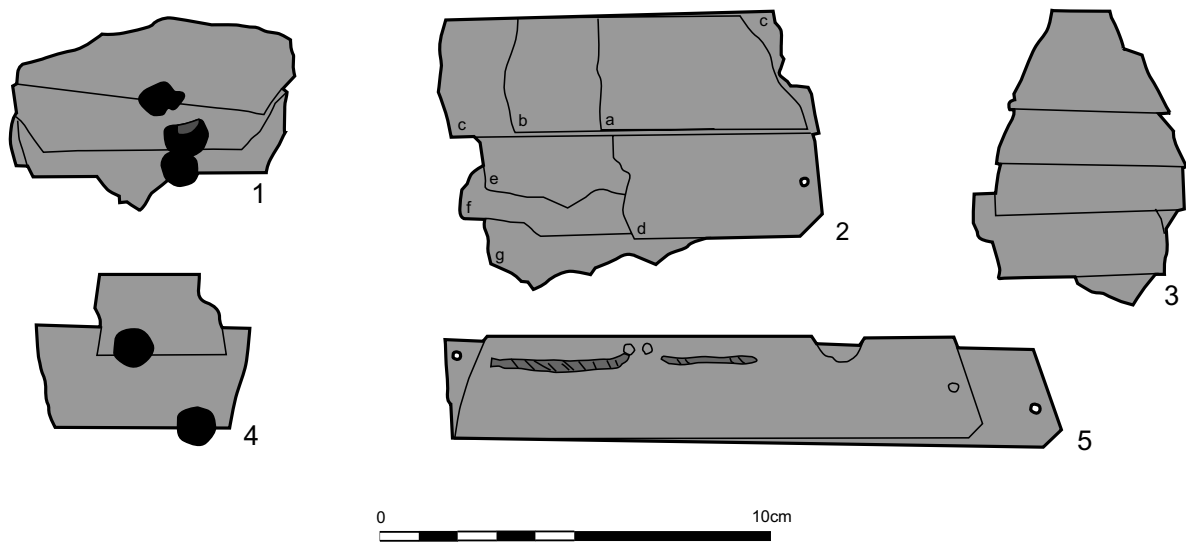


Fig.8.1 Finds of armguard (manica) from the Waffenmagazin at Carnuntum (scale 1:2).

### Description

First it is notable that (unlike segmental body armour) armguards could be made in either iron or copper alloy, although both types share the same form and their rivets were always made of copper alloy. Each complete or near-complete example of an armguard displays a number of distinctive features which renders it comparatively easy to identify components of this type of defence. A large upper plate is bordered on three sides by a series of holes punched through near its periphery. In the case of the Newstead example, the most completely understood at the time of writing, the edge of this plate appears to be bound with narrow U-sectioned guttering and there are indications that at least one of the Carlisle defences shares this characteristic.

Near the lower edge of this plate are rivets which secure internal leathers and these serve to articulate the whole defence. The rivet heads stand proud of the inner face of the upper plate since this is the side to which the leathers are attached (armguards overlap upwards, unlike body armour which does so downwards – see below).

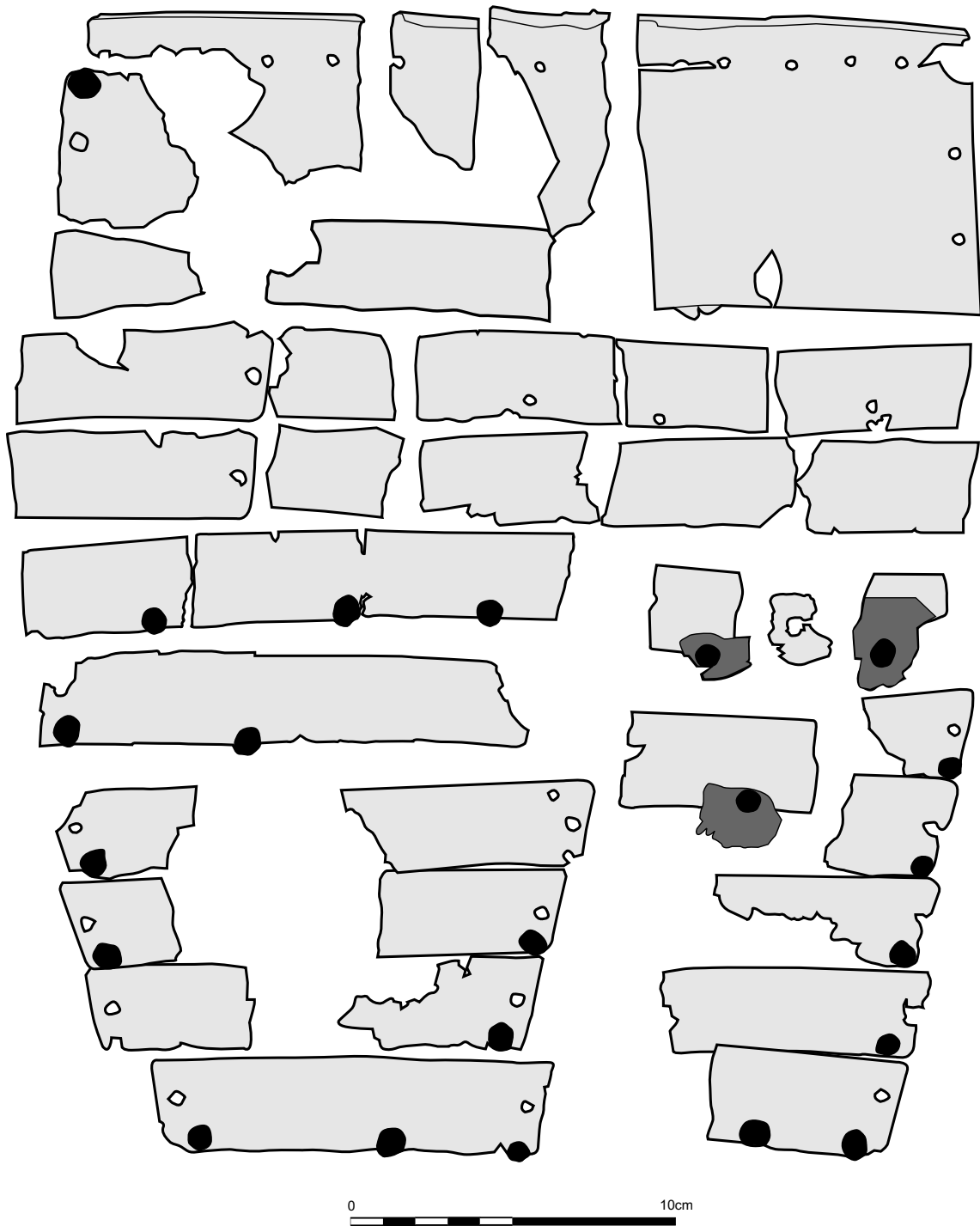
The main plates (or lames) of the defence varied in height between 25mm and 30mm and were of varying length, being longer nearer the top and shortening as they progressed down the arm. The copper-alloy Newstead plates range in thickness between 0.35mm and 0.5mm, by comparison with the fragments from Corbridge, which are 0.5mm.<sup>22</sup> Those on the Newstead armguard (which do not appear to be complete) range in length between 120mm and 170mm. Because the defence tapered towards the hand, the Newstead armguard reduced its internal leathers from four to three closer to the wrist. Each of the main plates had

an appropriate number of flat-headed copper-alloy rivets on its lower edge and a hole punched at either end. The most complete examples (*Sarmizegetusa* and Carlisle) have more than 25, and as many as 30, lames below the upper plate.

At the wrist, in at least two cases (Eining and León<sup>23</sup>) the terminal plates were riveted together and not articulated (Fig.8.4). Von Groller noted the presence of some sort of organic component which included leather and coarse linen, perhaps the remains of a padded sleeve or lining to which the plates were attached, while the copper-alloy Newstead example had fragments of the internal leathers surviving.<sup>24</sup>

### Reconstructions

Armguards probably had around 35 iron/steel or copper-alloy plates below the main upper plate (the number probably varied according to the length of the arm and the size of the lames). The fact that they were articulated on internal leathers fastened to them with copper-alloy rivets is well known, but the leathers, rivets, and metal plates were only three of the four major functional components of a *manica*. The fourth, missing, element was attached to the holes around the periphery of the plates. It is probably safe to assume that the missing component was organic and functioned as some sort of the lining for the defence. This was certainly the conclusion reached by Robinson.<sup>25</sup> Moreover, this would almost certainly have been a padded lining that worked in the same manner as the arming doublet worn beneath body armour, absorbing and dissipating the force of any blows delivered to the armour (see below, p.79). What is not immediately obvious is



*Fig.8.2 Finds of copper-alloy segmental armguard from Newstead. The plates follow Curle's arrangement but with the top plate uppermost. Note that although most plates are displayed with the inner face showing, some show the outer face. Scale 1:2*

the form taken by this padding: did it only extend over the inside of the plates, or did it completely enclose the arm, like a sleeve? There are many objections to fixing a lining to an articulated defence, not least the likelihood of tearing. Therefore it

is possible that, rather than being stitched to its backing, the armguard was laced around it.

The form of the armguard is only one aspect of its reconstruction, for the way in which it is worn affects its usefulness to its wearer. An armguard worn on the

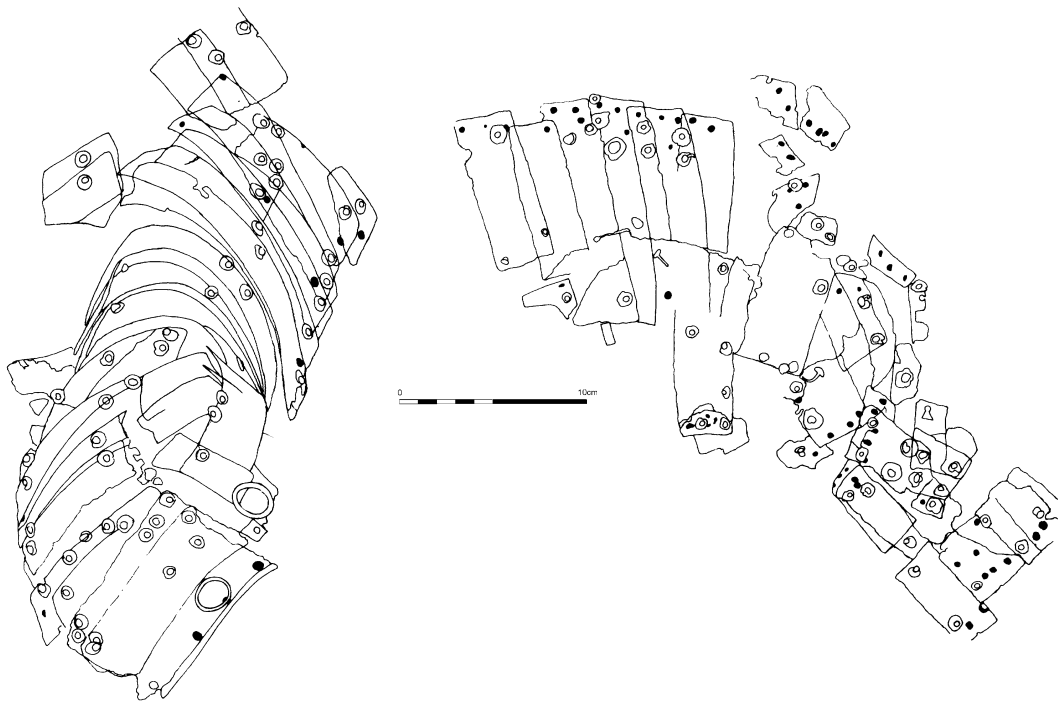


Fig.8.3 Tracings from X-rays of armguard components from Carlisle (from RICHARDSON, 2001, Fig.3). Scale 1:4

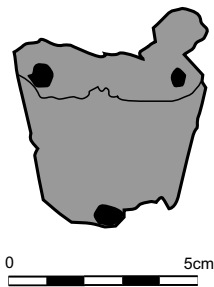


Fig.8.4 Riveted armguard wrist plates from Eining. Scale 1:2

back of the arm, covering the elbow, has to be able to allow its plates to expand over that joint. In medieval armour, this was accomplished by means of couter plates and moving joints. However, a defence worn on the front of the arm, over the inside of the elbow joint, only has to be able to compress and this is precisely what the Roman *manica* can do. More importantly, this method of wearing it offers the greatest protection to the most vulnerable part of the arm. When holding a

sword in the manner usually depicted, the upper arm was vertical and parallel to the torso, whilst the forearm was held at right-angles and to the front. The most natural and comfortable angle of repose is with the thumb uppermost and this explains why the terminal plates of the armguard were so small. They were never designed to protect the back of the hand but were intended to lie along the narrower, more vulnerable, upper edge of the arm (Fig.8.5).

The way in which the armguard was worn is also reflected in another important aspect of its construction: its plates overlapped upwards (whereas those of segmental body armour overlapped outwards or downwards). Any horizontal or glancing blows that were not stopped by the handguard of the sword would then be deflected up the arm towards the inside of the elbow joint, where the compression of the overlapping plates would mean that it was the most heavily protected part of the armguard.

**List of likely components**

shoulder plates	1
lames	c. 35
leathering rivets	90–120
internal leathers	3 or 4
padded fabric and leather lining	1

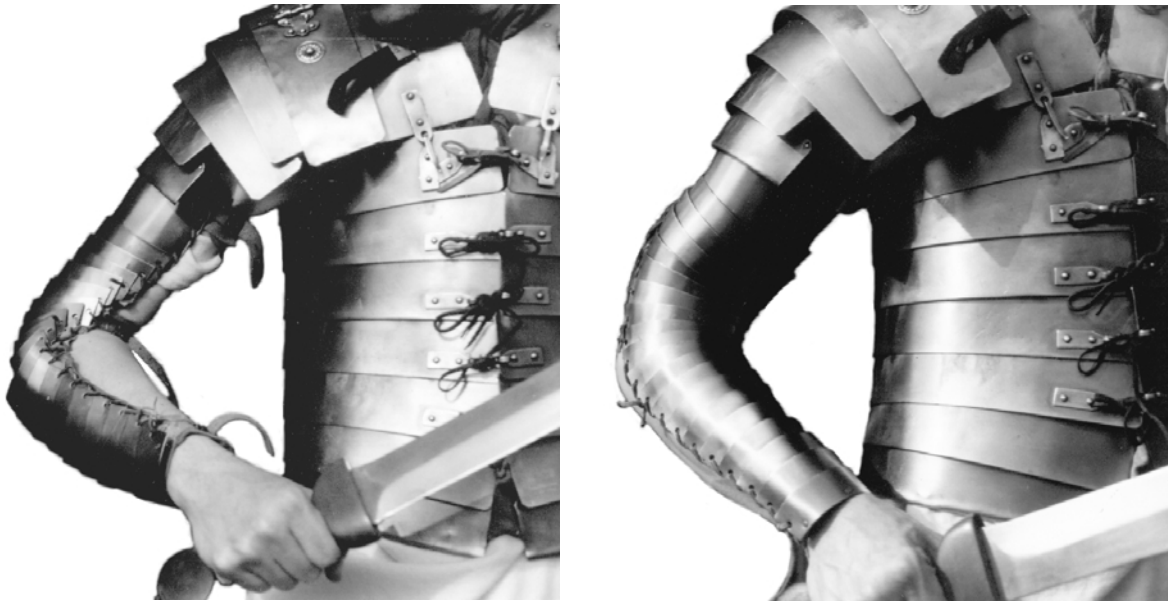


Fig.8.5 Incorrect (left) and correct (right) way of using the segmental armguard. Photos courtesy M. Amt.

## SHOULDERGUARDS

It has been suggested that a relief showing cavalymen, from the Belgium/Luxemburg border region, depicted laminated shoulderguards being worn with a cuirass made of some other type of material.<sup>26</sup>

### Evidence

The evidence for this type of defence is arguably purely iconographic (but see below). The relief in question (Fig.8.6), found at Arlon, shows cavalymen with what have been interpreted as laminated shoulderguards attached to mail cuirasses. This is one of a series of cavalry reliefs, interpreted by some as battle cenotaphs or funerary monuments, and needs to be seen in the context of other such works. In particular, comparison with a second relief from Arlon, another from Lüttich (Germany), and *Reitertyp* tombstones from the Rhineland<sup>27</sup> could easily be used to suggest that some confusion may easily have arisen on the part of the sculptors attempting to portray mail shoulder doubling.

### Description

Since no actual example of this form of defence has been recognised (if, indeed, it ever existed), any description will necessarily be sketchy and owe much to attempts at physical reconstruction (for which see below). A literal interpretation of the Arlon relief (Fig.8.7a) would identify an upper shoulderguard with four lesser shoulderguards but, apparently, no breast- or backplates associated. An alternative view might be that the sculptor intended to depict the

usual mail shoulder doubling, edged (possibly in leather or fabric), and with the tunic showing beneath the outer edging (Fig.8.7b). The Arlon relief itself is not of sufficient quality to allow one interpretation to be preferred over the other, but the comparable reliefs suggest that it is shoulder doubling, not segmental shoulderguards, that were intended.

### Reconstructions

The principal difficulty in accomplishing the marriage of segmental shoulderguards with a mail shirt lies in the manner in which they are joined. With normal *segmentata*, the whole defence depends (quite literally) on its internal network of leathers which, for the upper units, join the shoulderguards to the collar plates. No collar plates seem to be indicated on the Arlon relief so it would be necessary to assume that the leathers of the shoulderguards were in some way attached to the mail of the shirt.

A speculative reconstruction of this type of shoulder defence has indeed been produced by Michael Simkins (Fig.8.8) which shows that it is at least technically feasible. He used the unusual shoulderguard from Chichester (Fig.5.12) with its pairs of rivets (which breaks from the usual pattern of upper shoulderguards, which have single central leathering rivets). Simkins riveted the four central bosses through the mail and two of the four leathers, whilst the outer two leathers were only attached to the plates.<sup>28</sup> However, in the meantime, for conclusive proof of its use, we must wait for a suitably unambiguous archaeological discovery.



Fig.8.6 Relief from Arlon suggested as depicting segmental shoulderguards on mail shirts. © Musée Luxembourgeois

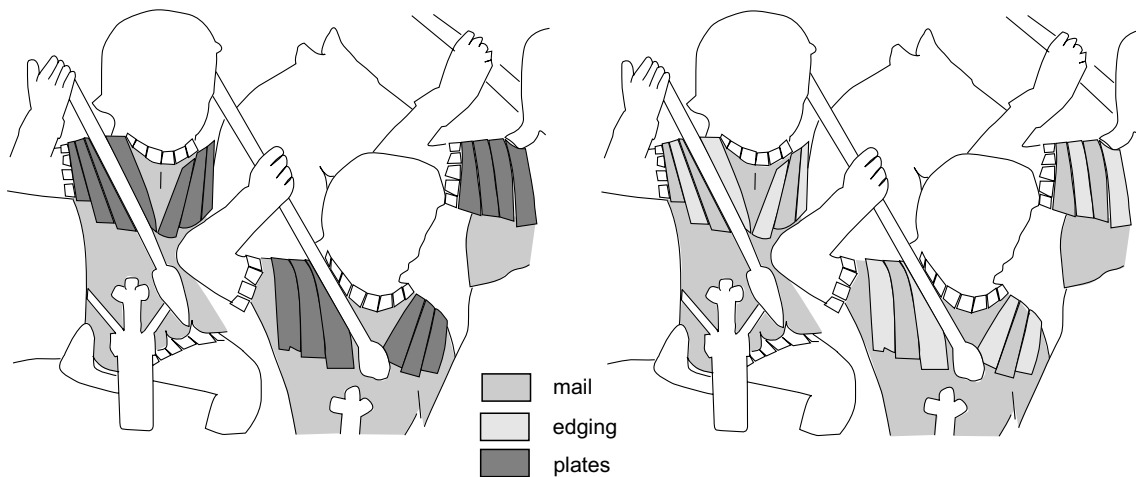


Fig.8.7 Interpretation of the relief from Arlon showing it with a) segmental shoulderguards and b) shoulder doubling on the mail.

### List of likely components

upper shoulderguard plates	6
lesser shoulderguard plates	8
shoulder leathering rivets	18
?shoulder leathering washers	18
shoulder leathers	6
lobate hinge-halves	8
lobate hinge fastening rivets	80

### CUISSSES AND OTHER SEGMENTAL ARMOUR

The cuisse was an important defence for an armoured horseman, as it protected the thigh. This was vulnerable because of the rider's sitting position,

exposing the upper leg to a downward blow from the sword of a passing foe, especially infantry. No examples of segmental metal cuisses are known from Roman contexts, although they were clearly being used by the enemies of Rome.



Fig.8.8 Reconstruction by Michael Simkins of the Arlon type of cuirass. Photo M. Simkins



Fig.8.9 Graffito of armoured cavalryman from Dura-Europos

### Evidence

Iconographic evidence is the main source for the existence of segmental cuisses and, as such, of limited help in understanding technical details. The famous graffito of an armoured cavalryman from *Dura-Europos* appears to depict segmental armour on the arms and lower legs of the cavalryman, but not on the upper legs, where a convention that may have been intended to represent mail or scale is shown (Fig.8.9). They are also shown (together with laminated arm defences) on Sassanid reliefs from Tang-e Sarvak and Naqs-e Rostam which date to the 3rd and 4th centuries AD.<sup>29</sup>

### Description

Since no actual examples exist (or, at least, have been recognised as such), it is not possible to describe an actual cuisse. Two examples from *Dura-Europos*, made of lacquered rawhide scales,<sup>30</sup> may make useful comparisons with the likely form of a segmental metal defence (Fig.8.9). They measure 770mm long by 600mm wide (tapering to 270mm) and 610mm long by 480mm wide (tapering to

210mm), with 14 and 12 rows of scales respectively,<sup>31</sup> and were thus probably intended to reach from the waist to the knee, and wrap around the sides of the thigh, tapering towards the knee. As with the armguard, it might be anticipated that some means of stopping a deflected sword blade moving up the leg would be required and continuing the defence above the leg may well be one way in which this particular danger was countered. Similarly, it can be anticipated that a cuisse will not wrap around the entire leg since this would be both too complicated to realise and, more importantly, unnecessary, since it is only the front (or top, when seated) and outer side of the thigh that requires protection.

### Reconstructions

Robinson's reconstruction of a segmental cuisse was based on a misinterpretation of the Newstead copper-alloy armguard remains, and appears not to make any provision for the defence reaching as far as the waist. Nevertheless, in its basics, it is probably as close as it is possible to get with the current limited state of our knowledge.



**List of likely components**

lames	<i>c.</i> 30
leathering rivets	90–120
internal leathers	3 or 4
padded fabric and leather lining	1

## NOTES

- 1 Occasionally nowadays anachronistically – and rather inaccurately (since it was very different in form to later armguards) – known by the medieval term ‘vambrace’. In reality, in medieval plate armour, the vambrace only covered the lower arm, the upper arm being covered by the rerebrace, and the elbow protected by couter plates, although modern usage tends towards referring to the complete arm defence as a vambrace (cf. EDGE & PADDOCK, 1988, 79–80).
- 2 In the case of the figurine from Versigny (PICARD 1980; JUNKELMANN 2000, 83, Abb.118) usually identified with a *crupellarius* (mentioned by Tacitus *Ann.* III,43,2 and 46,3).
- 3 FLORESCU, 1965, Figs.189–90, 195, 197–201, 204, 212, 217, 221.
- 4 For this is what we must presume the curved rectangular shields, standards, and *pila* are intended to signify (RICHMOND, 1982, 49).
- 5 COULSTON, 1989, 32.
- 6 Severus: *AuhV* 3, Heft 6, Pl.5,3; SELTZER, 1988, 142 Nr.59. *Salutus: ibid.*, 140 Nr.54.
- 7 *Ibid.* 67.
- 8 COULSTON, 1995, 16.
- 9 *ND Or.* XI and *Oc.* IX ‘*insignia viri illustris magistri officiorum*’. Cf. ROBINSON, 1975, Fig.191.
- 10 JUNKELMANN, 2000,83–4.
- 11 COULSTON, 1998, 5. Cf. the Villa Borghese mosaics, showing a copper-alloy armguard (JUNKELMANN, 2000, front endpaper). The representation of (apparently iron) scale armguards also indicates that such defences could be made of metal (cf. *ibid* rear endpapers).
- 12 VON GROLLER, 1901.
- 13 *Ibid.* 43.
- 14 CURLE, 1911, caption to Pl.XXIII claims it to have come from room 5 (the *sacellum*), but elsewhere suggests the find came from room 7 (*ibid.* 51, 159). It seems likely that the text is correct and the plate caption wrong.
- 15 ROBINSON, 1975, 185–6, Pls.503–4.
- 16 BISHOP, 1999b, 31–3, Fig.7.
- 17 M. Lyne, pers. comm.
- 18 Pers. obs. CO23508, 23542–3.
- 19 BISHOP forthcoming.
- 20 A. Morillo pers. comm.
- 21 Carlisle: McCARTHY *et al.* 2001, 507; RICHARDSON, 2001, 188–9, Figs.2–3. *Sarmizegetusa*: L. Petculescu, pers. comm.
- 22 Newstead: pers. obs. Corbridge: pers. obs.
- 23 Eining: BISHOP forthcoming. León: A. Morillo pers. comm.
- 24 ‘Das Futter war bald Leder, bald grobe Leinwand gewesen sein’: VON GROLLER, 1901, 116. Newstead: CURLE, 1911, 159, Pl.XXIII.
- 25 ROBINSON, 1975, 186.
- 26 ALFS, 1941, 122, followed by SIMKINS, 1988, 122.
- 27 Arlon: GABELMANN, 1973, 151–3, Bild 18; Lüttich: *ibid.*, 148, Bild 15; Reitertyp: *ibid.*, 156–70.
- 28 Simkins pers. comm. I am particularly grateful to Michael Simkins for providing details of his reconstruction.
- 29 *Dura-Europos*: BAUR *et al.*, 1933, Pl.XXII,2; Tang-e Sarvak: VON GALL, 1990, 13–19; Naqs-e Rostam: *ibid.*, 30–6.
- 30 ROBINSON, 1975, Pls.457–8.
- 31 ROSTOVTZEFF *et al.*, 1936, 450–2, Pl.XXIII.

## Chapter 9: Technical matters

### FERROUS METALS

All of the components for a segmental cuirass had to be made from sheet metal beaten out from ingots of the raw material. Billets of iron are known from Roman sites (Fig.9.1a) and bars of partially-worked brass have also been found (Fig.9.1b).<sup>1</sup>

Although it was long thought that the Roman army did not know how to form steel, or that where it did occur it did so accidentally, work by Dr David Sim has shown that this was not the case and that deliberate hardening of the plates of *lorica segmentata* was regularly accomplished, so that it was closer to a modern mild steel than wrought iron and the term 'steely iron' may be more appropriate to describe it. The sheet metal was apparently deliberately produced with harder perlite on the outside, softer ferrite on the inside.<sup>2</sup>

Due to the fact that most *lorica segmentata* plates that are excavated are heavily corroded and can yield little by way of useful information on their original thickness, the occasional discoveries of uncorroded pieces (particularly from waterlogged deposits) are especially valuable. From these, it can be determined that the thickness of the ferrous plate used varied according to its position in the cuirass. Plates at the top, particularly those on the shoulders, seem invariably to have been thicker (1mm or more) than those employed on the girth hoops (around 0.7mm),<sup>3</sup> presumably reflecting the perception of threat on the part of the armourers. The one likely example of a Kalkriese-type upper shoulderguard in fact shows a thickness closer to 3mm,<sup>4</sup> but this was considerably reduced by the time the Corbridge type came into use, presumably an acceptable compromise between weight and protection. Tests using modern mild steel showed that a replica of the infamous Dacian *falx* could still penetrate sheet metal 1.6mm thick.<sup>5</sup>

Part of the secret of the success of segmental armour – if indeed it can be thought to have been so – lay in the combination of simplicity and strength of the armour plate. Simplicity came from the fact that the major components were only ever curved in one axis (although some breastplates show signs of slight dish-ing) and could thus be quickly bent to shape. It may arguably also have been present in the component-based nature of the cuirass, allowing production and assembly to be undertaken by a large or a small workforce. Strength was provided by that same curvature: whilst a circle is a very strong shape, an oval (for the torso) is almost as good, and the repetition of convex curves throughout the armour made deflection of

blows a priority. However, it must be remembered that, ironically, some of the strengths can also be argued to have provided weaknesses in the cuirass.

### COPPER ALLOYS

The copper alloy used for most of the fittings (hinged fittings, lobate hinges, tie loops etc) was a type of brass known as *orichalcum*, the same metal used in brass coinage from the time of Augustus onwards.<sup>6</sup> *Orichalcum*, which is almost golden in appearance (Plates 1 & 4), was a binary alloy of copper (80–85%) and zinc (20–15%) and was quite widely used in military equipment from the 1st to the 3rd centuries AD. As such it closely resembles the modern alloys of 'low brass' (CA240) to 'red brass' (CA230) (with a Rockwell hardness of between 70 and 65). Since *orichalcum* was also used in currency, the components of *lorica segmentata* made from it were, effectively, constructed from bullion. The rivets used to secure the fittings to the iron plates might be of the same composition, but a softer metal was often used, with between 90/10 composition ('commercial bronze' (CA220), with Rockwell hardness of 58) and 95/5 ('gilding metal', CA210, with a Rockwell hardness of 52),<sup>7</sup> which made it easier to secure (peen) the rivets in place. The higher copper content of the rivets also gave them a more coppery colour. No examples of bronze fittings (i.e. a copper/tin alloy) have so far been identified on Corbridge-type cuirasses.<sup>8</sup> The different colour characteristics of the various metals means it is often possible to identify uncorroded metals tentatively without the aid of any scientific analysis (the Newstead fittings, for instance, are brass-coloured, although they have never been tested), but such analyses are obviously desirable in the long term.

### DECORATION

The decoration of *lorica segmentata* was achieved in a variety of ways. The first and most obvious way was by the use of ornamental fittings. Hinges, hinged fittings, and washers could all be embellished beyond simple functional requirements (Fig.5.6). This taste for decorative shapes is first evident on the Kalkriese type and still evident on the Newstead-type cuirass in use nearly 300 years later.

Sub lobate (Fig.4.3,1–3), and later lobate (Fig.5.3f), hinges are the most obvious examples of decorated

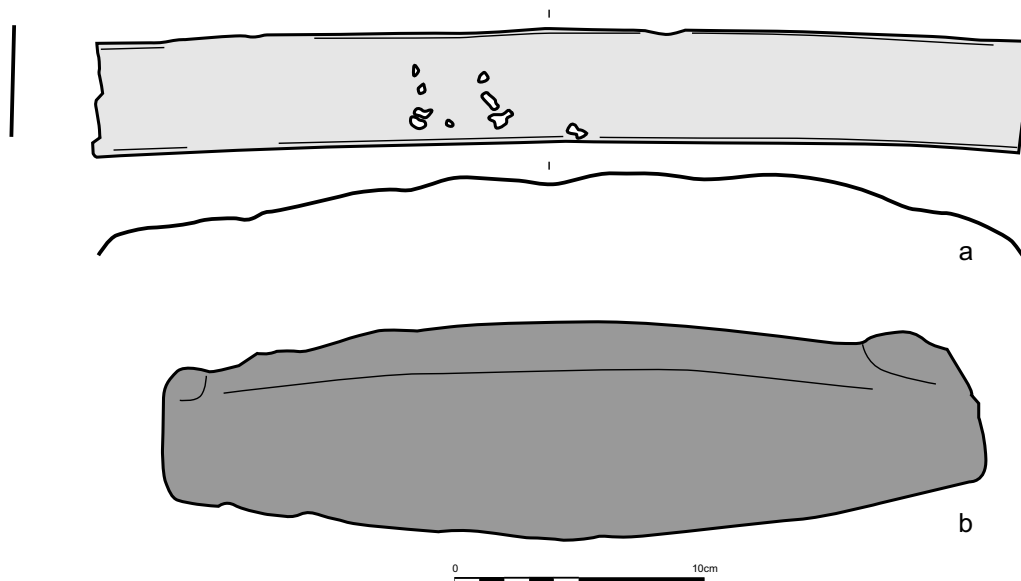


Fig.9.1 Sheet of brass from Corbridge (a) and billet of iron from Newstead (b). Scale 1:3

functional fittings. It might be argued that plain rectangular versions were all that was actually needed and were indeed used on occasion, but these seem to have been in the minority and may well represent hasty repairs. All of the repairs on the Corbridge Hoard cuirasses replaced lobate hinges with like (Fig.9.2), although the differing styles used suggests that the replacements may have been cannibalised from other (scrapped) units. In one or two cases, crude imitations of lobate hinges seem to have been fashioned (Fig.9.9,1), but what is remarkable is the way that decorated hinges continued in use for such a long time.

Ornamental shapes, in the form of scalloped edges, were also used on hinged fittings on the Kalkriese type cuirass (Figs.4.2,7 & 4.3,8), but by the time of the Corbridge type, these had become much plainer (Fig.5.6).

Next, surface decoration on the body of the fitting itself was also used (Fig. 5.8), whether as stamped concentric circles, scored lines, or embossed patterns. Decorative washers for leathering rivets began to be used on the Corbridge type. It has long been observed that segmental armour shared these with helmets of Robinson's Imperial-Gallic type.<sup>9</sup> A stamp (Fig.5.7) for the production of such decorative bosses has been found at Oulton (England)<sup>10</sup> and unfinished examples are known, although it is not possible to tell whether the bosses were intended for body armour or helmets (perhaps even both).

The third form of decoration came from the colour contrasts inherent in the metals used for the armour (Plates 1, 4, & 6) – grey for the plate itself together with a golden yellow for the copper-alloy fittings and, in many cases, a darker coppery colour for the rivets, was on occasion further enhanced by means of decorative

plating. Notwithstanding the aesthetics of the cuirass for modern eyes, the Roman army had a marked penchant for tinning and silvering which can be found, albeit rarely, on *lorica segmentata*. Only one fragment of tinned ferrous sheet is so far known (see below, p.80),<sup>11</sup> but a number of copper-alloy fittings are now known that were decorated in this way. Several of the Kalkriese cuirass fittings still retain traces of silvering (Fig.4.2,6), whilst a Corbridge-type lobate hinge from the Baden (Switzerland) Du Parc site was similarly treated.<sup>12</sup> The recent discovery of the Stillfried girth hoops demonstrated how tie rings could also be tinned.<sup>13</sup> Whether such tinning or plating was, at least in part, designed to help prevent corrosion is unknown.

## ORGANIC COMPONENTS

The only organic components of segmental armour itself were the leather straps upon which it was articulated (along with the ties used to secure the girth hoop halves). Actual examples of internal leathers from *lorica segmentata* have yet to be found,<sup>14</sup> although mineral-preserved remains are quite common. This is a process similar to fossilisation, whereby the cellular structure of the leather is replaced by iron oxide from neighbouring corroding ferrous plates. Therefore the form of the original straps is preserved, even though the organic component has rotted away. It is more common to observe it on larger deposits, such as complete sets of plates.

## MANUFACTURE

Although most modern replicas of *lorica segmentata* tend to be built by lone craftsmen undertaking all of

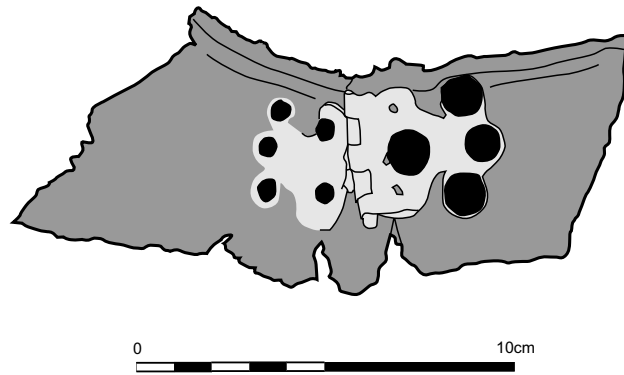


Fig.9.2 Substituted lobate hinge repair on collar assembly of Cuirass 3 from the Corbridge Hoard. Scale 1:2

the necessary tasks themselves, the segmental cuirass is ideally suited to a production-line method of construction. This would require various unskilled and semi-skilled labourers to concentrate on producing the components in parallel, finally bringing all the pieces together to form the armour under the guidance of a skilled armorer. Such a method of production may be the reason why plate armour is generally finished to such a mediocre standard. In a pre-industrial society, it was much more time-consuming to produce an item to the sort of levels of millimetre accuracy that our modern mechanised society takes for granted and it could well be that levels of expectation of quality of finish differed.

In fact, it could be argued that many of the known finds of *lorica segmentata* show clear signs of what might be termed a binary production process. First, the cuirasses were manufactured in the manner outlined above, resulting in fairly uniform (but seldom strictly identical) sets of fittings on any one cuirass, together with a rather obsessive level of detailing and decoration. Second, there is plenty of extant evidence for hasty repairs, often suggested as field maintenance.<sup>15</sup>

One possible interpretation of this pattern might be that the cuirasses were made during the quiet winter months, when there would be plenty of unskilled and semi-skilled labour available amongst the soldiery to operate in the production line manner discussed above. When the campaigning season arrived, however, such manpower would not be accessible, yet this would be the time when the armour would be most susceptible to damage, hence the need for makeshift repairs, cannibalising parts from existing cuirasses. Such would be the inevitable result of using the same body of men to construct the armour as well as use it. Other interpretations are doubtless possible, but few seem quite so attractive.

### SIZE AND FITTING

Examination of both original cuirass components and modern reconstructions has made it very plain that one size did not fit all. Modern re-enactors tend to opt for a 'small, medium, large' approach if they are not producing for specific individuals of known sizes (the degree to which armour was personally fitted is, of course, unknown and parallels with modern military practices unhelpful and ambiguous). Similarly, the range of breastplate sizes in the Corbridge Hoard shows wide variation (Fig.5.4). Some elements of plate design remain fairly constant, notably the distance between the lateral fasteners and the lower edge of the breastplate. Others show variation, amongst them the distance between the lateral fastener and the upper edge of the plate and the overall width of the plate. For those longer in the body, it is possible that more girth hoops were used (eight on the Corbridge A and one half of the Stillfried set, seven on the Corbridge B/C and the other half of the Stillfried set), or whether the depth of the girth hoops themselves was increased (in the Corbridge Hoard, depths ranged between 50mm and 60mm for the type A, and 55mm and 60mm for the B/C.<sup>16</sup>

Although the cuirass had to be designed to fit, it also had to be designed to fit over an arming doublet, which we know had to be worn with the cuirass.<sup>17</sup> Support for this assertion mainly comes from the archaeological finds, but would seem to be confirmed by observations of modern reconstructions. When worn without any padding under the shoulders, replica *lorica segmentata* 'sags' in such a way that the breastplates meet at an angle and often leave gaping holes in the centre of the chest (Fig.9.3a). This in turn places undue stress upon the lateral fasteners, particularly on the Corbridge type. The hinged buckle and hinged strap lateral fasteners were always riveted on parallel to the lower edge of the breastplate, perpendicular to the inner edges of the same plates. Original examples show no signs of

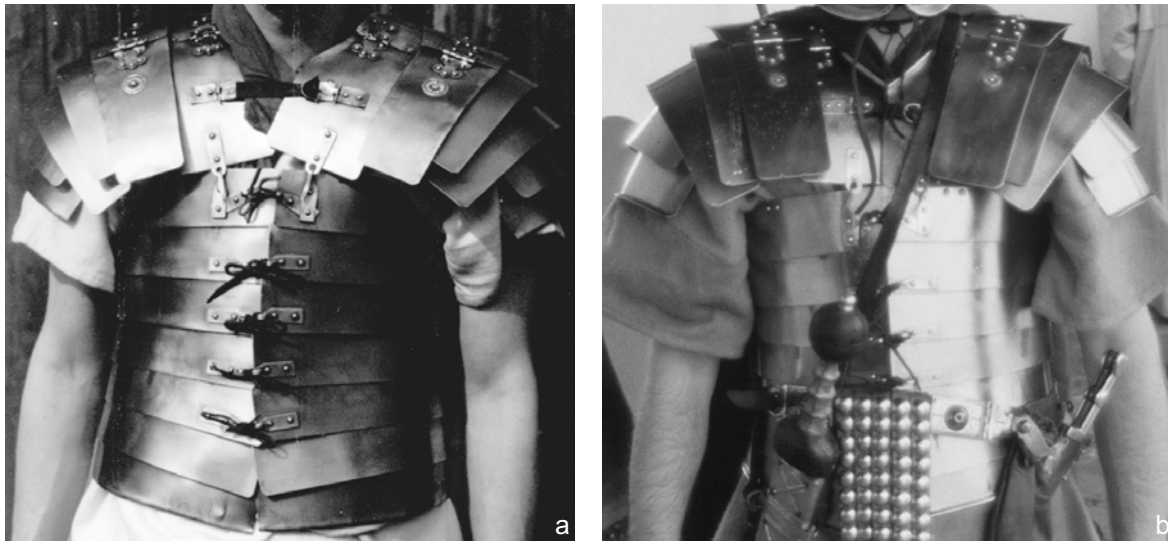


Fig. 9.3 Modern reconstructions a) without and b) with padded shoulders provided by an arming doublet (photos courtesy M. Amt (left) and J.C.N. Coulston (right))

the sort of damage that might be expected if the stressed condition actually applied in the Roman period, and Newstead cuirasses were clearly designed to have the breast- and backplates meet neatly, so we can reasonably conclude that Corbridge-type breastplates were not supposed to join at an angle. In fact, it was normal in the medieval period (and earlier) for body armour to be worn over a padded garment in order to absorb the shock of blows.

In order for the upper units to sit correctly, therefore, padding had to be provided to obviate the natural slope of the shoulders, largely a result of the trapezium muscles on either side of the neck. Ample padding on the shoulders not only provides a level basis for the shoulderguards, but also raises the neck aperture of the collar plates above the trapezium muscles, which explains why Corbridge type collar units have such small neck openings (Fig. 9.3b). Obviously, the padding provided by an arming doublet also improves the protection afforded by the armour, and since the design of the *lorica segmentata* focuses on protecting the shoulder region, additional padding in this region can come as no surprise.

In the Antonine period, *lorica segmentata* begins to be depicted being worn with *pteryges* (Figs. 2.4, 2.5, and 2.7) similar to those found in earlier periods on muscled cuirasses and with mail and scale armour. Regardless of whether they were made of leather, stiffened linen, or some other material, they would have offered some limited additional protection to the upper arms and lower torso.<sup>18</sup> It is logical to assume that these *pteryges* were in fact part of the arming doublet (and they are indeed depicted as such on one of the few known representations of the garment<sup>19</sup>), but the nature of the iconographic evidence (the Column of

Marcus Aurelius and a copper-alloy statuette), being at once metropolitan and highly derivative, is questionable to say the least.<sup>20</sup> Moreover, the Alba Iulia figure (see above, p. 62) – of provincial origin and therefore more reliable as an iconographic source – is not wearing *pteryges*.<sup>21</sup>

Although the use of an arming doublet with *lorica segmentata* is deduced and, as such, unlikely ever to be capable of proof, the necessity for it with segmental armour – as with all body armour – seems beyond doubt.

## CORROSION

*Lorica segmentata*, since it was always constructed using two metals (iron and copper alloy) was prone to bimetallic corrosion.<sup>22</sup> This was especially unfortunate, since most of the copper-alloy fittings were permanently riveted to their parent iron plates and it was thus impossible to clean between them without deriveting the fittings. This meant that every time a cuirass got wet, whether from a downpour or simply from the sweat of a soldier's exertions, the chemical reactions that led to corrosion could take place, and there was little that could be done about it short of the sort of fastidious drying that would most likely be impractical in the field (Plate 2).

There is no evidence that painting, 'bluing', or hot oil dips were used to enhance the resistance of the armour plate to corrosion (although, as ever, absence of evidence need not imply evidence of absence), but a fragment of ferrous plate, readily recognisable as part of an upper shoulderguard, from Xanten has clearly been tinned.<sup>23</sup>

Paradoxically, the same combination of metals that accelerated corrosion could also have an effect



Fig.9.4 Modern re-enactors' reconstruction of a Corbridge type B cuirass. It is not an exact replica of an original Roman cuirass in terms of the materials used and their thicknesses, but it can nevertheless prove informative about the way that such armour worked. Note that, as with Robinson's early reconstructions, the points on the upper shoulderguards have been set (incorrectly) to face outwards. Photos M.C. Bishop

upon the preservation of a ferrous plate once it had been deposited in the ground. Put simply, due to the zinc in the *orichalcum* fitting, the metal of the plate surrounding a brass fitting could be better preserved than those parts that were further away, which helps to explain why copper-alloy fittings are often found still attached to a small portion of ferrous plate.<sup>24</sup> Except in unusual conditions, such as waterlogging, the iron plates are usually found completely reduced to iron oxide. This has the disadvantage that it is normally impossible to study the metallurgical properties of the plate, and the advantage that associated organics, such as the internal leathers, are often still represented as mineral-preserved organics (see above).

### EVERYDAY ATTRITION

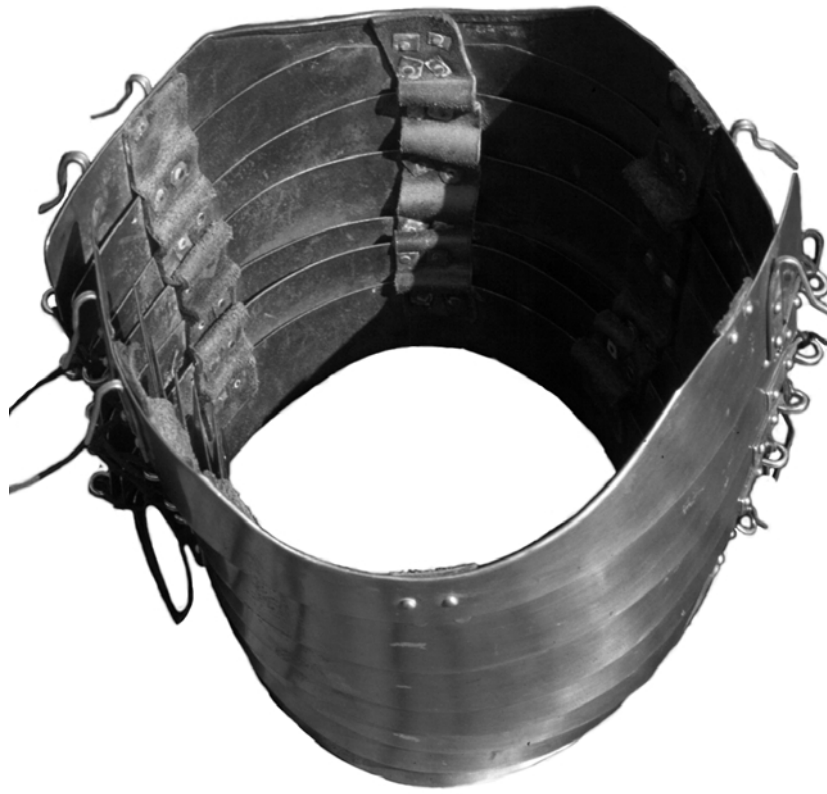
Wear and tear was clearly a problem even without the added hazards of combat. Here the experience of re-enactors performing in displays can be informative in giving some idea of the sort of problems encountered in everyday use (Fig.9.4).

Indeed, attrition from 'normal' use looks as if it may be one of the main reasons that *lorica segmentata* fittings are such common finds on military sites of the 1st century AD. One suspects (but, given the limits of the archaeological evidence, cannot prove) that the finds drastically over-represent the use of segmental armour in the Roman army: the frailty of segmental armour, compared to the much greater integrity of mail, means it is very difficult for us to assess the relative proportions of these types of armour in use at any one time.

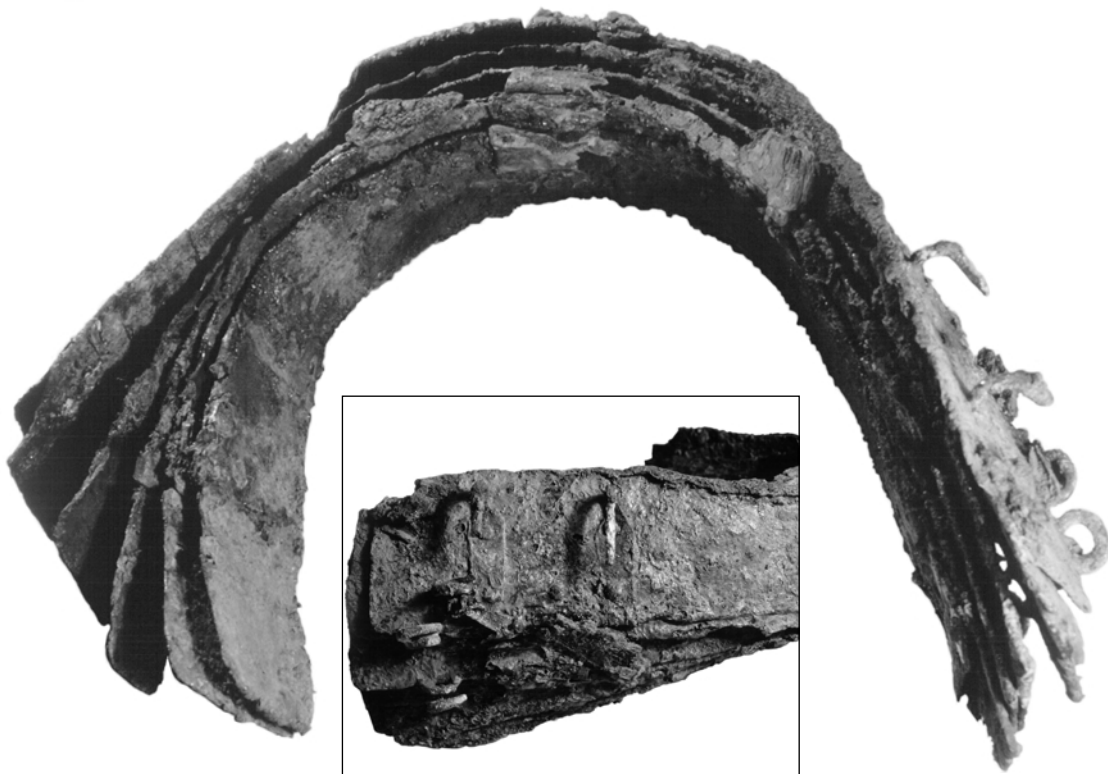
Modern reconstructions (almost exclusively of the three variants of the Corbridge type of cuirass) provide

some insights into the ways in which *lorica segmentata* could fail and the sort of measures necessary to deal with such potentially lethal problems. First, it must be pointed out that a straightforward comparison is by no means easy due to the limitations of modern replicas (see below, p.95ff). Nevertheless, display work and, in some cases, even simulated combat, can produce suggestive data that are at least worthy of consideration.

One of the greatest vulnerabilities revealed by re-enactors' experiences with segmental armour – and one which does not necessarily show too clearly in the archaeological record – is failure of the internal leathers on the girth hoops. It has been noted that rivets pulling through the leather can occur through poor assembly (the rivets having been incorrectly peened), as a result of a blow or crushing of the cuirass, or simply through inadequate maintenance of the leather (through over-oiling, which can cause it to stretch and weaken, or at the other extreme insufficient oiling, leading to drying and cracking).<sup>25</sup> The problem of rivets pulling through is effectively countered by the use of roves, a practice attested on many archaeological examples, but that this in turn could split the leathers longitudinally if poor-quality leather had been used. Some re-enactors have recorded minor failures occurring with a frequency of about one every 100 hours of wearing which, for a Roman soldier, would probably represent one a fortnight. A modern precaution is to carry spare leather thongs (of the sort used for tying the girth hoops together) for emergency repairs in the event of a riveting failure 'in action'. Similar problems of stretching leather can be encountered on the vertical fastenings of the Type A body armour, where the lower units are effectively suspended from the upper by means of two



*Fig.9.5 Reconstructed set of girth hoops standing on its internal leathers. The leather is not new and some sagging is visible, but it would still take considerable effort to compress the hoops. Photo M.C. Bishop*



*Fig.9.6 Over-compressed right-hand set of Type B/C girth hoops from the Corbridge Hoard (Cuirass v) with (inset) a detail of the rear of the set (including the mineral-preserved remains of a leather tie). Photos M.C. Bishop*



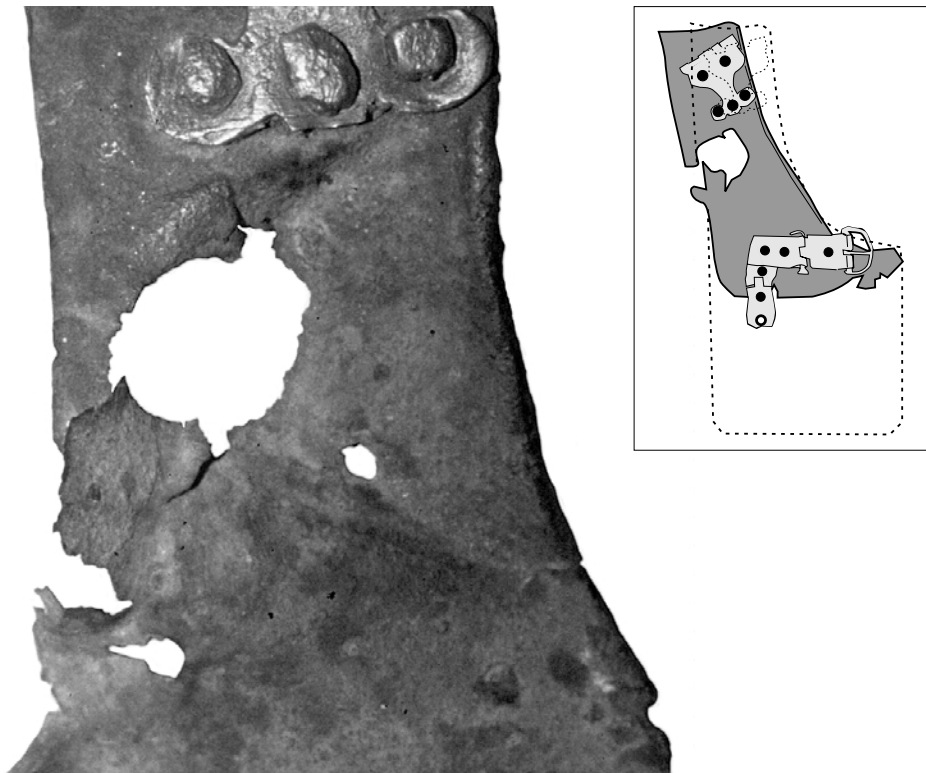


Fig. 9.7 Possible battle damage to the Bank of England breastplate. The plate seems to have been penetrated and distorted (see inset) by a blow just below the lobate hinge. Photo J.C.N. Coulston

external straps at the front and four internal at the rear (see above, p.32), suggesting that this may be why hooks were introduced as vertical fasteners.<sup>26</sup>

Finds of lower units of segmental armour almost invariably show signs of over-compression. Left to its own devices, a set of *lorica segmentata* girth hoops will stand more or less upright (Fig.9.5), depending upon the age and suppleness of their internal leathers.<sup>27</sup> A cuirass will slump more as the leather becomes softer, but it will still stand after a fashion and not collapse in the manner so vividly illustrated by the lower units in the Corbridge Hoard, for this requires deliberate compression by a human being, presumably in order to reduce the amount of storage space required. This appears, almost invariably, to have led to over-compression, whereby the girth hoops are jammed over each other, internal leathers are damaged, and the outer (ie upper) plates become distorted in shape (Fig.9.6, Plate 8). An over-compressed set of girth hoops would require repair before being used again, at least re-leathering, and possibly reshaping of the distorted plates. Therefore the act of compression would seem to imply that a set was considered beyond repair and was being scrapped.

### BATTLE DAMAGE

All armour is inevitably a compromise between efficacy as a defence and practicality from the point of view of its weight and mobility. Experiments have shown how easy it is to penetrate the sort of ferrous plates used in *lorica segmentata*, whether it be with a *falx*<sup>28</sup> or a catapult bolt,<sup>29</sup> but it is clear that the design ethos behind the cuirass was never intended to provide full protection from such threats. Functionally, defence was concentrated against the downward blow from an ordinary straight-edged sword, hence the emphasis on defence in the shoulder region, where the shoulderguards either turned the blow outwards and away from the neck or, assisted by the flange of the helmet neckguard, caught it on the out-turned or rolled edge of the collar section. The thickness of upper shoulderguards (particularly the Kalkriese-type examples) only serves to underline the primacy placed upon the role of the upper units in the defence of the individual. The girth hoops, on the other hand, served to deflect stray blows sideways and downwards and, as such, did not need to be as thick as the upper components. The curving shape of the plates would have helped the lower units deflect direct stabbing blows, but since few of Rome's enemies used such fighting techniques (it is unlikely that the armour would be designed with a view to combat in civil wars, where

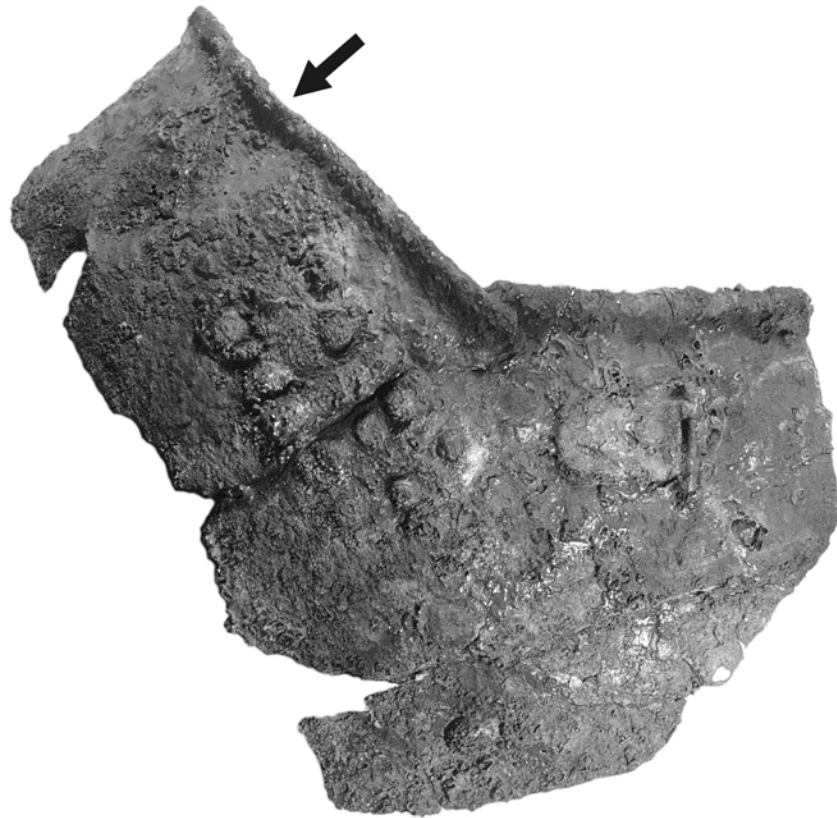


Fig.9.8 Parts of two backplates and the mid-collar plate from Cuirass 4 from the Corbridge Hoard showing damage (arrowed). Photo M.C. Bishop

other *segmentata* wearers using a sword for stabbing might be encountered), this would not normally have been a concern to the soldier.

There are no clear and indisputable examples of battle damage to a piece of *lorica segmentata*, unlike, for example, the gorget found with the Catalka (Bulgaria) warrior burial, where an arrow head is still embedded in the metal<sup>30</sup>. However, there are instances of what might be open to interpretation as combat damage. Chief amongst these is the Bank of England breastplate from London (Fig.9.7). This has received a substantial blow (probably sharp force) to the centre of the plate, resulting in a jagged opening below the lobate hinge and above the hinged buckle fitting. Interestingly, the plate has also been slightly twisted out of alignment and appears to have been cut down from its original size (cf. Fig.5.4). This is the most obvious example, but the mid-collar plate of Cuirass 4 in the Corbridge Hoard (Fig.9.8) is quite severely dented (possibly as a result of a blow) and most of the upper shoulderguards in the Hoard show signs of re-riveting (see below), a possible indication of blunt (or even sharp) force trauma. The more serious distortions may have been beaten out subsequently when the rivets were replaced.<sup>31</sup> The Eining backplate has been damaged by what would appear to have been a horizontal

blow, struck with insufficient force to penetrate it, although there is no way of telling if this was due to damage in service or attrition, suffered after its removal from a cuirass or even at the time of deposition.<sup>32</sup>

### MAINTENANCE AND REPAIR

Both archaeological evidence and experience with modern reconstructions indicate that the segmental cuirass was maintenance hungry, not least because of its inherent weaknesses (delicate fittings, large number of moving parts, susceptibility to corrosion) and nearly every piece of the armour that has ever been found shows some signs of repair in its lifetime.

In fact, many finds show signs of innovation on the part of armourers. With the Gamala armour, for example, internal leathers were replaced with a sliding rivet arrangement (foreshadowing a common medieval and early modern technique).<sup>33</sup> Conventional female vertical fasteners on the Newstead-type backplate from Eining were replaced with simple pinched loops<sup>34</sup> and such loops also appear to have been used on a fragmentary plate from Newstead.<sup>35</sup> Some such modifications could be of a superior quality: the Corbridge type C, the same as the Corbridge B

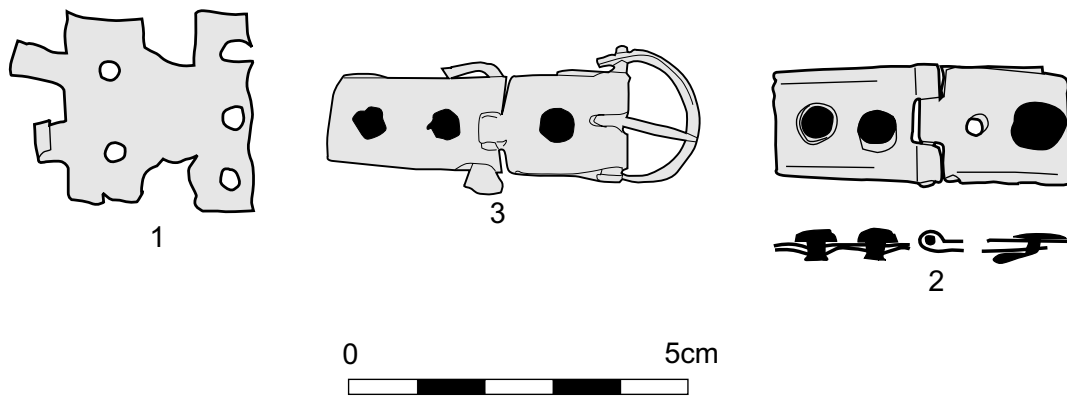


Fig.9.9 Corbridge-type fittings showing crude replacement lobate hinge (1), two normal domed and one large flat rivets (2) and crimped and folded hinge spindle (3). Scale 1:1

except for the fact that its female vertical fasteners were made of iron, rather than copper alloy, is the only example of its type so far identified, so may well represent a repair with available materials. The fact that the Newstead type cuirass continued to use copper alloy for such fittings clearly indicates that the Corbridge C was not an evolutionary development, but just a one-off modification.

Some of the more mundane repairs appear to have been common occurrences. Replacing hinge spindles on Corbridge type fittings was one such measure. When new, these items consisted of a circular-sectioned rod with near-hemispherical terminals to hold the component in place. The usual replacement comprised a piece of wire crimped at one (or, occasionally, both) ends and then bent over at the other to secure it in place (Fig.9.9,3). Another substitution that is often found is the use of large irregularly shaped and flat-headed rivets in place of the original small dome-headed ones (Fig.9.9,2).

The cuirasses in the Corbridge Hoard demonstrate how more substantial repairs could also be undertaken. In several cases complete lobate hinges had been replaced (Fig.9.2). In others, lobate hinges were functionally replaced by riveting neighbouring plates together (Fig.5.5). It is not always clear whether the riveting of plates and the substitution of hinges were contemporaneous or sequential where they occur together. If the former, it might be thought to imply an unnecessary obsession with decorative detail; if the latter, then it could be interpreted as representing repeated repairs to the same weak point. As an extreme example, the fact that both upper and lesser shoulderguards appear to have been transferred from Cuirass 6 to Cuirass 1 demonstrates fairly radical surgery being undertaken on units. It would have required deriveting the original plates from the internal leathers and then riveting the replacements into position. There is also the possibility that one of the girth hoops on Cuirass v had a rolled or upset bottom edge, implying that it was a re-used bot-

tom plate which had been inserted as a repair.<sup>36</sup> Indeed, it might be argued that the whole purpose of the cuirass units in the Hoard chest was to permit precisely these sort of cannibalisations.

Some of the Corbridge Hoard shoulderguard sets show evidence of re-riveting, perhaps the result of wear and tear, or even possibly repaired battle damage. This is betrayed by the arrangement of leathering rivets and decorative washers on the upper shoulderguards (Table 9.1): Cuirass 3, for example, has one flat-headed rivet with a decorative boss and two domed rivets without washers, suggestive of at least one instance of repair; Cuirass 1, on the other hand, where the shoulderguard section was probably being transplanted from Cuirass 6, has one domed rivet with no boss, and two with bosses of different patterns (so arguably evidence of two prior instances of repair). Interestingly, Cuirass 5 is one of the few where all the leathering rivets and washers appear to be original.<sup>37</sup>

Corbridge is not the only source of evidence for repair. A plate from Chichester has been dramatically patched with a riveted copper-alloy splint (Fig.9.10).<sup>38</sup>

Maintenance was clearly carried out on an ad hoc basis, to judge from the repairs we can still see. However, what we cannot know, but must assume, is that regular preventative care – such as oiling of leathers and cleaning of metal components – must have been undertaken by those wearing the armour. Ironically, the fact that it was may be hinted at by the note of disgust in the *Letters* of Fronto when examples of lack of care of armour were included amongst the examples of military indolence observed at Antioch by one Roman commander:

Pontius Laelianus, a serious man and an old-fashioned disciplinarian, partly tore up their cuirasses with his fingertips<sup>39</sup>

We need not assume (although many do) that armour was finished to a high polish,<sup>40</sup> but lack of

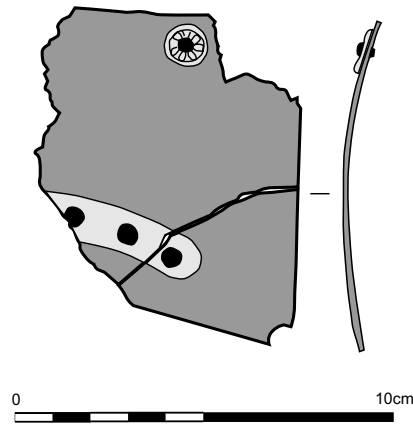


Fig.9.10 Plate from Chichester with riveted copper-alloy splint attached as a reinforcement, probably a repair. Scale 1:2

Cuirass	breastplate	mid-collar plate	backplates	upper shoulderguard	lesser shoulder-guards
1	riveted to mid-collar plate	riveted to breastplate and upper backplate; rear lobate hinge half missing	top plate riveted to mid-collar plate and middle plate	transplanted from Cuirass 6; one and possibly two of its leathering rivets replaced	<i>no obvious damage</i>
2	<i>no obvious damage</i>	riveted to upper backplate	top plate riveted to mid-collar plate (?and middle plate)	one leathering rivet replaced	<i>not identified</i>
3	vertical fastening hinged strap missing free element; duplicate leathering?	rear lobate hinge half replaced; hinge spindle distorted	no obvious damage (two not identified)	two leathering rivets replaced	<i>no obvious damage</i>
4	riveted to mid-collar plate	riveted to breastplate and upper backplate	top plate riveted to mid-collar plate; lateral fastener lacking free element	central plate riveted to ?front plate	<i>no obvious damage</i>
5	duplicate leathering?	<i>no obvious damage</i>	lateral fastener lacking free element	<i>no obvious damage</i>	<i>no obvious damage</i>
6	lateral fastener lacking free element	<i>no obvious damage</i>	<i>no obvious damage</i>	missing (transplanted to Cuirass 1)	missing (transplanted to Cuirass 1)

Table 9.1. Repairs to the upper units of the Corbridge Hoard cuirasses

proper cleaning will soon have taken its toll, particularly on a corrosion trap like *lorica segmentata*.

### PUTTING IT ON

Since Robinson first published a feasible reconstruction of the articulated Roman cuirass, it has always

been assumed that *lorica segmentata* was put on in a particular way. This usually involves the left upper and lower units fastened together, the right upper and lower likewise, and both halves fastened across the back so that the cuirass can 'be put on like a waistcoat'.<sup>41</sup> It has even been seen as a deficiency in a reconstructed cuirass if it is not possible to do



Fig.9.11 Reconstruction lorica segmentata stored broken into its four constituent units in two different ways.  
Photos M.C. Bishop

this.<sup>42</sup> However, the assumption that *segmentata* was indeed put on in this way is not necessarily the correct one, nor even the most logical one.

Mail and scale had to be put on over the shoulders of the wearer, almost certainly by raising the arms (and, in so doing, reducing the width of the shoulders). It is possible that segmental armour may also have been put on in this way. Such a suggestion may well meet with disbelief amongst re-enactors, used to donning the armour in the 'traditional' way, but there is at least one important structural feature of *lorica segmentata* that may have a bearing here: the hinged plates. The hinges on upper shoulderguards and collar plates appear to have no function, but if two upper units are left attached to each other but detached from their lower units, then the hinges allow the upper units to be placed almost flat on a surface. This implies that this feature was in some way important to the wearer. Moreover, the fact that upper units could be left attached may indicate that our assumptions that the cuirass should be (at least partially) broken into left and right halves need not be the correct one.

So, could the segmental cuirass be put on over the head? This may indeed have been the case and may explain why the lowest two girth hoops seem always to have been unfastened at the front and back.

## STORAGE

When *lorica segmentata* was not being used, how was it stored? To leave a cuirass assembled was not only bulky, but would also stress the leathers on the lower units if it were stood on a surface (the girth hoops were designed to be suspended from the shoulder units, not to support them). This is not to say that it

did not happen, just that it would be undesirable and unwise. Suspension on a pole passed side to side through both upper units would be feasible, and paralleled by the Norman method of transporting mail hauberks,<sup>43</sup> but it is difficult to see how such an arrangement could be accomplished in the limited space of a barrack room or, even worse, in a tent when on the march. A famous scene from Trajan's Column (Plate 2) shows a soldier fording a river with his equipment held above a river on the back of his shield, which he holds in both hands.<sup>44</sup> The equipment includes a *lorica segmentata*. In fact, a segmental cuirass could not be stored as compactly as a mail shirt (which could just be dropped in a pile on a shelf) unless it was disassembled. If broken into its four component units, then *segmentata* could be stored by stacking one inside the other, so that the whole cuirass would effectively only take up the space of one lower unit (Fig.9.11). This was how the units were packed into the chest of the Corbridge Hoard (with the exception that the girth units were over-compressed in order to fit the twelve units in the available space).<sup>45</sup> If this was indeed the normal method of storage, then it implies that disassembly was routine for a wearer of a cuirass.

## LIFETIME

How long did a segmental cuirass last? The simple answer is that we do not know. Plate armour articulated on leather straps of the 16th and 17th centuries has survived to the present day in small amounts, usually cosseted under special circumstances (often because it has been kept in a special collection).<sup>46</sup> However, whilst a lifespan of several hundred years

was theoretically possible, all our evidence suggests that the average cuirass lasted for a much shorter time. By analogy with other equipment, such as helmets (which bear multiple ownership inscriptions), it would not be unreasonable to expect a cuirass, if cared for, to last for the service life of its wearer and perhaps even longer.

Modern replicas, worn by re-enactors, have lasted more than 25 years in some cases, although it has to be stressed that such cuirasses are generally better-built and more strongly-constructed than the originals, and not worn as intensively as Roman ones would have been. The internal leathering has to be replaced every few years, but regular care keeps the metal components in good condition.

It is possible that some parts of a cuirass might last longer than others. The presence of twelve dissimilar, but opposing, halves of both upper and lower units in

the Corbridge Hoard implies that their matching halves were somewhere else, other than in the box. It is even possible that they were still in use: the two opposing halves of the Stillfried cuirass, both lower units, did not match (one had seven girth hoops, the other eight, and there are numerous other differences between them), and the coincidence between this discovery and the fact of the bizarre symmetry of the non-matched halves in the Corbridge Hoard<sup>47</sup> might lead to the inference that the Romans not only had no objection to asymmetry in their cuirasses, but actively practised a mix-and-match policy in order to keep as many serviceable sets of armour in the field as possible. This would be the next logical step after the cannibalisation of components to repair damaged armour and, as such, suggests that this armour was not just being worn for parades in peacetime.

## NOTES

- 1 On the processes of ferrous sheet metal production in Roman times, see SIM, 1992, 106; SIM & RIDGE, 2002, 71.
- 2 SIM, 1998, 9.
- 3 Upper plates at 1.5–1.7mm: BISHOP, 1998b, 28, 31; upper shoulderguard at 2mm SCHALLES & SCHREITER, 1993, 228; thickness of girth hoops (from Vindonissa) E. Deschler-Erb pers. comm.
- 4 UNZ & DESCHLER-ERB, 1997, 28, Taf.30,615.
- 5 SIM, 2000, 40.
- 6 BISHOP & COULSTON, 1993, 191.
- 7 Technical names, codes, and Rockwell hardnesses are taken from www.anchorbronze.com.
- 8 One bronze item from Camerton, suggested as having belonged to *lorica segmentata* (COWELL, 1991, 70 No.27; JACKSON, 1991, Pl.3,27), is probably either a repair or not a piece of segmental cuirass. There is also a 97% copper buckle loop from the same site, which may well be a repair made from riveting metal.
- 9 ROBINSON, 1975, 48.
- 10 JACKSON, 1990.
- 11 SCHALLES & SCHREITER, 1993, 50.
- 12 Kalkriese: FRANZIUS, 1995, 364; Baden Du Parc: DESCHLER-ERB, 1996, Abb.70.
- 13 Pers. obs. October 2001.
- 14 Although it is feasible that they might survive in anaerobic conditions (such as waterlogged or chemically rich environments) most of the leather that survives from the Roman period appears to be tanned. Tawed or oiled leather is much rarer (VAN DRIEL-MURRAY, 1985, 44).
- 15 Field maintenance is a subjective classification that depends partly upon our modern perception of what might or might not be acceptable quality for a piece of workmanship. Nevertheless, the difference (as we perceive it) seems sufficiently marked between ‘cuirass as produced’ and ‘repairs’ for it to be a real phenomenon and hence functionally derived.
- 16 ALLASON-JONES & BISHOP, 1988, 43–51. Although the number of girth hoops has always been thought of as a feature of the various types and sub-types of cuirass (ROBINSON, 1975, 177, 180), the Stillfried find shows that this may be a mistaken assumption and that it may really be connected with the sizing of *segmentata*.
- 17 Possibly to be identified with the garment known as a *subarmalis* (BISHOP, 1995). The identification of the *subarmalis* with the *thoracomachus* of the Anonymous’ *De Rebus Bellicis* XV (cf. WILD, 1979) is based primarily upon the SHA’s *Vita Severi* 6,11, where it is difficult to interpret the term in any way other than as a garment. The word also occurs in the *Vindolanda* writing tablets (BOWMAN & THOMAS, 1994, 139 (No.184)) and on a document from Carlisle, but the usage in these is more ambiguous than in the SHA reference (consequently, in at least one case, the term has been interpreted as a type of spear: TOMLIN, 1998, 62).
- 18 No examples of *pteryges* have been recognised as having survived from antiquity and it is by no means clear what material was used in their construction. ROBINSON (1975, 149) suggested soft leather.
- 19 ROBINSON, 1975, Fig.158.
- 20 Marcus Column: ROBINSON, 1975, Pl.240; statuette: *ibid.*, Pl.501.
- 21 On the relative merits and demerits of metropolitan and provincial sculpture, see BISHOP & COULSTON, 1993, 19–30.
- 22 Also known as galvanic or electrolytic corrosion.
- 23 SCHALLES & SCHREITER, 1993, 50.
- 24 I am grateful to Dr Mike Thomas for discussing this. Although iron is less noble than copper (and thus more prone to suffer in the corrosion process), zinc is in turn less noble than iron, which may explain this effect. It remains for this to be demonstrated scientifically, so it is a hypothetical, but nonetheless plausible, explanation for this phenomenon.
- 25 Damage to leathers can also occur through overcompression of girth hoops (see below).
- 26 S. Richards, pers. comm.
- 27 The lower units hang from the upper and thus the whole cuirass was never designed to be stood on its girth hoops in this way.
- 28 SIM, 2000, 40.

- 29 WILKINS & MORGAN, 2000, 93.
- 30 BUJUKLIEV 1986, Cat. number 96. Embedded arrowhead: pers. obs. September 1987.
- 31 Unfortunately, such reworking is only likely to be visible metallurgically on plates that have not oxidised, so this cannot be proven for any of the Corbridge Hoard plates. I am grateful to Dr David Sim for discussing this in some depth with me.
- 32 Bishop forthcoming. The Kalkriese breastplate (see above, p.24) is also dented in such a way to suggest a blow (pers. obs.).
- 33 G. Stiebel, pers. comm. For medieval and early modern sliding rivets see EDGE & PADDOCK, 1988, 181 fig.
- 34 BISHOP, forthcoming.
- 35 BISHOP, 1999b, 31, Fig.6,Frag.2.
- 36 ALLASON-JONES & BISHOP, 1988, 51; this is the second plate from the top.
- 37 ALLASON-JONES & BISHOP, 1988, 25–43, Figs.26–49.
- 38 DOWN, 1978, 299, Fig.10.36,vi.
- 39 Fronto *Ad Verum* II,1,19: ‘*vir gravis et veteris disciplinae Laelianus Pontius loricas partim eorum digitis primoribus scinderet*’
- 40 It is true that ancient writers (Vegetius II,12 and 14, and Ammianus XXXI,10,10, for example) comment upon the morale boost provided by shining armour, but the effect that they are noting is arguably as easily achieved at a distance with cleaned armour as it is with highly (i.e. ‘mirror-’) polished material. Appeals to The Roman Military Mind and commonality with soldiers’ love of shiny armour through the ages are unproductive and can as easily be countered from the sources as they can be supported. I am grateful to Thom Richardson of the Royal Armouries for pointing out that many post-medieval portraits depict plate armour with a blackened finish which is retained by very few actual examples of European plate armour in the Armouries’ collections (cf. RODRÍGUEZ-SALGADO *et al.*, 1988, 218, 13.2). For an elaboration on the variety of finishes available to the medieval and early modern armourer, see a contribution to the Arador Armour Library discussion board from Ian Bottomley of the Royal Armouries: [www.brothersgrymme.org/arador/forum/messages/29224.html](http://www.brothersgrymme.org/arador/forum/messages/29224.html).
- 41 ROBINSON, 1974, 11. Cf. ROBINSON & EMBLETON, n.d., 20–1, figure.
- 42 POULTER, 1988, 36.
- 43 As shown on the Bayeux Tapestry (GRAFE, 1994, 130).
- 44 CICHORIUS, 1896–1900, Scene XXVI.
- 45 Over-compression invariably seems to have happened when sets of girth hoops were deliberately deposited in the archaeological record. It can be seen with the Corbridge (ALLASON-JONES & BISHOP, 1988, 102), Zugmantel (*ORL* B8, Taf. XIV,50), Rißtissen (ULBERT, 1970, Taf.5,90), and Stillfried (pers. obs.) sets.
- 46 The various harnesses of Henry VIII are a case in point (RICHARDSON, 2002), preserved in the Royal Armouries and formerly kept at the Tower of London, where they received loving attention at the hands of the British army garrisons based there for several centuries (I am grateful to Thom Richardson for discussing this and many other issues relating to the survival of medieval and early modern armour). A chance survival is the armoury in the porch of the parish church at Mendlesham in Suffolk (England), which contains 16th-century armour of various origins (RODRÍGUEZ-SALGADO *et al.*, 1988, 139–41). Thanks are due to Dr J.C.N. Coulston for reminding me of this last reference.
- 47 Four A top units (two left, two right), one B (left) and one C (right) top unit, four A bottom units (two left, two right), and two B/C bottom units (one left, one right): ALLASON-JONES & BISHOP, 1988, 23–51. Moreover, the pairings of the girth hoop overlaps (see above, p.43) are suggestive of three sets of girth hoops (left-hand Cuirasses iii, iv, and vi overlapping; right-hand i, ii, and v being overlapped), rather than six individual units. Whilst at the time it was felt possible to write ‘we can be reasonably confident that they do not go together to make complete sets’ (*ibid.* 102) this no longer looks quite so certain.



## Chapter 10: Development and use

### **LORICA SEGMENTATA IN THE ROMAN ARMY**

Our evidence seems to point fairly convincingly to the fact that segmental body armour was primarily a legionary (and praetorian) form of defence. This does not mean that legionaries used it to the exclusion of other types, since there is ample evidence for the use of scale and mail amongst the legions throughout the Principate (and arguably on into the Dominate), simply that it was a form of armour that seems mainly (on the limited evidence exclusively) to have been issued to the legions and the Praetorian Guard.<sup>1</sup>

It has been suggested that the discovery of fragments of *lorica segmentata* at many supposedly auxiliary sites implies that auxiliary infantry also habitually used the same form of cuirass,<sup>2</sup> but this can equally be countered by suggesting that bases that have traditionally been identified as auxiliary may not have held a purely auxiliary garrison. The detailed arguments on both sides have been rehearsed elsewhere and need not be repeated beyond this briefest of summaries.<sup>3</sup>

Interestingly, although it has been speculated that equipment differentiation decreased between legionary and auxiliary troops during the 2nd century,<sup>4</sup> there is in fact no more evidence than for the earlier period that auxiliaries used the *lorica segmentata* beyond the discovery of pieces at sites (such as Zugmantel, Great Chesters, and South Shields<sup>5</sup>) traditionally thought to have been associated exclusively with auxiliaries. Legionaries were certainly still using it during the 2nd and 3rd centuries, as is abundantly clear from the tie rings found in the Roman Gates barrack area at Caerleon.<sup>6</sup>

Attempts to pinpoint the adoption of *lorica segmentata* by the Roman army have not, as yet, met with much success. These have included the Roman defeat at Carrhae in 53 BC and the revolt of Florus and Sacrovir in AD 21.<sup>7</sup> We now know that the Kalkriese form of the cuirass was in use as early as 9 BC, possibly by *legio XIX*,<sup>8</sup> and that it was present amongst *legiones XVII, XVIII, and XIX* when they were defeated in the Teutoburgerwald debacle in AD 9, so it had clearly been adopted well before AD 21 (Fig.10.1). It is a type of armour that provides defence against downward blows with long swords, a style of combat favoured by various Iron Age European peoples, so any notion that it was invented to counter the perceived superiority of Parthian archery in the east seems unlikely.

Articulated limb armour seems to have been adopted by Roman infantry in the latter half of the 1st century AD, perhaps even by the Flavian period, but well after segmental body armour (although it is not clear how long after armguards started being used in the arena). Although the Dacian use of the *falx* may have encouraged the employment of limb defences by the Roman armies opposing them it was certainly not the only stimulus. The Mainz tombstones and finds of *manicae* from the Danube, Britain, and Spain suggest much more widespread use of arm defences than just the Dacian theatre. As with greaves, the use of which was not confined to officers, the individual legionary may have enjoyed a degree of freedom in how he chose to equip himself which extended to the amount of limb protection.<sup>9</sup>

### **LATER ROMAN AND NON-ROMAN USE**

Segmental body armour seems to have fallen out of use with Roman infantry some time after the middle of the 3rd century AD (Fig.10.1),<sup>10</sup> although limb defences may have continued in service with armoured cavalry. A well-known, but rather crude, graffito from *Dura-Europos* shows an armoured cavalryman, often identified as a *clibanarius*.<sup>11</sup> He is depicted as wearing what can probably be identified as segmental armour on his arms and lower legs and, given the metropolitan nature of *Dura-Europos*, need not necessarily even be Roman.

Segmental limb defences are also shown in manuscript illustrations belonging to the *Notitia Dignitatum*, the late-4th to early-5th century Roman army lists recording the army's command structure and dispositions. These pieces of armour are crudely depicted in illustrations showing the insignia of the *magistri officiorum* and it is often suggested that these were pieces of cavalry equipment.<sup>12</sup> This time they are quite clearly in a Roman context and thus would seem to confirm the continued use of segmental armour (for limbs, at least) into the Late Roman period.

Interestingly, a fragment of segmental armour, almost certainly an armguard, has been excavated in Britain from a 4th-century context at a signal station at Bowes Moor, on the main road across the Pennines from York to Carlisle.<sup>13</sup> This is the latest certain use of segmental armour in the Roman West known to the writer.

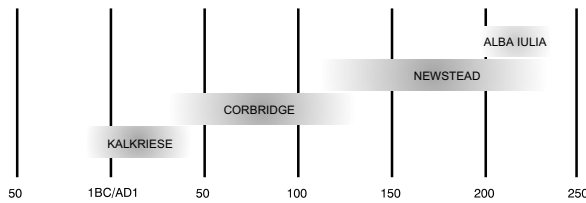


Fig.10.1 Timeline showing the approximate periods of usage of lorica segmentata in the Roman army.

## ADVANTAGES AND DRAWBACKS

*Lorica segmentata* (along with its related defences) is something of an enigma: all the available archaeological evidence suggests that it was, in many respects, an extremely fragile form of defence. Despite this, the timeline (Fig.10.1) show just how long each of the main forms lasted – at least 55 years in the case of the Kalkriese type, 70 for the Corbridge form, and more than 90 years for the Newstead type. This inevitably leads to the questions why did each form last so long and, when it did come, why was change thought necessary?

It would be easy to answer the first question by citing what is often perceived as the Romans' innate conservatism, and to make a comparison with a timeline for helmet development<sup>14</sup> which shows similar slow evolution. Nevertheless, there may be more to this than a supposed cultural unwillingness to change, perhaps connected with the slow rate of progress in pre-industrial societies.

In weapons technology, war is an all-too-obvious motivator for development and change. A parallel may be cited here in what might be called the 'Spitfire Curve' (Fig.10.2). Between 1938 and 1939, Supermarine produced only the one variant of the Spitfire, the Mk.I, but a comparable two-year period (1940–1) during the early stages of the second world war saw the aircraft developed to Mk.V. The period 1942–3 witnessed the greatest number of improvements, the war ending with the Spitfire having reached Mk.24. Some of these changes were purely to accommodate minor upgrades to the components (and this excludes all the minor variants of each Mark due to variations in weaponry or role), but others (such as the introduction of the Mk.IX) were often perceived as a direct response to an enemy threat (in this case the arrival of the Focke-Wulf 190 in 1942, markedly superior to the V).<sup>15</sup> Slowed down, and stretched out, we may be seeing a similar process in operation with the *lorica segmentata*. Minor variants (Kalkriese A to B, Corbridge A to B/C, perhaps even Newstead to Alba Iulia) accommodating improvements to the technology to counter recognised faults, but major type

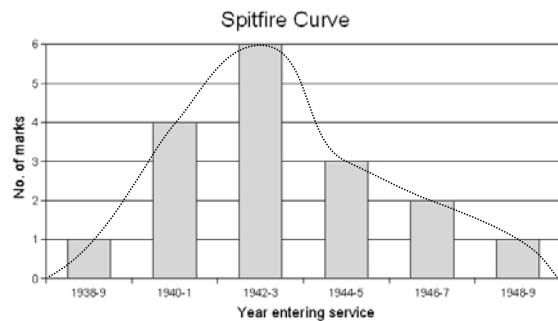


Fig.10.2 Graph showing introduction of new marks of Supermarine Spitfire between 1938 and 1946: an example of war-driven development. Data are only crude approximations of the main variants

changes (Kalkriese to Corbridge, or Corbridge to Newstead) as a response to some new kind of threat. But how fair an assessment of reality is this and is the modern analogy perhaps too convenient? Certainly, the oft-cited experience of Trajan's Dacian Wars, perhaps forcing the adoption of helmet cross-pieces, greaves, and the widespread use of laminated arm defences, might be thought to offer a contemporary parallel, but this does not stand up to analysis. Arm defences were in use before the Dacian Wars and in other areas, whilst greaves appear sporadically in the Roman army, which really just leaves helmet cross pieces. Just as Spitfire development continued independent of specific threats, so there is probably no need to postulate particular stimuli for the development of the Corbridge and Newstead versions of the cuirass. So one model – that of development driven by enemy technological superiority – through which to interpret the evidence for development, would not appear to be viable. It may be more profitable to think in terms of the techniques of fighting encountered by the Romans as a driving developmental force. *Lorica segmentata*, taken together with helmet designs that lay emphasis on deflecting downward blows, appears originally to have been intended to counter a particular style of combat.

Key to its success may well be the combination of a high degree of protection for the shoulders with its weight advantage over mail and greater flexibility than scale armour. Most reconstructed examples of *lorica segmentata* weigh between 5kg and 9kg, compared to 8kg to 9kg for an equivalent-length unriveted mail shirt (it might be estimated that riveting would add approximately 1kg to such a defence), or 6kg to 15kg for scale.<sup>16</sup>

There is plenty of evidence to confirm that *lorica segmentata* saw heavy and continuous use. That it was not found wanting and continued in service for more than 250 years is presumably some sort of testament to its perceived efficacy. The fact that active development

was undertaken may also support the notion that this was a type of armour popular with both the soldiery and their commanders. We must not let our subjective impressions of its shortcomings prejudice any assessment of its long-term effectiveness. *Lorica segmentata* clearly worked and, moreover, worked well.

### **COMPARISON WITH LATER ARTICULATED PLATE ARMOUR**

There is no evidence of continuity in articulated plate armour in western Europe after the Roman period. Its adoption once again during the medieval period does not appear to have drawn upon ancient

knowledge (particularly since the type is not mentioned in the classical sources), but once it had been rediscovered it showed certain traits in common with the older form, if only because of the inevitable practical similarities in the techniques used for its articulation.<sup>17</sup>

Plate armour articulated on internal leathers can be found in medieval contexts as early as the 14th century, but its heyday came in the 15th and 16th centuries, declining with the advent of the popularity of gunpowder weaponry.<sup>18</sup> The use of sliding rivets was also found, but once again this does not appear to have been a survival from the one set of which we are aware – from Gamala – from the Roman period.<sup>19</sup>

## NOTES

- 1 *Lorica segmentata* was used on Trajan's Column to distinguish citizen from non-citizen troops (COULSTON, 1989, 32). Other monuments, such as the Great Trajanic Frieze (LEANDER TOUATI, 1987, Fig. Nos. 22, 26) and the pedestal of the Pius Column (VOGEL, 1973, Pl.9, 12, 15, 28–9) show praetorians (identifiable by their standards and insignia) clad in it.
- 2 MAXFIELD, 1986, 68. Cf. POULTER, 1988, 39–42.
- 3 COULSTON, 1988b, 13–15; BISHOP & COULSTON, 1993, 206–9; BISHOP, 1999a, 114–16. The argument refuses to go away despite the lack of hard (as opposed to circumstantial or deduced) evidence for the auxiliary use of *segmentata*: see now SAUER, 2000, 23–8, which sadly brings nothing new to the debate.
- 4 BISHOP & COULSTON, 1993, 209.
- 5 Zugmantel: ORL B8, Taf. XIV,50; Great Chesters: ALLASON-JONES, 1996, Fig.12,50; South Shields: ALLASON-JONES & MIKET, 1984, 3.689 and 3.691.
- 6 Webster in METCALFE & EVANS, 1992, 116–19.
- 7 Carrhae: BRIZZI, 1981, 198; Florus and Sacrovir: BISHOP & COULSTON, 1993, 85.
- 8 As indicated by finds from Dangstetten (BISHOP, 1998, 12).
- 9 Greaves: BISHOP & COULSTON, 1993, 87. Choice of equipment: COULSTON, 1990, 151; 1998b, 173.
- 10 The late context of the Carlisle plate (CARUANA, 1993, 15) being ascribed to residuality, although we must beware of circular arguments here.
- 11 Graffito: BAUR *et al.*, 1933, PLXXII,2. *Clibanarius*: NEGIN, forthcoming.
- 12 ROBINSON, 1975, Fig.191.
- 13 Bishop in VYNER, 2002, 169–70.
- 14 WAURICK, 1988, Beilage 2.
- 15 Spitfire development: VADER, 1969. Many of the changes involved upgrading or converting existing airframes and the 'sequence', such as it was, looks quite haphazard upon close inspection. E.g. the XIV was a re-engined XII, there was no XV (it being a Seafire, the naval version), then the XVI was merely a IX with the American-built version of the Merlin 66 (and these were further modified in 1945). For all this there were only two major changes to the airframe, the VII and the F21 (*ibid.* 144).
- 16 The whole question of weight is a fraught one and not helped by some re-enactors' reluctance to publish details of vital statistics for their equipment (for here, size definitely matters). Whilst Robinson's first *lorica segmentata* replica weighed only 14 lb (6.35kg: Daniels in ALLASON-JONES & BISHOP, 1988, 99; ROBINSON, 1974, 11), and Peterson's is just 12lb (5.5kg: PETERSON, 1992, 22), a modern *Albion Armouries* replica is heavier at 20 lb (9kg: [www.albionarmorers.com/armor/roman/lorica.htm](http://www.albionarmorers.com/armor/roman/lorica.htm) – checked 9.7.02), so much depends upon the gauge of the materials used. A true estimate of Roman weights will only be gained once a cuirass has been made using authentic materials and techniques. Mail is even more variable, depending as it does on the thickness of wire used, and the size and number of the rings, whilst the fact that re-enactors nearly always use butted, rather than riveted, rings leads to underestimates of the weight of mail. The scale shirt weights are suggested by JUNKELMANN, 1986, 169 at 8kg to 9kg for 30,000 rings (*ibid.* 166). He also speculates that *segmentata* would normally be 2kg to 3kg lighter than mail (*ibid.* 168).
- 17 I am grateful to Thom Richardson for discussion on this point.
- 18 14th century: EDGE & PADDOCK, 1988, 68; 15th century: *ibid.* 100–1; 16th century: *ibid.* 139.
- 19 EDGE & PADDOCK, 1988, 178, 180.

# Chapter 11: Reconstructing *Lorica Segmentata*

Since Robinson's first attempt at a reconstruction of one of the cuirasses from the Corbridge Hoard, a veritable cottage industry has grown up to supply the demand for replica Roman plate armour (it is now even possible to buy a mass-produced one over the internet).<sup>1</sup> This essentially takes two forms: first there are specialist craftsmen who produce sets of armour for museum displays; then there are those who produce them for re-enactment groups, either singly or cooperatively (many re-enactment groups providing assistance to would-be novice armourers). Amongst these there is a degree of crossover, with some craftsmen producing for re-enactors, whilst some re-enactment groups have produced armour for museums.

However, until now, what has been lacking is any attempt at serious experimental archaeology: many of the existing reconstructions can certainly provide valuable insights into *lorica segmentata*, but they cannot provide the sort of scientific data that is badly needed, particularly where the efficacy of particular materials is in question. This should not be seen as a criticism of such replicas or of the intentions of their constructors (which obviously have to be seen in practical and economic context), but rather a lament that the archaeological community has not seen fit to build upon Robinson's elementary work.

To this end, a few comments on the construction of replica segmental armour may be appropriate, although it should be emphasised that this discussion is not intended as a guide to building a cuirass (indeed, there are far more capable texts than this widely available on the internet). If anything, it should point up caveats in the value of reconstructions, what they are intended for, and just how authoritative any statement based upon the construction, use, or destruction of a replica may be.

## MATERIALS

It has long been common to use rolled mild steel to produce the ferrous plates, whereas (as has been pointed out above, p.77) the Romans had to manufacture their sheet metal by beating out ingots. The characteristics of the metals are inevitably, therefore, going to be different between the two techniques. The same is obviously true of the copper

alloy used for fittings: modern sheet is preferred over that beaten from ingots. To some extent it is easier to be authentic with leather, although we do not know whether tanned or tawed material was used by the Romans for the internal leathers of segmental cuirasses, nor even which type of animal hide was used. Nevertheless, the composition and thicknesses of the materials used will have a direct bearing on any assessment of issues such as the overall weight of the cuirass or its defensive capabilities. *Re-enactment is not necessarily valid experimental archaeology.*

## FINISH

With few exceptions, most modern replicas are too well made. This may seem a surprising statement, but close inspection reveals how haphazard, even shoddy, Roman armouring could be. Roman craftsmen were certainly capable of fine pieces of work, but these tended to be the exception rather than the rule. A slapdash approach to the production of segmental armour can be manifested in many ways. Such indications might include poor finishing of plates (the Newstead and Eining back- and breast-plates are rather irregularly edged), amateurish cutting out – and highly irregular (and asymmetric) riveting – of fittings. Moreover, once repairs needed to be undertaken, little care seems to have been taken to match 'new' fittings to their parent cuirass. Where needed, holes in *lorica segmentata* seem invariably to have been punched, rather than drilled. Sometimes this led to dishing around the punched hole, presumably a measure of the competence of the person wielding the punch. *Most Roman armourers were not as competent as their modern imitators.*

## LEATHERING

Robinson felt that Roman armourers may have used leathering templates for cuirasses, although it has to be said that all the extant cuirasses seem to show unique leathering regimes.<sup>2</sup> This may well point towards the conclusion that leathering was an individual preference of any given armourer, and this tends to be reinforced by the evidence of plates where traces of more than one leathering regime are still evident, usually betrayed by the presence of su-

perfluous riveting holes.<sup>3</sup> The skill of the Roman armourer, as opposed to his minions (probably seconded soldiers producing the components),<sup>4</sup> lay in assembly, for it was then that the various pieces came together and, without the millimetre perfection that has only become possible with modern machinery, there was inevitably going to be a need for some adjustment during the assembly process; hence, the leathering for each cuirass was almost bound to be unique. *Leather is as vital a component in lorica segmentata as copper alloy or ferrous plate.*

### **SIZING**

How did the Romans size their cuirasses? Nowadays the tendency is to scale up or down from known examples of cuirasses on a fairly ad hoc basis and there is no reason to suspect that the Romans did anything different: ancient artisans tended to work from experience, not measured plans. It has already been stressed that allowance has to be made for not only the size of the individual for whom it is being made, however, but also for an arming doublet which is almost an integral part of the cuirass, since it will have to be padded to ensure that the shoulder guards sit level and prevent the breastplates crossing and gaping. *Sagging and gaping plates are the sign of a poor fit.*

### **USE**

Apart from issues associated with the necessity for the use of a padded arming doublet worn beneath *lorica segmentata*, there are a number of assumptions that stem from Robinson's reconstruction of the cuirass. Prime amongst these is the idea that the two lowest girth hoops were left unfastened because they would be secured by the belt.<sup>5</sup> Whilst it is undeniably true that they would indeed be fastened by the belt, there remains a possibility that this is was not the primary function of this feature. Many re-enactors prefer to secure a belt to the lowest of the fastened girth hoops, as it tends to constantly slip off the unsecured ones. *Assumptions based on familiarity with modern reconstruction cuirasses will always be just that: assumptions (but no more or less valid because of it).*

### **REPORTING**

Ultimately, the test of the academic usefulness of reconstructions of *lorica segmentata* since Robinson lies in the number of publications providing details of how these replicas perform. It is, perhaps, salutary that – even on the most charitable interpretation – such reports are scarce.<sup>6</sup> It is to be hoped that this situation will be remedied in the near future. *In order for the results of any sort of experimental archaeology to be taken seriously, they must be published.*

## NOTES

- 1 It would be invidious to name particular modern armouries (and none of them can of course be endorsed by the author), but many of them may be reached from the companion website for this volume, [www.loricasegmentata.org](http://www.loricasegmentata.org).
- 2 ROBINSON, 1972, 32. Such templates, if they existed, presumably would have taken the form of patterns for the craftsman to copy. The very notion of practical handbooks in the ancient world has been called into question (in the context of tactical manuals: CAMPBELL, 1987) and may be an example of projecting back into the past modern approaches that are irrelevant in a pre-industrial society.
- 3 Examination of the sets of armour in the Corbridge Hoard certainly points towards a high degree of individuality in leathering and, moreover, that different leathering regimes were employed on the same cuirass when replacement was needed (whilst the Corbridge type B Cuirass 5 uses a single large sheet to join its three backplates, the type C Cuirass 6 has two separate straps, as do all the type A collar assemblies in the Hoard: ALLASON-JONES & BISHOP, 1988, Figs. 43 and 49 for the B and C respectively).
- 4 Cf. BISHOP, 1985, 12–13.
- 5 ROBINSON, 1975, 177; for hints of Robinson's misgivings about the accepted interpretation of the lack of fastenings on the lower two plates, see *ibid.* 181.
- 6 One of the most detailed examinations of reconstructed equipment (JUNKELMANN, 1986) concentrated on the Augustan period and, at the time, since it was not thought the *lorica segmentata* was in use then, it was not used in the exercise covered there. Published accounts of experimental work with segmental armour include POULTER, 1988; KNIGHT, 1998; HAINES, 1998, 54–5; HAINES *et al.*, 2000, 123; WILKINS & MORGAN, 2000, 93.

## Epilogue

*Lorica segmentata* was a form of body armour that lasted in Roman service for more than 250 years. As such, despite many apparent shortcomings, it can only be judged as a success. It was a lightweight and flexible defence that could be patched up in service by any soldier and maintained to a higher standard by any competent craftsman. It also arguably provided the best available defence for the shoulders of an infantryman.

We have seen how much appears to have been left to the individual preferences of the armourer, with few hard-and-fast rules in the construction of segmental armour. Furthermore, there appears to be evidence that the technology of plate armour articulated on leather straps was, like virtually all their arms and armour, borrowed by the Romans from other peoples.

The chief weaknesses of the body armour lay in the fragility of some of its components and, to a lesser extent, the fact that it appears to have been designed (or evolved) with one principal enemy in mind: an enemy slashing downwards with a blade. The level of ingenuity in maintenance that is all too obvious from the archaeological record suggests that these faults were fully appreciated and allowed for in everyday use.

Almost as interesting as the evolution of the cuirass itself is the history of scholarship of this type of armour and the pervasive influence of the reliefs on Trajan's Column. The study continues apace and, far from everything being solved by the discovery of the Corbridge Hoard, the only thing of which we can now be sure is that there is much more still to find out.



# Glossary

Over the years, a technical terminology of Roman articulated armour has built up more by accident than design (Fig.13.1) and is only partially related to more familiar medieval armoury terms. Much of it was invented by Robinson, and has been added to (and in some cases modified) in subsequent years, but an attempt has been made in what follows to reference the first use of terms (as applied to *lorica segmentata*) where appropriate.

## AKETON

See **arming doublet**.

## ARMGUARD

Limb defence (*manica*) protecting the (usually sword) arm of the wearer. Sometimes anachronistically (and, the present writer feels, incorrectly in a Roman context) called a **vambrace**.

## ARMING DOUBLET

Padded garment worn beneath armour to absorb the impact of blows and improve comfort for the wearer in everyday use. Also known by the medieval term **aketon**, the Greek *thoracomachus*, and (possibly) the Latin *subarmalis*.

## BACKPLATE(S)

Either three (Corbridge) or one (Newstead) plate covering half of the upper back area up to the collar line and forming part of the **collar plate** set. Hinged to the **mid-collar plate** and fastened to the neighbouring **backplate(s)** and topmost **girth hoop**. (ROBINSON, 1975, 177 as 'back-plate'; ALLASON-JONES & BISHOP, 1988, Fig.22 as 'backplate')

## BOSS

External decorative washer used with some of the **rivets** used to secure the internal **leathers**.

## BREASTPLATE

One of three **collar plates** covering one half of the chest area up to the collar line. Hinged to the **mid-collar plate** and fastened to the neighbour-

ing **breastplate** and topmost **girth hoop**. (ROBINSON, 1975, 177 as 'breast-plate'; ALLASON-JONES & BISHOP, 1988, Fig.22 as 'breastplate')

## COLLAR PLATES

Collective term for the **breastplate**, **mid-collar plate**, and **backplate(s)** which form the collar of the armour. Attached to the **upper shoulderguard** by means of three **leathers**.

## COUTER PLATES

Large flat plates that protected the elbows on articulated medieval armguards.

## CUISSE

Defence for the upper thigh.

## DECORATIVE BOSS

See **boss**.

## DERIVETING

Removing **rivets**, usually for the purpose of repair or maintenance.

## GIRDLE PLATE

See **girth hoop**. (ROBINSON, 1975, 177)

## GIRTH HOOP

Curved ferrous plate that is one of the components of a **lower unit**. Shaped to fit the torso, each plate is paired with a mate on the opposite side of the body. Fastened using **tie loops** (Corbridge types) or **tie rings** and **slots** (Newstead).

## HALF-COLLAR PLATE

See **mid-collar plate**. (ROBINSON, 1975, 177)

## HINGED BUCKLE

On the Corbridge types used with **hinged strap fittings** as **lateral fasteners** to join the pairs of

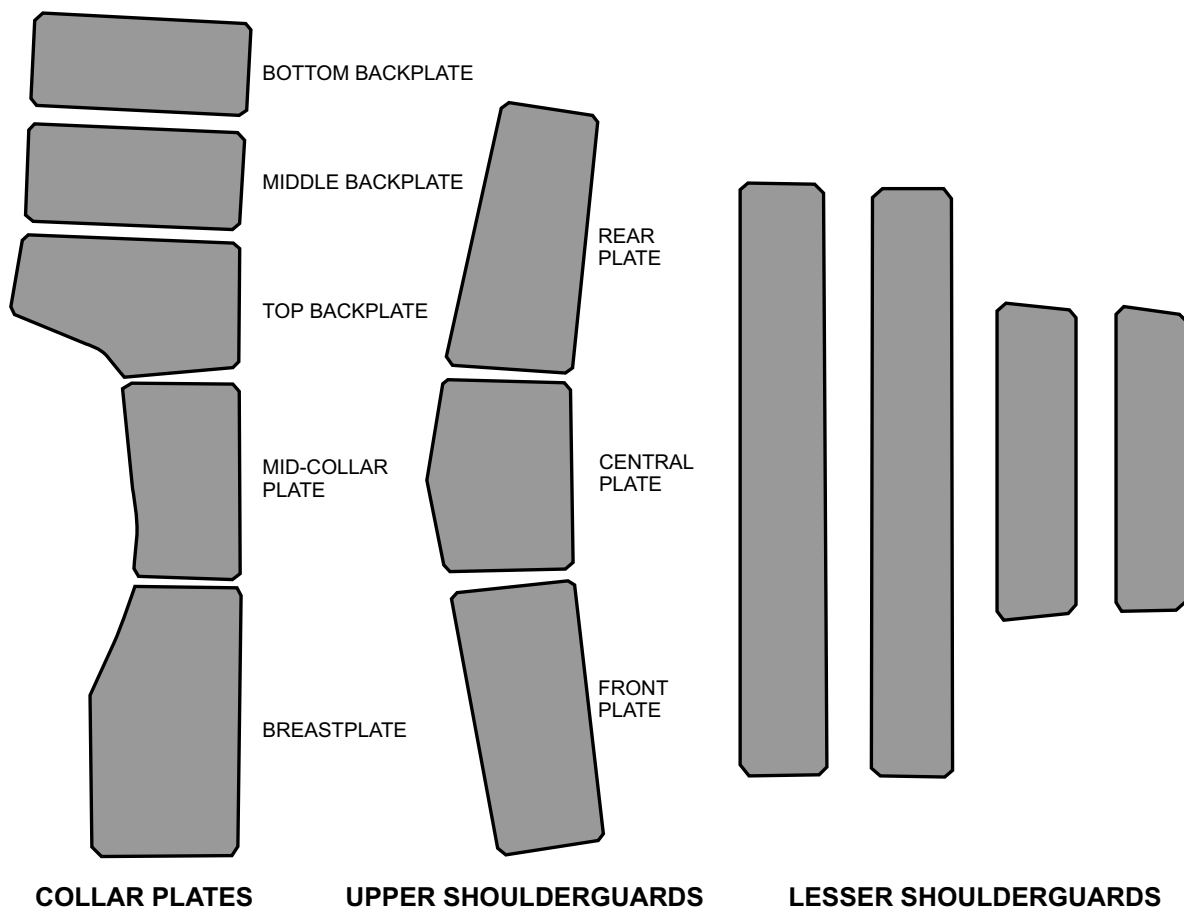


Fig.13.1 Technical terminology of the upper units of lorica segmentata

**breastplates** and **backplates**. On the Corbridge Type A, also used as **vertical fasteners** to join the **breastplates** to the upper **girth hoops** (and as such usually mounted on the girth hoop).

#### HINGED STRAP FITTING

On the Corbridge types used with **hinged buckles** as lateral fasteners to join the pairs of **breastplates** and **backplates**. On the Corbridge Type A, also used as vertical fasteners to join the **breastplates** to the upper **girth hoops** (and as such usually mounted on the **breastplate**).

#### HINGELESS BUCKLE

On the Corbridge type A used to attach the internal **leathers** of the **backplates** to the upper **girth hoop** (where they were normally mounted) and the known examples were made of iron. Similar buckles (but of copper alloy) were also associated with the Kalkriese type and it is assumed they fulfilled a similar function with this cuirass.

#### LAME

Term employed in medieval armoury to describe a single plate, often used of the components of **arm-guards** or, less often, *lorica segmentata* itself.

#### LATERAL FASTENER

The means of fastening pairs of **breastplates** or **backplates** together, using **hinged buckles** and **hinged strap fittings** (Corbridge) or **turning pins** and **slots** (Newstead).

#### LEATHERS

Internal strips of leather to which the metal plates of segmental armour were riveted. (ROBINSON, 1975, 177)

#### LESSER SHOULDERGUARD

Sets of four curved plates that form the outermost elements of an **upper unit**, attached by three **leathers** to the **upper shoulderguard** and, eventually, the **collar plates**. (ROBINSON, 1975, 177)

as ‘shoulder-guard’; ALLASON-JONES & BISHOP, 1988, Fig.22 as ‘lesser shoulder guard’)

### LOBATE HINGE

Two-part decorative hinges, used to join the three parts of the **upper shoulderguard** and the **breast-, mid-collar,** and **backplate**. Held in place by **rivets**. (ROBINSON, 1975, 177)

### LOWER UNIT

See **unit**.

### MANICA (L.)

See **armguard**.

### MID-COLLAR PLATE

One of the collar plates, hinged to both the **breast-plate** and **backplate** and attached by **leathers** to the **upper shoulderguard**. (ALLASON-JONES & BISHOP, 1988, Fig.22)

### ORICHALCUM (L.)

An alloy of copper similar to modern brass (in particular, analagous to alloys like ‘low brass’ and ‘red brass’), composed of copper and zinc. The maximum zinc proportion possible in the Roman period was around 28%.

### PEENING

Hammering over the end of a rivet or shank to expand it and thereby hold it in place.

### PTERYGES (L. FROM THE GK.)

Literally ‘wings’ in Greek (presumably because they flapped around), these were movable strips that hung below the waist and over the shoulders. Usually presumed to have been attached to an **arming doublet**. They may have been made of leather or possibly stiffened linen.

### RIVET

Usually dome-headed and made of copper alloy when new (sometimes with a higher copper content than other fittings), these were frequently crudely repaired with flat-headed substitutes. Used to attach all the **leathers** and the various copper-alloy fittings, such as the **hinged buck-**

**les, hinged strap fittings, lobate hinges,** and **tie loops**.

### ROLLING

The process of turning the edge of a plate back on itself (usually outwards) to prevent chafing. Used on **collar plates** and the topmost and lowest **girth hoops**.

### ROVE

A washer, usually (but not always) square or rectangular in *lorica segmentata*, which secured the end of a **rivet** passing through a **leather** (thereby ensuring that the **rivet** could not be torn out).

### SLOT

Method of fastening used on Newstead type cuirasses. Used with **turning pins** on the **breast- and backplates**, and with **tie loops** on the **girth hoops**. Usually surrounded by a riveted copper-alloy plate.

### SPLIT PIN

A length of wire bent into a loop, the two ends of which butt against each other before turning outwards. Evidently multi-functional in the Roman period.

### SUBARMALIS (L.)

See **arming doublet**.

### SUB-LOBATE HINGE

Similar in function to **lobate hinges** but used on the Kalkriese type of cuirass. Instead of fully-formed lobes, they have either a) three pointed terminals or b) two shallow hemispherical lobes. They are held in place by varying numbers of **rivets**, either three in the case of a), or three or four in the case of b).

### SUB-RECTANGULAR HINGE

Similar in function to **lobate hinges** and **sub-lobate hinges** and possibly used on the Kalkriese form of segmental body armour. Generally held in place by three **rivets** on either leaf.

### THORACOMACHUS (L. FROM THE GK.)

See **arming doublet**.

**TIE HOOK**

See **tie loop**, which is preferable, as these fittings are usually loops rather than hooks in form.

**TIE LOOP**

Pairs of tie loops were used to fasten **girth hoops**, each pair with their own knotted leather thong. Made either from rod beaten out into sheet or plate rolled up at one end, these objects consist of a tapering plate attached to the **girth hoop** with two **rivets** with the part nearest the end of the plate rolled up to form a loop.

**TIE RING**

Cast ring with a shank which passed directly through the **girth hoop** and was peened over to hold it in place, sometimes with a **rove**. It formed one half of the method of fastening **girth hoops** used on Newstead type cuirasses, each loop passing through a matching **slot** in the matching **girth hoop** and was probably secured with a **split pin**. (First use: Webster 1992)

**TURNING PIN**

Possibly used (with a matching **slot** and probably secured with a **split pin**) as a **lateral fastener** on Newstead type armour. Having passed through its slot, it would be rotated through 90° and secured.

**UNIT**

Each cuirass was made up of four units, two upper and two lower. An **upper unit** consisted of **breastplate**, **backplate(s)**, **upper shoulderguard**, and

four **lesser shoulderguards**. A **lower unit** comprised between six and eight **girth hoop** halves.

**UPPER SHOULDERGUARD**

Three plates (front, central, and rear), attached by means of **leathers** to (and sitting above and partially covering) the **collar plates** on one side and the **lesser shoulder guards** on the other.. (ROBINSON, 1975, 177 as 'shoulder-guard'; ALLASON-JONES & BISHOP, 1988, Fig.22 as 'upper shoulder guard')

**UPPER UNIT**

See **unit**.

**UPSETTING**

Thickening the edge of a ferrous plate by hammering that edge in order to prevent chafing. Used on **collar plates** and the topmost and lowest **girth hoops**.

**VAMBRACE**

Term from medieval armoury often used to describe an **armguard**, although strictly the more recent example consisted of a rerebrace on the upper arm, vambrace on the lower, and couler plates at the elbow.

**VERTICAL FASTENER**

Joining upper and lower **units**, taking the form of buckle and strap on the earlier forms, a hook and eye on the later.

## Appendix A: Major Published Finds of *Lorica Segmentata*

The following handlist comprises only the most significant published (and at the time of writing there are a number of very important *unpublished*) finds of the armour together with their principal components. Full details will be found in the second volume, THOMAS, 2002.

### BODY ARMOUR

Date found	Site	Publication	Contents
1899	<i>Carnuntum (Waffenmagazin)</i>	VON GROLLER, 1901	Corbridge girth hoops, fittings; Newstead girth hoops, fittings
1905	Newstead (Pit 1)	CURLE, 1911	Newstead collar unit, lesser shoulderguards
1906	Zugmantel	<i>ORL</i> 8B	Newstead and/or Alba Iulia backplates and girth hoops
1917	Eining (Weinberg)	REINECKE, 1927	Newstead backplate and lesser shoulderguards
1936	London Bank of England	WEBSTER, 1960	Corbridge breastplate
1961	St Albans	NIBLETT forthcoming	Corbridge girth hoops
1964	Corbridge (Hoard)	ALLASON-JONES & BISHOP 1988	Corbridge collar units and girth hoops
1968	Riðtissen	ULBERT, 1970	Corbridge ?breastplate, girth hoops, and fittings
1989	Carlisle	CARUANA, 1993	Newstead backplate
1987–95	Kalkriese	FRANZIUS, 1995	Kalkriese breastplate and fittings
2000	Stillfried	EIBNER, 2000	Newstead girth hoops

### ARMGUARDS

Date found	Site	Publication	Contents
1899	<i>Carnuntum (Waffenmagazin)</i>	VON GROLLER, 1901	lames, rivets, organics
1905	Newstead ( <i>principia</i> room 5)	CURLE, 1911	shoulder plate, lames, rivets, organics
1905	Newstead (Pit I)	BISHOP, 1998	lames, rivets
2001	Carlisle	McCARTHY <i>et al.</i> , 2001; RICHARDSON, 2001	shoulder plate, lames, rivets, organics

## Appendix B: Sources of Illustrations

This appendix provides details of the sources used for all the (re)drawn line illustrations employed in this book. Readers who find their interest in a particular fitting aroused are urged, wherever possible, to refer to the source drawing or photograph and, naturally, to consider attempting to see the original artefact (for which there is, of course, no substitute).

For the purposes of consistency, a uniform simplified style has been adopted for the line illustrations of finds used in this volume. An attempt has also been made to distinguish between ferrous metal, copper alloy, silvering/tinning, and leather by means of a series of tone conventions, the key for which will be found on p.viii.

- Fig.3.3: BERNARD, 1980, Fig.11  
 Fig.3.4: CONZE, 1913; BISHOP, in preparation b  
 Fig.4.1: FRANZIUS, 1995, Abb.2  
 Fig.4.2: 1: FRANZIUS, 1992, Abb.9,1; 2: *ibid.* Abb.9,4; 3: *ibid.* Abb.9,6; 4: *ibid.* Abb.9,7; 5: *ibid.* Abb.9,3; 6: 1995, Abb.7,3; 7: *ibid.* Abb.7,5  
 Fig.4.3: 1: FILLOY NIEVA & GIL ZUBILLAGA, 1998, 266 No.353; 2: DESCHLER-ERB, 1999, Taf.15,238; 3: DESCHLER-ERB, 1996, Taf.21,312; 4: UNZ & DESCHLER-ERB, 1997, Taf.33,764; 5: HÜBENER, 1973, Taf.14,22; 6: DESCHLER-ERB, 1999, Taf.13,192; 7: FINGERLIN, 1970–1, Abb.11,8; 8: UNZ & DESCHLER-ERB, 1997, Taf.32,731  
 Fig.4.4: 1: FORRER, 1927, Taf.LXXVII,26; 2: DOWN, 1989, Fig.27.5,80  
 Fig.4.5: UNZ & DESCHLER-ERB, 1997, Taf.30,615  
 Fig.4.6: UNZ & DESCHLER-ERB, 1997, Taf.30,619  
 Fig.5.1: WEBSTER, 1958, Fig.6,159  
 Fig.5.4: Corbridge 1: ALLASON-JONES & BISHOP, 1988, Fig.26; 2: *ibid.*, Fig.31; 3: *ibid.*, Fig.34; 4: *ibid.*, Fig.39; 5: *ibid.*, Fig.43; 6: *ibid.*, Fig.49; London: WEBSTER, 1958, Fig.6,159; Vindonissa: UNZ & DESCHLER-ERB, 1997, Taf.30,616; Kalkriese: FRANZIUS, 1995, Abb.2; Newstead: BISHOP, 1999b, Fig.2  
 Fig.5.5: 1: ALLASON-JONES & BISHOP, 1988, Fig.39; 2: *ibid.*, Fig.31; 3: *ibid.*, Fig.26  
 Fig.5.6: 1a: UNZ & DESCHLER-ERB, 1997, Taf.33,746; 1b: *ibid.*, Taf.31,636; 2a: VON GROLLER, 1901, Taf.XIX,46; 2b: UNZ & DESCHLER-ERB, 1997, Taf.31,631; 3a: RITTERLING, 1913, Taf.II,14; 3b: UNZ & DESCHLER-ERB, 1997, Taf.34,827; 4a: VON GROLLER, 1901, Tav.XVII,25; 4b: UNZ & DESCHLER-ERB, 1997, Taf.32,670  
 Fig.5.7: 1: JACKSON, 1990, Fig.8; 2: ULBERT, 1969, Taf.29,6; 3: *ibid.*, Taf.29,7; 4: *ibid.*, Taf.29,3; 5: *ibid.*, Taf.29,2  
 Fig.5.8: 1: UNZ & DESCHLER-ERB, 1997, Taf.32,723; 2: JACKSON, 1991, Pl.2,11; 3: UNZ & DESCHLER-ERB, 1997, Taf.31,636; 4: BROWN, 1986, Fig.28,202; 5: FRERE & ST JOSEPH, 1974, Fig.26,29  
 Fig.5.12: DOWN, 1978, Fig.10.36,iv  
 Fig.6.1: 1: VON GROLLER, 1901, Taf.XIX,57; 2: *ibid.*, Taf.XIX,59; 3: *ibid.*, Taf.XIX,58; 4: *ibid.*, Taf.XVIII,29; 5: *ibid.*, Taf.XVIII,30; 6: *ibid.*, Taf.XVIII,31; 7: *ibid.*, Taf.XIX,66  
 Fig.6.2: BISHOP, 1999b, Figs.2–3  
 Fig.6.3: BISHOP, in preparation a  
 Fig.6.4: BISHOP, forthcoming  
 Fig.6.5: CARUANA, 1993, Fig.1  
 Fig.6.7: 1a: RAJTAR, 1994, Abb.7,1; 1b: *ibid.*, Abb.7,2; 2a: VON GROLLER, 1901, Taf.XVIII,28; 2b: *ibid.*, Taf.XVIII,27  
 Fig.6.11: GARBSCH, 1978, Taf.8,1; a: GUDEA, 1989, Pl.CCVII,28; b: *ibid.*, Pl.CCVII,21; c: *ibid.*, Pl.CCXL,42; d: *ibid.*, Pl.CCXL,50  
 Fig.6.12: 1: EVANS & METCALF, 1992, 118 Fig., 48; 2: *ibid.* 55; 3: *ibid.* 59; 4: *ibid.* 63; 5: unpublished; 6: McCARTHY, 1990, Fig.109,48; 7: WRATHMELL & NICHOLSON, 1990, Fig.70,28; 8: ALLASON-JONES & MIKET, 1984, Fig.3.691; 9: NEWSTEAD, 1928, Pl.IX,11; 10: BRYANT *et al.*, 1986, Fig.5.5,3150; 11: BISHOP, 1996, Fig.37,419; 12: unpublished  
 Fig.7.3: 1: VON GROLLER, 1901, Taf.XVI,6; 2: *ibid.*, Taf.XVI,16; 3: *ibid.*, Taf.XVI,13.  
 Fig.7.4: 1: JUNKELMANN, 1996, Abb.141; 2: GARBSCH, 1978, Taf.8,1; 3: JUNKELMANN, 1996, Abb.134  
 Fig.7.5: BISHOP, in preparation a  
 Fig.7.6: VON GROLLER, 1901, Taf.XIX,57  
 Fig.8.1: 1: VON GROLLER, 1901, Taf.XX,7; 2: *ibid.*, Taf.XX,6; 3: *ibid.*, Taf.XX,9; 4: *ibid.*, Taf.XX,8; 5: *ibid.*, Taf.XX,10  
 Fig.8.2: CURLE, 1911, Pl.XXIII  
 Fig.8.4: BISHOP, forthcoming  
 Fig.9.1: top: ALLASON-JONES & BISHOP, 1988, Fig.97,250; bottom: CURLE, 1911, Pl.LXV,9  
 Fig.9.2: ALLASON-JONES & BISHOP, 1988, Fig.35  
 Fig.9.9: 1: ULBERT, 1969, Taf.33,17; 2: WEBSTER, 1958, Fig.6,159; 3: CRUMMY, 1983, Fig.145,4186  
 Fig.9.10: DOWN, 1978, Fig.10.36,vi

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# Index

This index should also serve to guide the reader to the geographic locations of the various sites mentioned in text. The nationality of these has been indicated using the standard three-letter international abbreviations (following ISO 3166) for the countries concerned which are as follows:

AFG	Afghanistan	ESP	Spain	ISR	Israel	RUS	Russian Fdn
AUT	Austria	FRA	France	ITA	Italy	SVK	Slovakia
BEL	Belgium	GBR	Great Britain	KAZ	Kazakhstan	SVN	Slovenia
BGR	Bulgaria	GRC	Greece	LUX	Luxembourg	SYR	Syria
CHE	Switzerland	HRV	Croatia	MAR	Morocco	TUR	Turkey
CZE	Czech Republic	HUN	Hungary	NLD	Netherlands		
DEU	Germany	IRN	Iran	ROM	Romania		

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This monograph is the first in-depth examination of articulated Roman plate armour since H. Russell Robinson published his ground-breaking reconstructions of *lorica segmentata* in *The Armour of Imperial Rome*. With detailed discussion of all the significant evidence (including previously unpublished material), the book looks at each of the principal types, using photographs and scale drawings of original finds, alongside full-sized physical and specially-prepared computer-generated reconstructions. It examines the origins of this form of armour, its strengths and weaknesses, a wide range of technical details, together with practical aspects relating to its reproduction.

