THE ARMS AND ARMOUR
FROM DURA-EUROPOS, SYRIA

Weaponry recovered from
the Roman garrison town and
the Sassanid siegeworks
during the excavations, 1922-37

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Volume 1:
Text,
Catalogue
and published papers

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A reconstruction of the possible appearance of a Roman heavy cavalryman, based on the evidence from Dura-Europos and elsewhere.
ABSTRACT

The arms and armour discovered during the excavations at the Roman frontier city of Dura-Europos, Syria, by Belgian, French and American archaeologists between the wars constitute one of the most important but least studied assemblages of the kind ever found. Little of it has ever been published.

Most of the finds can be associated with the events surrounding the final destruction of the city by the Sassanians, which can be dated to the mid-250s AD. This close dating of a large body of arms is unparalleled in the Roman Empire. It is also the only really large group of Roman armour from the whole of the Eastern Empire.

Most of the arms were deposited in contexts which prove they belong to the Roman defenders, but a handful belong to the Persian attackers, not least an important iron helmet, the first well-dated Sassanian head-piece. Other items, such as the cane shields, are hard to definitely attribute to either side.

The material is extremely rich and diverse, the special conditions of burial of many items preserving delicate organic elements including shield paintings and arrow fletchings, allowing a much better understanding of the technology and appearance of Roman weaponry. There are a number of unparalleled complete items, such as the famous scutum and the horse-armours.

The size, preservation, close dating and Eastern provenance of the collection combine to give it unique value to military archaeologists. However, close study of the evidence for the historical context of the siege demonstrates that the archaeological remains left by the defenders cannot, as hoped, be linked with the copious documentary evidence from the site. We do not know the exact identity of the Roman units defending the city. The Roman weaponry is in many respects indistinguishable from that used on the European frontiers of the Empire. Were the defenders European expeditionary troops, or Eastern troops wearing identical equipment? The answer lies in further research into the archaeology of the Eastern army, whose weapons are rarely found. The Dura assemblage will be the yardstick against which new finds will be measured.
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Part 1. From discovery to the present research

1.1 Introduction; the assemblage and its potential

This thesis began as a general study of the arms and equipment of the later Roman army. However, various factors conspired to limit its scope to material from one city, deposited, for the most part, in a single year. The main reason for this refinement was my visit to Yale University Museum in 1980, and the discovery of the potential of the unpublished arms and armour from Dura-Europos, which is mostly housed there. It became clear that study of this remarkable assemblage would require a thesis in its own right. The following is an analysis of the material in the United States supported by work on other published evidence. Other work on the late Roman army originally undertaken as part of the thesis but not related to Dura, notably my study of the fabricae of the late empire (James 1988), is submitted for consideration with the present work, as are other papers relating to the Roman army and its equipment deriving from the thesis as originally planned (James 1984, 1986a). A considerable proportion of my Dura research has also already been published and copies of these papers, and the other works mentioned, are also included (James 1983, 1985, 1986, 1987).

1.2 An outline history of Dura-Europos

The Roman frontier fortress and garrison city of Dura-Europos, excavated during the 1920s and 1930s, has provided an invaluable window on the Roman East in the third century AD.

A Seleucid foundation, the city of Europos was established as a garrison town on the road running up the South bank of the Euphrates, connecting Seleucia, Ctesiphon and Southern Mesopotamia with Antioch and Syria. The city enclosed a bottleneck on the route, where the Euphrates cut into the edge of the desert plateau in a series of cliffs, roughly 60km downstream of Circesium. The road was forced to ascend to the high ground via a wadi, which the city enclosed and controlled. The city, known as Dura (“fortress”) in the local Semitic dialect, remained an important military post thereafter, and became wealthy as a nodal point on the caravan routes, both to Syria, and via a more southerly track which left the Euphrates at Dura to run across the desert to Palmyra and the southern Levant. The close connection with Palmyra strongly influenced the life of the city.

A Parthian stronghold close to the Roman frontier in the first and early second centuries AD, it was captured by Trajan but not held. However, it finally passed under Roman rule in 164, and thereafter
was an increasingly important Roman military base. It appears to have served as a forward staging centre for Severus's Eastern operations, but with the collapse of the Parthian Empire and the establishment of Sassanid Persia, the balance of power tilted against Rome and Dura became the kingpin of the forward defence of Roman-held Mesopotamia.

The face of the city was much altered by the permanent presence of the military. A large area of the city was requisitioned, many buildings erected or modified, and military inscriptions and graffiti appeared in many parts of the town.

Dura was in Syria Coele, and was the centre of a special territorial command, that of the dux ripae, who had a force of legionaries and auxiliaries based in the town. However, even these special measures were not enough to save the province; they failed even to save the city from the attacks of the Shah, Shapur the Great.

The history of the AD250s is confused and obscure, and it is now almost certain that Dura was taken by the Persians briefly in 253 (see section 3.3.6). Archaeology shows that the Romans were holding it again in 254, and that they were soon making massive preparations to withstand a siege. The expected blow fell, perhaps in 255 but most likely in 256, and after a bitter struggle, about which the archaeology is eloquent but history silent, Dura was overrun and destroyed. It was deserted and never reoccupied, happily for us as so much consequently survived to be rediscovered this century.

1.3 Discovery, excavation and context of the assemblage.

The story of the discovery of the deserted city and its identification as Dura Europos has been treated many times, so the details need not be repeated here (the most useful account is Hopkins 1979 which also contains an extensive bibliography). After the identification of the site in 1920 (Breasted 1924), the first scientific excavations were undertaken in 1922-3 (Cumont 1926), followed by the main series of excavations over ten winter seasons between 1928 and 1939, sponsored jointly by the French Academy and Yale University (Reports on the Excavations, 1st to 9th Seasons, published 1929-1952; the report on the tenth and final season was never published).

Finds of arms and armour, largely deposited during the final siege in the AD250s, were very common at Dura; Cumont found and published some, and weapons were turning up during the whole course of the Yale/French Academy excavations. The analysis of this material is the core of the present study.

It is evident that the bulk of the weapons came from deposits laid down during the course of the final siege, especially in the towers of the desert wall. Tower 19 and the mines beneath it produced the largest concentration and the great bulk of the more complete pieces (plates 1.B to D). The painted shields were deposited immediately before the siege, as they were buried in the body of the emergency rampart. Elsewhere in the city such arms as survived were far more exposed to decay as they were not
deeply buried and therefore vulnerable to the winter rains and biological attack. The heart of the city was also much more vulnerable to looting when the city was sacked, resulting in the apparent removal of all but small fragments of arms from the interior.

A few items certainly date to earlier times. For example, the necropolis produced some iron arrowheads which clearly predate the siege. Similarly, the bronze arrowheads include Bronze Age types and are all regarded as residual, none likely to date later than the early Hellenistic period.

However, almost all the stratified material was deposited at the time of the fall of the city, so it is reasonable to assume that most of the objects whose provenance is lost were deposited at that time. Arms were found in most parts of the city; fragments of body armour in the barracks, stone artillery projectiles in the citadel, etc.

1.4 The wider significance of the assemblage

The sheer volume of material is, by comparison with individual military sites in the West, quite exceptional. Only the massive quantities of armour found by von Groller at Carnuntum can rival the assemblage (see the early volumes of *RLO*, particularly II). However, Dura surpasses even Carnuntum in its diversity, and above all in the near-perfect state of preservation of many of the objects.

Unlike most Roman military sites in Europe, where the great majority of organic material decays and only metal and bone survive, the relatively dry environment of the arid plateau on which Dura stands has preserved leather, textile and wooden parts of arms and armour which are virtually unknown elsewhere. More specifically, certain microenvironments established around and beneath the South-Western defences by the circumstances of the siege led to exceptional survivals. For example, four complete scale defences were found, including two armoured horse-trappers, still with cloth backing, leather edging and stitching, and two cuisses (thigh-guards) of laced leather scales. These are the only intact examples of scale armour from anywhere in the Roman world. Dura also provides us with our only complete wooden catapult quarrel shafts, and even reed arrows with their original fletching. Perhaps the most famous pieces are the remarkable wooden shields. Complete shield-boards are known from elsewhere in the empire, but the Durene examples are the only ones to preserve their brilliant painted decoration.

The assemblage also includes items so far unique in the Roman world, such as an incendiary ballista-bolt head of a type described in ancient sources but of which no examples have previously been recognised (James 1983). There is also a superb iron helmet, perhaps the most important of the hitherto unpublished objects, anticipating as it does the construction of fourth-century Roman helmets (James 1986).

The assemblage of arms and armour is of enormous value to Roman military archaeologists, and
indeed to scholars studying the early Sassanian army. Its value is further enhanced by the fact that it is closely datable. Much of the material was deposited immediately before or during the final siege of the city in the mid-250s AD. While the methods of excavation and recording were far below current standards, we can be confident of the dating of the better provenanced objects. We can have no such confidence with, for instance, von Groller’s Carnuntum material, or the assemblages from many of the other forts on the Rhine and Danube frontiers excavated around the turn of the century, which provide the bulk of our comparative material. Very little of this is adequately provenanced, so it may usually only be dated to the period of occupation of the fort and no closer. For many sites this gives us a bracket of at least a hundred years, from the mid-second to the mid-third centuries AD if not longer. The smaller-scale, but more scientific excavations of more recent years are only slowly producing properly dated material.

1.5 Aims of the present research

Dura then, provides us with a great quantity of well-preserved equipment worthy of detailed study in its own right. The twin bonuses that it is closely datable and comes from the eastern frontier hold out the prospect of answers to a number of key questions about Roman arms which are not readily approachable from other evidence. As a battlefield site, we can expect the arms of both sides to be represented, although as will be seen it is clear that the bulk of what survives belongs to the defenders, and so may be labelled as Roman. Some items like the helmet from the mines (helmet 1) can reasonably be assigned to the attackers, and in that sense can be called Persian. However, it must be noted that within these categories may be distinct local traditions only nominally belonging to the two great powers, such as Palmyrene or local Mesopotamian material; the problematical question of attribution is covered in more detail in part 3.2.

The unique scale trappers, cuisses, decorated shields etc., all of which come from contexts proving them to belong to the defenders, provide us with new data on the techniques and repertoire of the Roman arms industry. There is also a lot of information about the soldiers of the resident garrison, who might be assumed to be the owners of the weapons. Can this be used to look at how far equipment was standardised in the Roman army, and to enquire whether different units had distinctive weapons? Did regimental distinctions extend to other items of dress, armour and equipment?

Of equal interest is the problem of regional variation in arms and armour. The Roman armies on the eastern frontier faced a very different physical, strategic and tactical environment from that facing their European counterparts. They also had a reputation for not being as tough or as disciplined as western armies (MacMullen 1963 178; Watson 1969 119). Had they diverged in other ways from the armed forces of the West? By the time that Dura fell, many units had been in the East for centuries, and many others had been raised there. Had their equipment become “orientalised”? The Roman army is well known for adopting the arms of its enemies. Oriental horse-archer regiments were added to the eastern army and remain prominent in the Notitia. Some items of equipment found elsewhere also show
signs of oriental stylistic influence. Some cavalry sports helmets certainly do (e.g., an example from Emesa; Robinson 1975:121 and plates 349-51).

To date, Dura provides almost the only assemblage of Roman military equipment worthy of the name from the entire eastern empire. The closest comparable site is Hatra, which has produced a catapult (Baatz 1978) and unpublished material including a shield boss (D. Baatz pers. comm.), mail, arrow heads and arrowshafts (D. Nicolle pers. comm.). There are various more isolated finds from the East, cited in the catalogue where appropriate, among the most important of which are the Nawa material (also known as Tell Oum Hauran; Abdul Hak 1955) and the Hebron hoard (Weinberg 1979). However, little of the Eastern material is properly published or even widely known, emphasising a point which is rarely made; that the archaeological evidence on which general statements about Roman arms are based is almost exclusively European, and comes mostly from Britain and Germany. Even the Lower Danube has produced relatively little published armour. Studies of eastern equipment should provide a broader and more secure basis for general understanding, and more importantly should give an opportunity for direct comparison of equipment from East and West.

The richness of the material, aided to some degree by depictional evidence from the site (see section 1.15) promises much information on the actual appearance of third-century Roman troops in battle order. Attempts at reconstruction were to be one of the aims of the project.

The aims of the following study are, firstly, to describe the objects in the collection in their own right, and to look at the individual affinities and parallels. This is presented in the form of a descriptive catalogue (part 2) divided into functional groups (e.g., helmets, edged weapons etc.). Each group is also reviewed collectively. The whole assemblage is then considered within its context at Dura, and against the wider historical background in order to pursue more general questions relating to the implications of the material, especially for our understanding of the Roman army (part 3).

Because so much is known about the third century garrison from epigraphic sources, it was also hoped that it might be possible to tie particular equipment or types of equipment to named units, to investigate whether particular types of equipment are associated with particular units or types of regiment (“unit specificity”, a question which has been little addressed; Johnson 1980:312). To achieve this it was first necessary to analyse all available evidence on the historical context of the siege and the deposition of the assemblage (part 3.3.9).

Also, given the relatively detailed information regarding the distribution of findspots of arms within the city, and the apparent rapidity with which most were deposited during the siege, it was hoped that distribution patterns might be discernible giving additional information about the garrison, the course of the siege, or both. However, the poverty of recording soon made it clear that this was not to be a fruitful avenue of research, so it was not pursued.
1.6 Definition of the area of study.

The subject is described as "arms and armour" rather than the more general "military equipment" as the latter also includes items of uniform other than fighting equipment proper, most notably decorative bronze belt fittings. Excluding these fittings from exhaustive analysis is in many ways unsatisfactory, for they were the main vehicle for expressing fashion in decoration, study of which may help the tracing of regional styles of uniform and their dissemination.

However, it was decided to concentrate on the weaponry for the following reasons; first, the fittings are an enormous area of study in their own right (eg Oldenstein 1976). In any case, many of the bronze fittings have already been published and so are available for study (Frisch and Toll 1949). Secondly, the projected Final Report VII, the Arms and Armour, has never been written, and it is hoped that the present work should form the basis for it (a tentative agreement has been reached with Ms. Susan Matheson, assistant curator in charge of the Dura collection at Yale University Art Gallery). It is convenient, if not entirely satisfactory, to follow the artificial division into arms and fittings laid down by the established publication policy although use is made of the fittings where this can help the wider understanding of the material.

1.7 Structure of the thesis

To simplify assembly of this thesis a dendritic structure of sections and subsections has been adopted to allow for flexibility in adding in material as work progressed, without the need for large amounts of renumbering. The completely unexpected appearance at a late date of quantities of material at the Royal Ontario Museum has vindicated this flexible approach.

The thesis is divided into three sections, as well as the catalogue, plates and published works. The sections are;

- Part 1. From discovery to the present research
- Part 2. The assemblage Description and analysis of the material by categories (see below).
- Part 3. Analysis Overview of the material, analysis of its historical context, and conclusions.

Part 2, in which the material is described, is divided into functional groups, each with its own subdivisions (eg 2.6, bows, arrows and archery tackle, with its subsections 2.6.1 bows; 2.6.2 arrows, etc). Part 2 is closely related to the catalogue, which shares the same section numbering system.

The logic that dictates the order of the sections is, as far as possible, to describe groups of material in order of closeness to the body; helmets (2.1), armour (2.2), swords and other bladed weapons (2.3); then items which were hand-held, ie shields (2.4) and spears etc (2.5); and finally projectile weapons, ie bows and arrows (2.6) and artillery (2.7).
All illustrations are plates, and are numbered according to a system which ties them directly to the text and catalogue sections. Each plate is labelled according to the relevant text/catalogue section, with an additional identifying letter; so plates of archery equipment are designated Plate 2.6.A, 2.6.B, etc. Captions for individual plates will be found in the front of the plate volume.

All dimensions are given in SI units (e.g., metres and millimetres). In the catalogue, dimensions given with a plus sign (e.g., 68mm+) indicate the maximum preserved dimension, and that the object is incomplete.

In the projected published version, a running series of unique numbers will be adopted to avoid ambiguity and for ease of use; however, the present system will allow easy addition of material into the structure before such a series is applied, should further items become available for inclusion.

1.8 The recording system used on the excavations. (Plate 1.A)

The system of recording employed during the excavations seems to have involved entering each object, or group of objects in the season’s finds register, and giving it an identification consisting of a letter denoting the year and a numeral. So, for example, F1333 was the 1333rd object recorded in the sixth season. The finds registers included a brief description, such as “sword fragments”, or “arrows” and some details of provenance. The latter were rarely as specific as an identification of the room in the building where the object was found. More exact details of some individual provenances can sometimes be gleaned from accounts in the Reports; the original records behind these are difficult, if not impossible to locate. Some of the objects were further described on site on cards which contain sketches, measurements, and observations. How widespread this practice was is unclear, but quite a number of these cards are preserved at Yale. Most of the major finds of arms and armour, such as the scutum and the horse trappers have them.

Provenances, where they exist at all, are a far cry from the precision of post-war stratigraphic recording. There is often little beyond the broad coordinates of the city block in which an object was found, e.g., “N8” (plate 1.A). Sometimes there is a suffix giving more details, perhaps locating it to a particular numbered room in a building, or a stretch of wall. One of the most frequently encountered in the records is “L7W”, the stretch of city wall between Towers 18 and 19. From this it will be appreciated that it is usually impossible to tell exactly where an object was found in plan, let alone whether it was from the surface (unstratified, and so possibly dropped centuries later), or under a floor (and so pre-siege).
1.9 The current whereabouts of the material.

Arms and armour from Dura are currently in at least four separate locations; Yale University Museum; Damascus Museum; the John W. Higgins Armory Museum at Worcester Massachusetts; and the Royal Ontario Museum.

The location of the small quantity of material found by Cumont is unknown (it is not even clear that it still exists) and so these pieces were not available for study. However they were published in Cumont 1926.

The much larger quantities found during the Yale/French Academy excavations were, like the rest of the finds, divided between Yale and Damascus museums. The writer has been unable to visit the latter, and Yale has no formal list of the material left in Syria; however, study of the site records and Yale accession records has allowed me to establish that the great majority of the arms went to America. Only a few choice items stayed in Damascus, including some wooden bolt shafts, a sword and most notably one of the two complete armoured horse-trappers. Informal approaches through Mr. Peter Parr of the London Institute of Archaeology were not fruitful, as Damascus apparently has even less documentation regarding its Dura material than is held at Yale, and the exact whereabouts of the few known items not already published is uncertain. Given this situation it was deemed impractical and unjustifiable for the moment to attempt a trip to Syria, given the likelihood of a fruitless trip. However, there are substantial site records of both the sword and the horse armour, and a published account of the latter, so the omission is of minor importance.

Yale’s share of the material is now the responsibility of the University Museum and Art Gallery, where most is housed in the stores, although a considerable amount is on permanent loan to the John Woodman Higgins Armory Museum in Worcester, Mass. Yale’s horse armour is currently on display at the Higgins. The following work is based on study of the Yale and Higgins material, in conjunction with the site archive (also in Yale Art Gallery) and published accounts which also give details of the small quantities of material found by Cumont and that in Damascus.

Thanks to Dr. John Hayes, who very kindly provided the most detailed descriptions and pictures, it came to my attention in September 1985 that a small quantity of material also found its way to the Royal Ontario Museum. It is quite clear that this material is a selection of pieces from the Yale assemblage given to the ROM many years ago, although no mention of this gift was seen by me in the Yale archive.

Given the unexpected appearance of the ROM material, the possibility remains that the failure to locate a number of objects recorded at Yale may be due to a further unattested gift or gifts to other museums.
1.10 The Dura archive at Yale University Museum

The material deposited at Yale University Museum and Art Gallery was given normal accession numbering, consisting of a year followed by a numeral, eg 1938.1555. Accession numbers mostly refer to single objects, or groups of fragments certainly or probably from single objects, although some numbers refer to groups of items with no obvious reason to be associated. Each object was to be photographed and the print attached to a descriptive card for entry in the Dura collection card-catalogue, wherein the entries are arranged by function and/or material. There is a separate arms and armour section. Each card was to bear the gallery accession number, the Dura site number, details of provenance and physical condition. It would also include a scale drawing if applicable, and a description of the object along with any other relevant notes, references to parallels and details of its eventual publication. Finally, the Yale accession numbers were to be cross-referenced back into the Dura site registers.

Such was the theory, but the actual present state of the records is very far from the ideal. This situation is a result of the poor standard of recording on the site and the lack of attention the collection received immediately after its arrival at Yale. Despite great efforts on the part of more recent curators, especially Susan Matheson, limited headway has been made in the face of shortage of manpower, resources and finance.

The practical problems are as follows. Firstly, some objects were apparently never entered in the site finds registers. Many which were have no recorded provenance, not even "unstratified"; there is no indication of which part of the site they came from. There was also a considerable time-lag between discovery of much of the collection and its accession at Yale. Most objects have the accession date 1938, and it seems that the original site numbers (with their details of provenance) became disassociated from many of the finds before they were accessioned. This may be partially blamed on the use of adhesive labels to number the objects. They frequently fell off, especially from iron objects, making it impossible to be certain of the identity and exact origin of many of the pieces in the collection. Furthermore there are objects both with and without site numbers which although now housed at Yale either never got accession numbers or have lost them. In the latter case they cannot be reassociated with the file cards which often lack any detailed description, drawing or photograph. A few have Yale accession numbers written on them, but do not appear in the card index. Other objects in the card catalogue could not be located in the stores, or could not be certainly identified. Of these the most important was one of the oval wooden shields (shield 5).

Of course all these problems make study of the collection difficult, but in practice it is often possible to establish with a fair degree of certainty where a now unprovenanced object came from within the city. For example, most of the metal shield bosses now at Yale may be assigned to the Tower 19 countermine with some confidence. We know many umbones of bronze and iron were found there, and some are identifiable from the sketches of the excavation. Furthermore, according to the records, it appears that hardly any umbones were found elsewhere. Nevertheless, the lack of detailed provenances and the absence of any information at all for many objects, place certain constraints on
what may be done in analysing the assemblage. For example, it makes drawing any but the broadest conclusions about distribution of finds within the city very risky. Trying to work out where individual objects came from is a nightmare, and often impossible. Much of the research can be characterised as the historical analysis of the archive of the archaeology of Dura!

1.11 Condition of the material; conservation

Few of the items housed at Yale have been conserved; most are more or less as they came out of the ground. Fortunately, they had for the most part been buried in dry conditions and are largely stable in their unconserved state. Metal objects show a wide range of degrees of oxidation, especially the iron. Some of it is completely mineralised, while other pieces, notably some of the quarrel heads, still preserved their original shiny surface marred only by superficial localised pitting. Similarly, some of the bronzes are in perfect condition, others have heavy layers of corrosion products. The condition of an individual piece obviously depends on the specific conditions of burial. The reason that so many pieces are in such remarkable condition is that they were quickly and deeply buried. Rain does fall at Dura, but does not penetrate far below the surface before evaporating again. Consequently, organic material survived well in the very dry and stable environment in, for example, Tower 19 and the mines below it, but soon rotted if near to the surface. Shallow-buried metal objects also suffered severely.

What conservation there has been was not always beneficial. The most extreme and unfortunate cases are the painted oval shields. The binding agent applied to consolidate the pigment has darkened and cracked, lifting the pigment from the wood and effectively destroying the paintings. The wooden boards are unaffected, and remain mechanically strong. The same is true of other wooden objects such as catapult quarrels, which, although often worm-ravaged or charred in antiquity, remain generally robust and stable without treatment. The surviving leather of relevance (mainly anti-chafing strips around the edge of scale defences) is in equally good condition; much of it has been cleaned and conserved, although the process used appears to have destroyed the colour of the leather in some cases while preserving the form. Textile backing of scale armour varies in condition from a state of total disintegration to virtually full survival of its original flexibility and tensile strength. This was illustrated most dramatically in the case of the scale horse armours from Tower 19. The cloth onto which the scale rows had been sewn was quite strong enough for the trappers to be taken straight out of the ground and placed on the back of an Arab pony to be photographed (plate 2.2.X, bottom).

1.12 Previous work and publications

As explained in 1.3, the projected final report on the arms and armour has never appeared, but a number of individual objects have been more or less fully published in the Preliminary Reports. Of these,
the most important are the horse armours and the painted shields (*Rep*. VI 439-449; VII/VIII 326-369).

Other objects were given varying degrees of coverage, many getting no more than a bare mention. No other general account has been published. Publication references for individual objects will be found in the catalogue.

Some specialist work on identifying the organic materials has been carried out in the past, especially in identifying the wood species used in the catapult quarrels and wooden shields, and the pigments used on the latter. This is credited where possible, although many wood identifications are simply anonymous notes on the archive record cards. A lot of work remains to be done, especially on the textile backing and stitching, and the leather-and-rawhide edging of scale armour, but this is not likely to be done in the foreseeable future.

Before the present research the only major work carried out on the assemblage since the excavations was that of the late Donald R. Wright, who in 1963 submitted a Scholar of the House paper on the weapons to Yale University. Apparently this was to have formed the basis for the final report, but Wright made no further progress on the subject before his untimely death. The paper is now housed in Yale's Stirling library and in the Dura archive at Yale. I was able to consult it in 1981. Subsequently, thanks to the kindness of Mr Wright's widow, I have been able to acquire a copy. It includes a catalogue and discussion. The former lacks any scale drawings or photographs. Wright carefully catalogued all the scale armour, using his own system but unfortunately the latter is actually a hindrance to understanding the material, and has been abandoned in the present work. The discussion also contains errors of fact and interpretation which suggest that Wright had rather limited familiarity with Roman military equipment, and had insufficient time to work on the archive. For example, he was under the impression that there were two “Sassanian” helmets whereas only one was found (Wright unpub. 106-7). His interpretation of the assemblage is discussed and reviewed in more detail in part 3. However, the paper does contain items of new information, and it is easy to criticise with the benefit of twenty more years research which have seen numerous discoveries and a refined understanding of Roman weaponry.

The only work since Wright’s paper was done by the late Mr. Merrill Lindsay, then President of the Eli Whitney Museum near New Haven, Connecticut, who submitted a brief (20 page) paper on the Yale material to the Arms and Armour Society of Great Britain. It consists of a short review of the objects in the collection, with the valuable aim of bringing the Dura armour back to the attention of scholars after more than forty years of general neglect. However, this paper remains sadly unpublished (Lindsay unpub.).

I have already published several papers arising from the present research, regarding the date of the fall of the city (crucial to understanding the historical context of deposition of the arms; James 1985) and also particular aspects of the weaponry itself (James 1983, 1986, 1987).
1.13 The research; opportunities and problems

The fieldwork on which the catalogue is based took place during two visits to the United States in 1981 and 1982, totalling about nine weeks. The material at Yale and the Higgins was made freely available to me, and much generous assistance was given by the staff of the Higgins, and especially by Susan Matheson, curator of ancient art at Yale Art Gallery, who is in charge of the Yale's Dura collection. She also made the Dura archive and the gallery's own accession records and catalogues available, making the following study feasible. However, the limited facilities at the gallery placed various constraints on the work; for example, it was not possible to procure an accurate set of metric scales for weighing the catapult bolt warheads for statistical purposes. There was also no opportunity to X-ray the iron objects, such as the helmet, the Higgins spatha or the mail etc., all of which would be much better understood if radiographs were available.

1.14 Methodology

The research was based almost entirely on unaided naked-eye examination of the pieces in the Yale collection, backed up by reference to the paper archive. A considerable number of pieces were not available, being missing, on loan, or in Damascus as noted in the catalogue. In such cases published accounts and the archives were used.

Where specialist analysis has been carried out (eg Lillios unpub.) it was of course used, but no analytical facilities were available and many questions of materials identification and metal analysis await future work.

Pieces were generally identified and categorised by reference to previously published archaeological discoveries, mainly on the Rhine and Danube frontiers and in Britain due in large measure to the greater density of research and publication in those areas. Of course, wherever possible parallels were sought in the Roman East and the territories of the Sassanian empire. However, there is relatively very little available, especially for the latter, in terms of excavation and available publication, resulting in a heavy bias of comparable material to the Roman Empire, and especially the Northern limes. Parallels are noted in the catalogue, and are used to try to identify some of the affiliations of the pieces found.

Difficult questions of attribution, foreign influence and their importance for understanding the assemblage and its wider significance arose during the research, and these are detailed in part 3.2.

There are no surviving documentary sources of direct relevance to the arms found in the siege (and this includes the papyri from the site; see part 3.3.4 to 3.3.6). There are not even any particularly useful historical works by classical writers covering the period in any detail, from which information on weapons could be drawn. Instead, earlier and later works have been used (eg Dio and Ammianus).
to help construct a general picture of weapons and tactics (which can leave no archaeological trace) in the periods either side of the use and deposition of the assemblage, i.e. for the early third, and the fourth century. Other sources from more distant periods have been employed where they appear to be helpful; the rule of thumb used is that ancient sources are quoted where they are clearly or probably describing the form or use of material attested archaeologically.

Consequently such sources are used sparingly, as they suffer from a number of their own inherent problems, not least the failure to use technical terms properly or consistently (even Ammianus, a professional soldier, used obsolete terms for literary effect). On the other hand, some terms perhaps used properly may not be fully understood today (for example, descriptions of fire arrows were imperfectly understood until examples were found; Brok 1978; James 1983).

1.15 Pictorial evidence; methodology of employment (plates 1.E to G).

Dura itself has produced a variety of depictions of soldiers, ranging from graffiti to the very elaborate synagogue paintings and the mural of Terentius in the Temple of Bel (plate 1.E. Terentius was killed in battle, probably in 239; Rep. IX, 1, 108). There are also secondary sources outside Dura which may be able to throw light on the equipment in use at the time of the siege, and its methods of employment. These range from the extraordinary Sassanian rock-carvings depicting the Shahs at war (e.g. Bishapur; Herrmann 1980, 1981) to sculptural evidence from Palmyra, Hatra and other similar sites in the East, to military tombstones and monumental sculpture in the Latin West.

Like documentary and archaeological evidence, these sources have their own special pitfalls and problems, requiring a careful consideration of the methodology of their use. This has become especially apparent in the last twenty years or so in the case of monuments such as Trajan’s Column. Nowadays few would take every detail of the military reliefs as a photographically accurate view of the appearance of the Roman army of the early second century (Lepper and Frere 1988 266-8). It is clear that, consciously or unconsciously, the depictions are affected by the conventions of Hellenistic art, and the fact that it was carved by sculptors not entirely familiar with some of the subject matter. That they were working from descriptions for some details is betrayed by the bizarre representation of Sarmatian horse armour, for example (for a discussion of the problems, see Coulston 1989).

It is generally agreed that the most trustworthy representations of Roman soldiers are those made by the army itself, or by people in direct contact with it, rather than those of artists trained in the repertoire and style of cosmopolitan Rome (e.g. Waurich 1980). I am thinking in particular of military tombstones, and monuments such as the metopes of Adamklissi (Florescu 1965). The impression given by these reliefs is that the sculptors often went to great lengths accurately to depict details of uniform, but that naturalism was not important: The provincial taste across most of the empire was to represent people and things as they “were”, not necessarily as they looked in terms of proportion. For the period of immediate concern, the third century, there are a considerable number of military...
tombstones, notably from the Balkans, with details of equipment including armour (Oldenstein 1976 Abb.13-14; Speidel 1976; Coulston 1987). A large number have recently been found in Syria itself, at Apamea (Balty 1988). The latter are of particular interest, not least because such pieces are rare in the East, where the fashion for such monuments did not catch on (Kennedy 1989 242 fn.1); the Apamea examples appear to have been relatively poor versions made by local stonemasons to the orders of Danubian troops (Balty 1988).

The detail observed in many of these pieces, which vary quite widely in standard of execution, is nevertheless high and corresponds well with archaeological discoveries (for example, details of swordbelts).

For this reason I am more inclined to trust details on such monuments than those on Trajan’s Column or splendid marble battle reliefs on sarcophagi, which are more likely to be “contaminated” by artistic convention. However, both metropolitan art and provincial works may include simple distortions, eg of relative size: witness the sheep-sized horses on Trajan’s column. This tendency to diminish or, sometimes, exaggerate the size of items like shields (often suspected of being ‘shrunk’ to avoid obscuring figures) means that such evidence is untrustworthy. Distortion of proportion may be suspected even on the generally trustworthy third-century tombstones. I therefore regard these aspects of depictions as inadmissible evidence.

Depictions may perhaps be given credence where they depart from the established canon or repertoire. For example, the appearance of shields with forearm straps on a third century relief I would regard as highly suspect, for not only does it contradict the archaeology but it is something well established in the Hellenistic tradition as Greek shields had once been made like that. However, if the depiction showed an armoured horse, I would be more inclined to accept it as possibly an accurate representation of contemporary reality, precisely because it departs from convention. In this category I would place some of the reliefs on the Arch of Galerius at Thessalonika (Laubscher 1975) which show soldiers in helmets and scale shirts which differ from the established artistic repertoire (eg helmets with nasals).

Illustrations can elucidate the archaeology. A good example is the wearing of cross-bow brooches. Certain depictions, which may be regarded as worthy of credence because they show the archaeologically-testable details accurately, confirm that the foot was worn upwards (eg on a tomb painting from Silistra, and the Stilicho diptych; Brown 1971 plates 17 and 87). When considering Roman provincial art, depictions should normally be used only to elucidate the archaeology, unless there is a powerful reason to trust its unsubstantiated testimony.

From the Roman Empire, then, few illustrations of the relevant period meet my criteria of trustworthiness. The most important are the third-century tombstones, plus some other cases selected on their merits, such as the reliefs on the Arch of Galerius at Thessalonika (Laubscher 1975), mentioned above.
Further problems arise when we consider the other sources of depictional evidence outside Dura, which are part of or related to the Partho-Iranian tradition; Parthian, Sassanian, Palmyrene, Hatrene and other near-Eastern depictions. These can be treated in exactly the same way as the Roman sources, even though there is much less understanding of the degree and nature of conventionalisation. Palmyrene art, for instance, is extensively Hellenised, but also clearly shows signs of oriental hierarchy (Colledge 1976). Sassanian art is also highly formalised, a process which may compromise the reliability of carvings and paintings as sources of information on arms (Ghirshman 1962; Herrmann 1977).

However, we can apply some acid tests, by looking at how they represent Roman and other archaeologically attested weaponry. In this, the accuracy of detail of Sassanian rock reliefs proves remarkable. The details of uniform, belts and sword-fittings of the three Roman emperors depicted with Shapur at Bishapur are shown with complete accuracy (Herrmann 1977 93 top; 96). This cross-check encourages me to trust the details of Sassanian weaponry shown on the reliefs, even though we have as yet virtually no archaeologically proven third-century Sassanian weapons. However, it is still possible that foreigners are depicted with accurate observation of their novel dress, but that Shah and other Persians will have been formalised!

Looking specifically at the material from Dura, these considerations lead me to trust some representations more than others. For example, I regard the details of the Terentius mural as reliable, because this represents real individuals (at least Terentius!) who could be seen by the artist - who was perhaps a soldier himself. Ultimately I trust it because of its correspondence with the archaeology and because it clearly matches the sculptural representation on military tombstones; these all form a harmonious body of evidence. I think it likely, therefore, that Terentius really did wear a long-sleeved white tunic and tight breeches.

Furthermore, because of its uniqueness and the way it is supported by the archaeology, I also trust the general appearance of the clibanarius graffito (plate 1.1H) as a reflection of reality at Dura. On the other hand, how far can the detail of the figure be trusted? The drawing may be interpreted as showing laminated arm and shin defences (or are they striped or quilted fabric?), scale cuisses (of leather? metal? or are they actually mail?), perhaps a breastplate of splint armour (a type of defence not attested archaeologically at Dura) and a conical, composite helmet (or is it just badly drawn?). Detail in graffiti is not reliable, because of the ambiguity of the simple style used, which usually contains insufficient information to be quite certain of what is intended to be depicted, and what is successfully depicted.

Similarly the various portrayals of galloping horse-archers are all of a common conventionalised type, of widely differing degrees of competence. We know that there were horse-archers at Dura, but I doubt that these depictions are reliable enough in detail to draw categorical conclusions about the exact shapes of bows in use at the city. The main problems with the graffiti are the question of who drew them, and more importantly, which side do they depict? Is the clibanarius a Persian, or a Roman (perhaps a Palmyrene in Roman service)? Graffiti are hard to use except in general terms.
Most interesting of all are the Dura Synagogue paintings. Several scenes show troops, eg at the Battle of Eben-Ezer, and the crossing of the Red Sea. The iconography and sources of inspiration for these famous murals have been discussed elsewhere (Bellinger et al 1956; Gutman 1973). It is clear from this work that some paintings were drawn from illustrated manuscripts, pattern books or even from memory as standardised "visual clichés" (Goldman 1973 74). Whatever the exact sources, the classical influence is immediately apparent: the Temple at Jerusalem is a full Corinthian temple complete with victories on the roof, and Moses is in classical dress. Similarly, the soldiers in one of the Ezekiel scenes are typical Hellenistic types with muscle cuirasses and crested helmets, artistic clichés (panel NC1, section C; Bellinger et al. 1956 plate LXXII). On the other hand, some of the other soldiers are dressed in ways completely at variance with the classical tradition. There is clearly some Iranian influence; Mordechai (plate 1.1. F, bottom) is a Parthian horseman, and at the battle of Eben-Ezer, two horseman charge each other, Iranian style, with couched lances (plate 1.G, top).

However, the details of dress in some of these cases, especially the latter, command attention, as they do reflect closely the details detected in the archaeology of Dura. Most notable are the long-sleeved mail coats. These are quite foreign to the mainstream Greco-Roman tradition, as is the depiction of troops fighting armoured but bare-headed (plate 1.G).

However, while one or two of the scenes do seem to match the archaeology in certain respects (ie the use of long-sleeved mail shirts and the possibility that helmets may not have been worn by some troops; plate 1.G), almost all these details have precedents in either the Greco-Roman, or the Partho-Sassanian tradition; the depiction of Ardashir at Firuzabad shows him fighting bareheaded (Herrmann 1977 88). The only exception appears to be the scale-covered, or more likely mail, hoods in the Ark of the Covenant scene (plate 1.G, bottom; the fine detail is only clearly seen in Tomlin 1989 240). To my knowledge these are without known parallel at this date (although they appear to be part of the repertoire by the fifth century; Weitzmann 1977 plate 4), and so may be drawn from observation of troops in the city. However, no such hoods are known archaeologically, and given the conventionalisation of almost all the rest of the depictions, it would be dangerous to place any weight on the idea. In summary, then, the Synagogue paintings tell us nothing reliable about the appearance of the soldiers of Dura.

As a general rule, then, if a depiction accurately portrays equipment attested by archaeological remains, then its testimony regarding the way equipment was put together, worn or used may be regarded as valid - provided it makes functional sense. This does not mean that they are absolutely reliable in portraying these details; it is a non-sequitur to say that accurate drawing of objects means that other aspects must be equally accurate; did Terentius’ men all really stand on each other’s toes (plate 1.E)? Did Shapur really fight helmetless or is this a convention to show his face? Yet probability of accuracy in these areas is higher, and so with due caution they may be used.
1.16 Bibliographical references

The Harvard system is used with a number of special exceptions where abbreviations are employed. These are listed at the beginning of the bibliography.

The series of Preliminary Reports on the first nine seasons (that on the tenth was never published) are referred to as Rep. I to IX. However, the rather fragmented and incomplete series of Final Reports is more conveniently referred to by author in standard notation (eg Frisch and Toll 1949).

Ancient sources are referred to by abbreviated names and where necessary by works, eg Amm. for Ammianus Marcellinus.

Modern series publications and journals are also usually referred to by abbreviations or initials which may be found at the beginning of the bibliography.
PART 2: THE ASSEMBLAGE

2.1 Helmets (Plates 2.1.A to H).

The material relating to helmets divides into two groups. Firstly, there is the only complete helmet, the iron example from the tower 19 countermine. This is not a known Roman type, and indeed is quite unrelated to the mainstream of classical helmet design. Its affiliations are discussed in 2.1.1. However, it clearly does have great significance for the origins of fourth century Roman helmets, which were of a completely different design from those in use in the third century and before.

(NB Wright catalogues a second helmet, “almost an exact copy” of the first, unpub 92. He gives the helmet found in the mine the number 185, the supposed second helmet the number 186. The description of his 185 appears to be wholly drawn from the site records; the very thin description of 186 lacks any details of provenance, site- or accession numbers, and appears to be based on direct observation of the helmet at Yale. Given that his no.185 is a paper record without a helmet, and his 186 is a helmet without a paper record, I do not understand why he did not conclude, as I have done, that they are one and the same (my helmet 1). I can only suggest that he did not realise that the Yale helmet was heavily restored, and so concluded that this apparently intact piece could not be the shattered Tower 19 mine helmet).

The second group consists of a small number of fragments from helmets which were all of undoubted Roman design, discussed in 2.1.2.

2.1.1 The “Persian” helmet (Plates 1.C, 2.1.A to D).

In the countermine under tower 19 lay an isolated corpse, some few metres away from the tangled mass of bodies of Roman soldiers and close to the junction with the Persian siege mine (plate 1.C). The body lay on its back in a manner which suggests but does not prove that he was facing into the city when wounded, and fell over backwards. He attempted to remove his mail shirt before dying (Rep. VI 192). These considerations make it likely that he was one of the attackers. This is supported by the design of the sword and helmet found by the body, which show that their owner had been equipped in an oriental and not Roman manner. The sword had a pommel of non-Roman form, which was made of jade from Chinese Turkestan (Part 2.3, hilt fitting 9). The helmet (helmet 1), which lay on its side, crushed when
found (James 1986 fig.14), was also of no known Roman type.

Its structure is described in detail in the catalogue, and its affiliations were fully considered in the publication (James 1986). Briefly it differs from contemporary Roman helmets in virtually all aspects of design and construction, consisting of a tall helmet bowl made in two halves joined along the midline by a separate strip of iron; a nasal defence (now lost) anchored by wings in the form of "eyebrows"; and a pendant camail of iron rings instead of integral plate neck-guard and hinged cheek-pieces. This construction is quite alien to the middle Imperial Roman milieu (to which all the other helmets clearly belong) and is further evidence for assuming the helmet belongs to a member of the attacking army.

There are two major points of interest regarding this helmet. Firstly, it is the only well-dated helmet which can with confidence be attributed to the Sassanian army. Others are known but details of provenance, and especially of dating, are shaky (James 1986 117-120). However, the Sassanian army consisted not only of Persians but of contingents from many subject peoples from Mesopotamia to Afghanistan, and so it can only be assigned to the Persian Empire as a whole, and not specifically to Persia proper (James 1986 123).

The second major point is that this helmet provides the first well-dated plausible prototype for many of the most salient features of fourth-century Roman helmets. These were of forms utterly different from those of the preceding four centuries (Klumbach 1973; Johnson 1980; James 1986). I have argued elsewhere that the occasion and probable reason for the introduction of these new types was the "nationalisation" of arms production under the Tetrarchy, when huge new factories (fabricae) were created and quantity became more important than quality; the new helmets were simpler to mass-produce and were often crudely made (James 1988 271-3). However, the source of inspiration for the new designs must also be considered, and an obvious possibility is Persia, whence so much else (not least elements of official dress and ceremonial) was drawn at the time. Hitherto the problem had been the absence of well-dated evidence for the nature of Sassanian helmets in the crucial period, the mid to late third century.

Helmet 1 from Dura is exactly the sort of evidence that was needed, and indeed it shows the essential characteristics which appear on Roman helmets from about AD300; bipartite bowl with a riveted fore-and-aft connecting strip, "eyebrows" and nasal. The fourth century Roman types may indeed now be regarded as somewhat Romanised pieces of Persian inspiration (for a more detailed discussion, see James 1986).

### 2.1.2 The Roman helmet fragments (Plates 2.1.E to G).

The remainder of the material, such as it is, consists of a small number of fragments of iron and bronze helmets of well known Roman types. There is a virtually complete iron cheekpiece (no.2; plates 2.1E and G), a fragment of iron helmet skull (no.3; plates 2.1.F and G) and two bronze crest reinforcing bars,
(nos. 4 and 5; plate 2.1.G) which may come from a single helmet (if indeed 5 is from a helmet at all). With the bronze brow guard, (no.6; plate 2.1.G) four or five helmets are represented.

Apart from the uncertain no.5 all the fragments come from helmets usually regarded as auxiliary cavalry forms, specifically types E and F of Robinson's classification (1975). The brow guard could be from a type I. The restricted number of types is probably only a reflection of the tiny size of the sample, and does not indicate that these were the only Roman types in use at Dura; the absence of infantry types cannot be held to be significant.

Particularly striking is the precision with which these fragments may be matched to helmets from Europe, not only in general arrangement but also fine details of construction and even degrees of curvature. This evidence, limited though it is, suggests that the helmets of the Durene garrison were indistinguishable from those to be seen in contemporary Western forts.

2.1.3 The "parade helmet" (no.7; plate 2.1.H)

This extraordinary piece is unlike the other helmets in that - if it is indeed correctly identified as a headpiece - it is not fighting equipment. The thinness of the metal and the details of the ornate repoussé and inscribed decoration clearly relate it to some of the most elaborate of the so-called cavalry sports or parade helmets. There are also so-called cavalry sports cuirasses from the site, but the Dura evidence suggests that these, too, may have been widely used in fighting (see section 2.2.7). It is perhaps fitting that the closest parallel comes from Syria (Nawa/Tell Oum Hauran helmet B, Abdul Hak 1955 174-185; Garbsch 1978 60 helmet N2 plates 16,2-4), so it is possible (but far from certain) that this represents an Eastern variation on the general theme.

The main reason for the difficulty in identifying the exact form of the piece is its extremely mangled state, twisted and torn into many fragments, most of which are lost. It was probably being recycled as scrap.

Whatever the case, it is notable that Dura is again in the mainstream of Roman military sites in providing evidence of the use of such spectacular non-functional equipment.

2.1.4 Helmets at Dura

It is difficult to make any general comments on the "Persian" helmet 1, simply because it is effectively unique at the moment; there are as yet no other reliably dated and provenanced Sassanian helmets. However, it is possible to draw some tentative conclusions, or at least to make some observations, about the Roman side.
It is difficult to assess whether the scarcity of Roman helmet material at Dura is significant, especially in view of the great quantities of body armour found. However, much of the latter comes from the fortuitous preservation of a number of complete scale garments, especially in Tower 19. Roman-pattern helmets were certainly worn in the East during the Roman period. A number have been found, representing so-called legionary types (e.g. Hebron, Robinson 1975:71 plates 175-8), cavalry pieces (Jerusalem; James 1986a) and cavalry "sports" types (e.g. Emesa, Robinson 1975:121 plates 349-351) and Nawa/Tell Oum Hauran (Abdul Hak 1955), both in Syria, and Sheikh Ibada, Egypt (Garbsch 64 helmet O12, Taf. 19,3). Helmets may well have been particularly prized as booty by the victorious Persians; alternatively, perhaps iron was becoming more common as the metal used in making them (it is universal in the fourth century; Klumbach 1973; James 1986), so perhaps we can blame preferential looting and differential corrosion. Nevertheless it is perhaps worth considering the significance of the fragments we do have.

As noted above, absence of evidence of so-called infantry types (as defined by Robinson 1975) cannot be taken as evidence on purely archaeological grounds, due to the sample size. However, despite the notorious absence of well-dated pieces from the Roman Empire, it seems to be increasingly clear that numerous examples of so-called auxiliary cavalry helmets can be assigned to the third century; in contrast, hardly any of the allegedly infantry patterns are to be dated after AD200. Indeed, this chronological difference is already evident from a consideration of material in Robinson (1975). It appears that one must conclude either that Roman infantrymen generally abandoned wearing helmets in the third century, or that our identifications of third century helmets as belonging almost entirely to auxiliary cavalry regiments is simply wrong; such helmets were worn by both infantry and cavalry. (This observation then casts doubt on the validity of the distinction for the first and second centuries when both forms were in use simultaneously; but that is not our present concern).

A consideration of Severan and later tombstones shows that the latter explanation is far more likely. Dress is often shown in considerable detail on these reliefs and can be closely checked for accuracy (for a general discussion see Coulston 1987). For example, the tombstone of Aurelius Surus of Legion I Adiutrix in Istanbul (Oldenstein 1976 Abb. 14,2; Coulston 1987 pl.2) shows the legionary with his helmet on the ground next to him; it has a small neck-guard and large cheek-pieces and the characteristic tall peak of the so-called cavalry pattern (the tomb of M. Aurelius Avitianus is also comparable, Speidel 1976 Plate 5). It seems, then, that third-century legionaries and auxiliary infantry also used the so-called cavalry type helmets, which should probably now be reclassified.

Nevertheless the scarcity of helmet remains at Dura still prompts me to wonder whether helmets really were worn by all the Roman troops stationed at Dura. In the one place where this can be tested, i.e. the tower 19 countermine, there is no evidence that any trace of helmets was found among the great mass of Roman armour and bodies found there (Rep. VI 188). Bronze and iron shield bosses were found in some numbers, as well as mail (Rep. VI 195, figs.17,18). The complete oriental helmet was found nearby (Rep. VI fig.16). The conclusion must be that the Roman soldiers were fighting in the mine in body-armour but bareheaded.
This may seem strange, as one might expect that wearing of helmets in a fight in a cramped, dark mine would be particularly attractive given the obvious additional risks of head injuries. It is tempting to wonder whether perhaps the soldiers fighting in the mine were not issued with helmets.

In fact, representations of soldiers fighting without helmets are to be seen in the synagogue (plate 1.G). Several of these figures had some kind of headdress which has been interpreted as a medieval-style mail coif (Bellinger et al. 1956 97; in the published versions, only Tomlin 1989 240 is sufficiently detailed). No evidence was found for such hoods at Dura (although this could be due to the chances of survival) and indeed I am aware of no evidence for them from elsewhere in the Roman or indeed Sassanian world. The only parallel known to me is to be found in one of the illustrations in the 5th-century Vatican Virgil manuscript which shows figures apparently wearing such mail hoods (Vergilius Vaticanus fol.73v; Weitzmann 1977 plate 4). I would regard them as an illustrator’s convention of unknown inspiration, not reflecting reality at Dura. Likewise, the bare heads of the infantryman may derive from observation of the garrison at Dura, but could also be a Persian artistic convention (see part 1.15).

It may seem highly illogical that troops should be provided with body armour and shields but be left bare-headed; after all modern studies of battlefield trauma have highlighted the particular vulnerability of soldiers to head injuries so that the only armour normally worn by modern soldiers is a helmet. However, it is clear that the development of Roman armour does not always follow what seems to be a logical course, and it is evident that fashion and perhaps other factors could override plain practicality. Perhaps metal helmets under the desert sun were considered by at least some infantrymen to be more of a health-risk than combat. In this connection it has been observed that in modern situations where there is high risk of head injury, such as on building sites and excavations, it is often very difficult to get workers to wear helmets even when issued, and they know the risks; they are often discarded on grounds of sheer discomfort. The situation is so serious that failure to wear helmets is now being made an offence liable to instant dismissal (Patricia James, pers. comm.). Given these observations, it may be that the Durene infantry did not normally wear helmets, or that they discarded them in the mine to avoid restricted vision, and because the cramped conditions removed the risk of blows from slashing weapons.

With regard to regional style among the Roman helmet material, it is notably lacking with the possible exception of helmet 7 (if such it is), with its extraordinary Medusa-head decor which does seem to have an eastern distribution on the basis of the meagre parallels; however, the motif itself is of course classical. Otherwise, as noted above, the fragments are all identical to European pieces.

There is one hint of cross-frontier exchange in the assemblage, but interestingly this is to be found on the “Persian” helmet 1; the reinforcing strip down the front of the helmet may well be Persian copy of similar elements on Roman helmets! Copying can be a two-way process.
2.2 Armour (Plates 2.2.A to AQ)

A staggering quantity of armour was recovered from the excavations at Dura, ranging from entire horse-armours to fragments of single bronze scales. There are several thousand individual items, and it is here that the chaos of the records is felt most keenly. In addition to the usual problems of objects being disassociated from their original site numbers, assuming they had any, many have also lost their Yale accession numbers, or never had them. Worse, there seem to have been at least two attempts to sort and classify the scale armour (one of them by Wright), with scant regard to seeking context and likely association of different pieces; so items probably from the same scale garment have been separated out because the pattern of holes through the scales is different. The better-preserved fragments show that hole-patterns varied within a single garment, with, for example, edge-rows often having one large hole to lace on trimming where neighbouring scales may have four for stitching to the backing cloth. Other garments had more than one size of scale (eg miscellaneous scale no.37, plate 2.2.AQ). Consequently, the rigid attempts to establish a typology have probably led to loss of excavated associations, and now hinder understanding without producing any meaningful result. They are therefore not used in the present study.

The published references are often of little help in establishing which pieces were found in which season and where. Armour, or objects identified as such, were found from the start of the Yale/French Academy seasons, but the references are often hopelessly vague (eg. Rep. I, 4, 73). Others do not correspond to anything in the existing archaeological record; for example, scales with “usually four holes in the upper right hand corner by which they were sewn to the coat of leather or cloth” are recorded (Rep. I 73), but there is no sign of such scales anywhere in the archive. Are they simply lost, or is the description mistaken?

It is clear that a number of armours were recovered essentially intact. These are mostly well-known, comprising the leather cuisses, the two armoured horse-trappers, and two mail shirts. The Reports also reveal that complete sets of scales from armours whose backings had disintegrated were also recovered, especially in Tower 19, but even though much of this material can be tentatively identified at Yale, it is not possible to do much with it as, at the most basic level, we cannot be sure that all that was found is still at Yale. Quantities of armour went to the Higgins, the Royal Ontario Museum, and perhaps elsewhere; we cannot even be certain of what was left at Damascus.

The remains are considered by garment type; mail shirts, scale cuirasses, limb defences and horse armour. It should be noted that some of the identifications are tentative due to the fragmentary condition of most of the pieces, and our limited understanding of the repertoire of garment types and forms to which we are trying to assign the pieces. The substantial quantities of very fragmentary scale defences have been grouped into a miscellaneous section at the end, as they could have been used for a variety of purposes.
2.2.1 Mail shirts (plates 2.2.A to I).

All the mail surviving from Dura is of iron, often embellished with rows of bronze rings, on edges and elsewhere. It is assumed here that all the mail fragments come from shirts, as there is no evidence for the use of this type of armour for leg, head or horse armour in the Roman world (although see the probably Persian camail on Helmet 1), and all the more intact pieces are demonstrably from such garments. It is not possible to estimate how many garments are represented, due to the state of the records. The accompanying catalogue lists 30 entries, some of which could be different fragments of a single shirt, while single entries such as no.8 could include fragments from more than one.

There is one complete shirt (no.2) and one largely complete (no.1). The latter, along with most of the larger and best preserved fragments can be attributed to the group of material from the countermine beneath tower 19 (nos 3 to 5).

Circumstantial evidence, as well as the curious trident device on its front, suggests that no.1 is Persian. The rest is likely to be mostly or entirely Roman, especially the remainder of the mine material.

All the mail seems to be of standard construction in which each ring passes through four others, two in the row above, and two in that below. There is no sign of any other species of ring armour, contra Rep. III 79 and the site description of mail fragment no.7. These other types probably never existed in reality, but find their origin in Victorian misinterpretations of representations of standard mail (for mail construction see Burgess 1953). On the other hand there is no trace of such archaeologically attested exotica as mail with scales attached to the rings (eg from Augsburg and elsewhere, Robinson 1975 173 and plate 484).

In the absence of x-rays the details of construction of the iron mail is obscure. Even the best preserved fragments are too corroded to be certain whether rings were butted or rivetted, and whether stamped rings were used. The Romans certainly used rivetted mail (see mail shirt no.1 for examples). It may be that the bronze edging rings preserved in some quantities at Dura can be taken as a guide, as they do preserve these details. Both stamped and butted bronze rings are represented (eg nos.7, 14 and 22). No rivetted bronze rings were certainly identified. However, this apparent absence of the use of rivetting need not apply to the iron rings. The butted bronze rings are probably all from edge trimming, where mechanical strength is a low priority and so the weaker technique could be used. It may be that the iron rings which made up the great bulk of the same garments were rivetted for superior strength. Some of the better preserved fragments have small spots of copper corrosion in the oxides on the surface of the rings (eg no.6) and these could well betray the presence of copper rivets like those used on the mail shirt from Sutton Hoo (6th/7th century AD; Bruce-Mitford 1978 232-9, fig 181). See also the Roman period mail from Thorsbjerg (Alfs 1941 78).
A considerable variety of ring sizes is seen between the fragments. Links of diameters ranging from 6 to 10mm are preserved. Except for the rings apparently stamped from plate, which have a squarish cross-section, the other bronze links are of wire of approximately circular section. The iron links are insufficiently well preserved to see their sections.

The only shirt whose overall form is completely recovered is the “Persian” shirt (no.1), which was a simple “pullover” in form. It had a slit for the neck, and long sleeves reaching to mid-forearm or wrist. The skirt was short, reaching probably to upper thigh level, and had a short split up each side, presumably to facilitate riding.

Among the presumably or certainly Roman remains, the complete no.2 is too convoluted to restore, while others are too fragmentary to be of much help except for the two sleeves (nos.3 and 5) which indicate that both long and short sleeves were in use (Plate 2.2.D and F). The synagogue paintings, some of which may depict contemporary soldiers, indicate long sleeves. However, it is not certain whether the garments depicted, which are grey, represent mail rather than iron scale.

The use of bronze rings on some, but by no means all the mail shirts was at least partly for embellishment, to produce a gold on silver effect. This is certainly true for the “Persian” shirt (no.1), whose trident device can have no practical function. Such “gold trimming” remained in fashion on both oriental and western armour throughout the medieval period. However, bronze collar, cuff and hem trimming may have had a practical purpose. Collar and cuffs were particularly accessible to the corrosive sweat of the wearer, so it may be that resistant bronze was preferred to iron for these parts.

The use of bronze rings on the Dura mail is not a sign of orientalisation, as such trimming was used by the Roman army in the West (Alfs 1941 78), seen most spectacularly in the “check” of bronze rings in a Roman shirt from Bertoldsheim, Austria (Garbsch 1984; information from M. Bishop). On the other hand, the use of butted links does not appear to be known in the West. In medieval times and later, the use of the weaker butting technique was regarded as an oriental characteristic (Blair 1958 20). Whether this also applies to the classical period is a difficult question, when so little well-preserved Roman mail survives in the East (see mail shirt 1 for parallels) and, outside Dura, no certainly Sassanian mail has yet turned up at all. In form the mail shirts at Dura, so far as can be established, were all simple “pullovers” without additional shoulder reinforcements.

2.2.2 Scale armour

Fragments of scale defences were found in substantial numbers. Bronze was far more common than iron, but as ever the picture is probably massively distorted by differential corrosion. Much of the armour seems to have been only shallowly buried and even the bronze is in a poor state; the survival of a number of twist-fasteners from scale cuirasses which presumably have otherwise completely oxidised away is a dramatic illustration. Iron scale could have been in wider use than bronze. However,
I think this is actually unlikely, especially for the finer sizes of scale needed for shirts rather than horse-armours. It is noticeable that the smallest surviving iron scales are as big as the larger bronze scales, with not much overlap. Iron scales were evidently mainly used for horse-armours and other relatively heavy, coarse defences, with bronze more common for human armour.

There is a relatively limited range of distinct types of scale in use at Dura, although within each type particular examples show a certain amount of variation of size and proportion. It was noted above that there is evidence that some garments contained more than one type of scale.

2.2.3 Construction of scale armour

All the scale garments, from soldiers' shirts to horse armours are constructed in similar ways and so can be discussed together. The only exceptions are the leather cuisses, which are discussed below.

The armours were constructed on a coarse backing cloth (two layers in the case of horse armours) which gave the garment its shape. The fabric used appears to have been linen (horse armour 1; greave liner, limb defence 8).

The scales, which appear always to have been of a single metal and usually of a single size on a given garment, were attached to each other in rows by staples of metal, usually bronze wire or strip, which passed through a vertical pair of holes in each lateral edge. The ends of the staple were bent or hammered over at the back. The rows usually overlapped consistently in one direction; on the horse-armours the overlap was arranged so that each scale covered part of its neighbour to the rear, and the top of the row below, to encourage projectiles coming from the front or above to glance off. Where the overlap changes and becomes irregular there are usually reasons for assuming that this marks a repair.

The completed rows were then attached to the fabric backing, usually by heavy thread. This was sewn through a group of apertures, either a vertical pair or a square of four holes, in the centre of the top of the scale. Several different methods have been identified. Where there are four holes a cross-stitch was used (plate 2.2.AA). Where there is a single pair of holes there are two methods known. In the first (seen on cuisses 3 and 4; see plate 2.2.T, bottom) two separate threads run along the rows, passing one through the top hole and one through the lower hole of each scale, and crossing over for the next. This is presumably designed to keep the scales in place if one of the threads should break.

In the second method (seen on scale cuirasse 17, plate 2.2.M), a single thread loops through the upper hole and over the face of the scale to a lower row, and in so doing loops over a second, thicker cord which runs along the outer face of the row. It is likely that this arrangement improves the resilience of the armour, and also helps to reduce chafing of the fixing threads by minimising their contact with the scale. Scales were also usually carefully prepared to minimise stitching wear caused by friction against sharp edges; holes seem to have been filed if burred, and upper corners of scales.
sometimes cut off. Where there are burrs it is usually a rough field repair with a poorly made scale.

Each row was arranged to overlap the one below by a third to a half the height of the scales, enough to cover the vulnerable stitching (eg plate 2.2.AB, below).

Edging was also highly standardised. Top edging on shirts, and top and side edging on horse-armours consisted of a strip of leather folded over the edge and held on by a running lace of rawhide which transfixed the entire thickness of the garment through leather, fabric and metal. There were special additional holes cut in the relevant part of the edge scales to take it. Where these were top edge scales, the lace hole might be in addition to, or replace entirely, the stitching holes (plate 2.2.AF).

Bottom edging, known with certainty only for horse-armours, was somewhat different. A strip of leather was stitched to the outer face of the cloth backing, running under the rear of the bottom-most row of scales. It projected downwards somewhat, and was clearly mainly intended to prevent the scales chafing against the horse, particularly its legs. Several fragments of this lower skirting are indented with a serrated pattern, which may perhaps have been used only to edge neck-defences as the leather points would chafe the horse's legs (plates 2.2.AE and AG). The edgings of the intact trappers are not serrated.

There are many variants to this basic picture, some more common than others. Minor variants include scales with two side-staples instead of one (miscellaneous scales 16 to 21; plate 2.2.AH), and scales attached to the backing with rawhide instead of thread on Horse Armour 3.

A more important variant is garments with scales stapled at top and bottom as well as laterally (miscellaneous scale 1 to 15; plates 2.2.AH, AJ and AL). These scales are longer and thinner than normal, and are perhaps a variant designed to tackle the main weakness of scale garments; their vulnerability to an upward thrust under the scale rows. Whilst they were stronger defences, there was considerable loss of flexibility. There were also greater difficulties in attaching to a fabric backing. Some show no means of doing so, and so probably lacked a liner. Others have wide looped staples, which may have been a means of improving flexibility, but may also have been for some kind of lacing or stitching to fabric (eg nos 2 and 7; plate 2.2.AH and AL).

It is noteworthy that this type, especially the long, thin examples, is suitable for making tubular shapes (eg breastplates and perhaps sleeves or cuisses), because it is more flexible in the horizontal than the vertical plane.

### 2.2.4 Scale cuirasses

Despite the wealth of material the Dura evidence still does not allow us to reconstruct a complete scale shirt to see how the problems of taking scale rows around the arms and over the shoulders were
overcome. It cannot even be determined whether Durene scale shirts were sleeved. This is the sort of detail which might have been recovered had the objects been properly recorded and not simply collected up and bagged; the standards exhibited on the broadly contemporary Sutton Hoo excavations suggest that this is not entirely unreasonable hindsight. We are left with tantalizing, but unfathomable clues like miscellaneous scale no 56, an unparalleled item perhaps from some kind of shoulderpiece.

The detail such as it is matches evidence from elsewhere in the Empire, most noticeably the recently recovered fragment from Carpow in Scotland of Severan date (Wild 1981). The top edge (neck aperture?) of the piece is bound in leather strip with rawhide stitching in the same technique as that employed universally at Dura. The method of attaching the scales, and the details of the scales themselves are also virtually indistinguishable from Dura examples (eg scale cuirasse 17; plate 2.2.M).

Of particular interest are the numbers of fragments of bronze scale shirts with pairs of chest-plates, which where well enough preserved to show detail are embellished with figural decoration. These are of a type often thought to be cavalry armour, probably for the hippika gymnasia described by Arrian. However, their commonness at Dura (about a score are represented) makes it fairly certain that these were used in the fighting. Was this just an emergency measure, when even parade armour was pressed into service, or were these cuirasses standard fighting equipment? The special circumstances at Dura make it impossible to be sure. However, the evidence does suggest that our usual ideas about these armours may be wrong. They may even have been used by foot soldiers as well as cavalry as a standard bronze scale-shirt type. They could even have been the standard type; there is nothing in the Dura evidence to prove that scale shirts without these plates were worn. Admittedly the identified examples are associated with square scales, but the sample is very small and in the West these plates occur with the long top-and-bottom-stapled scales too (at Hrusica, Yugoslavia; Garbsch 1978 79 no. P18, Taf 35.2). On practical grounds, this type of shirt seems to be a good solution to the problem of making a neck aperture big enough to pull the shirt over the head, but then closing it tightly around the neck. The solid plates may have offered better protection that their thinness and elaboration imply; indeed the repoussé work would add rigidity to the thin plate.

2.2.5 Limb defences

Separate defences for legs, especially greaves, are well attested in the Roman archaeological record. Dura has produced a fragmentary bronze greave of standard Roman form, and what is almost certainly a linen liner for another (limb defences 7 and 8, plate 2.2.W). These are probably cavalry arms at this period.

Cavalryman’s cuisses (thigh-protectors) are not often found in the Roman Empire, or more likely are just not easily identified because they were often made of the same scales as other defences; they
need to be largely complete to be recognised by their shape and attachments. Outside Dura the only authenticated ones known to me are from Newstead, and consist of bronze laminated armour (Curle 1911 156 and plate XXIII). A fragmentary iron cuisse of very similar form was found at Dura, the only piece of this type of armour from the site (limb defence 6; plate 2.2.V). Significantly, it seems to have come from the necropolis and probably antedates the siege; consequently there is no evidence that laminated armour of any kind was used during the fighting. Given that laminated limb defences are known in Asia long before the time of the siege (eg at Ai Khanoum, Afghanistan, Bernard 1980 60-3 and plate XXXVIa; College 1977 plate 27a and fig.40), and apparently long after (Notitia Dignitatum, Or. XI,2; Occ. IX,2), and even seem to be depicted at Dura itself (plate 1.H), I suspect that in fact such armour was present, used by the Persians and possibly the Romans, but was not preserved due to the chances of deposition.

The two remarkable cuisses of leather from Tower 19 are well-known, but misunderstood because examination of the pieces proved beyond reasonable doubt that the published photographs show only the backs of the garments. This has been misleading, as the mass of lacing and the apparently upward overlap of the rows of leather lamellae make these pieces look very unlike other Roman armour, and more like traditional oriental lamellar armour. Their construction from organic materials and the reliance on lacing rather than backing supports their general definition as lamellar armour, but a look at the hitherto unpublished front sides tells a different story. Far from overlapping upwards, the individual elements overlap downwards, and the lower ends are free, producing an appearance far more akin to Roman scale than oriental lamellar armour.

The proposed identification of some garments of conventional scale construction as cuisses (limb defences 3 to 5) raises the likelihood that cuisses were much more commonly worn than is usually thought; scale fragments are usually assumed to belong to shirts. The suggested identifications here were only possible because substantial parts of the garments survived showing elements of their shape and construction, a circumstance generally not prevailing in the West, where loose scales or rows are the rule.

2.2.6 Horse armours (plates 2.2.X to AG).

Dura is still, to date, the only Roman garrison site to produce unequivocal remains of full armour for horses, of the type used by the super-heavy cavalry of the Parthian, Persian and Later Roman Empires. At least three armoured trappers or bardings were found in Tower 19, where they had apparently been in store. The two intact pieces were both incomplete when found, lacking laces and other elements. Trapper 3 had completely disintegrated into rows of scales as the backing had perished, and was beyond reconstruction. Yale holds a fragment of a fourth set, most probably from a horse’s neck defence, which cannot have been from Tower 19 as it has a Yale accession date of 1929 (horse armour 4); its exact provenance is unknown, but it, and the loose iron scales also possibly from trappers (eg miscellaneous scale 22-30), suggest that the Tower 19 pieces were far from being alone at Dura.
Horse armour had a long history before the siege of Dura, and the literary evidence was surveyed by Frank Brown (Rep. VI 444-9). For the extensive literature on the heavy cavalry which used such armour, and which were known as cataphracts or clibanarii, see Coulston 1986 62-6.

The two intact trappers (horse armours 1 and 2; plates 2.2.X to AD) each consist of a pair of large panels of double-thickness linen to which scale rows were sewn. The panels were connected to each other by a wide strip of leather running along the horse’s spine, with a hole for the saddle. The purpose of the strip may have been to prevent chafing of the horse’s spine, but the fact that it was apparently not deemed necessary to carry armour over this area may suggest that the main purpose of the armour was to defend against arrows, rather than against sword-blows which would have been likely to strike the unprotected strip. It is noteworthy that their detailed shapes differ considerably, the iron no.2 offering more enveloping protection than the bronze no.1.

It must be assumed that the trappers were just one element of a more complex suit of horse-armour, also protecting the neck and head of the mount. The ties close to the front edge of the bronze scale trapper 1 are only easily explicable in terms of attachment points for a neck defence (plates 2.2.X and Y, left) which substantially overlapped the leading edge of the barding. The report claims that both bardings were found with a quantity of fragmentary scale defences and loose scales which were interpreted as remains of such accessories. The supposed accessory with barding 3 was made of scales differing from those of its allegedly associated trapper, and is here identified as a pair of cuisses or thigh-guards (limb defences 3 and 4); however, some of the fragments are indeed most probably from neck defences, especially those with serrated leather edging. These are hard to reconcile in form with cuisses, but on the other hand the serrations are likely to have chafed the horse’s legs if they were from trappers. That they are edgings from neck-defences seems the most likely explanation (plates 2.2. AB, AE, and AG).

There was no evidence for such exotica leg protectors for horses, and it seems highly unlikely that any were used, even if they were a practical possibility.

No chamfrons were recovered from the site, but this is assumed to be due to chance, as the horse-armours make little sense without them. Both leather and plate examples are known from the Roman world, both incorporating “tea-strainer” eye protectors. These were also used in the East (Tell Oum Hauran; Garbsch 1978 61 No.N5). It is possible that at Dura chamfrons were made of metal scales on linen like the rest of the horse armour.

Certain details of barding 1 defied explanation at the time of discovery, for example, the two strong plaited loops at the rear edge of the saddle hole, speculated to be suspension points for quiver and sword (Rep. VI 449). Recent work on the Roman saddle (Connolly 1987), which is now seen to be basically the same as the Partho-Sassanian saddle (Herrmann 1989) leads me to suggest a much more plausible explanation for the presence of these loops. It is now known that saddles had four pommels, two jutting out laterally from the front of the saddle over the rider’s thighs, the other pair being on either side of his buttocks. The coincidence in position of the rear pommels, and the loops on the Dura trapper,
is persuasive; I believe that the loops were hooked over them. The purpose of this was presumably to link the saddle, and its harness, to the armour, and may be a way of transmitting some of the load to spreading the weight more evenly: or perhaps the armour tended to ride backwards over the horse’s rump when on the move.

It is noteworthy that the very large iron scales from the site seem to be largely confined to horse armours (eg no.2), although it is possible that some may have been used for human armour, at least for cuisses, if limb defence is correctly identified from its characteristic shape. It may be that iron scales were of limited use for human armour because smaller sizes were needed for flexibility, especially for infantry equipment, and these were not so easy to make in iron; perhaps readily worked bronze was considered adequate for most scale armour. It seems probable that large iron scales found elsewhere, (eg at Carnuntum; RLO II Taf XV, nos.12-4 etc) are from cavalry armour.

2.2.7 Armour at Dura.

Although Dura has produced the only complete scale garments from the Roman empire known so far, it is unfortunate that it has failed to provide answers to some of the key questions, especially about the form of scale shirts, which its well-preserved evidence seemed to hold in prospect.

With regard to the question of unit specificity of armour types, it seems likely that the cuisses were solely for mounted troops, who have less need for mobility of the lower limbs, but great need for defences for the vulnerable thigh (especially if fighting shieldless with the long lance). However, with regard to a possible distinction between scale and mail, no clear division can be made. It is certainly noteworthy that no scale armour was found with the bodies in the tower 19 countermine; the squad of troops trapped there were all clad in mail (unless some were unarmoured). It is further likely that this small squad was drawn from a single unit, and it may be postulated that that unit was uniformly mail-clad, but this is beyond proof.

It was noted above that the apparent commonness of the scale cuirasses with chest-plates raises the possibility that they were general fighting equipment at this period rather than ceremonial pieces, and that there is little reason to assign them solely to cavalry. Whether there was some other strict or broad distinction between legions and auxilia at Dura - assuming both were indeed present - for example with mail clad legionaries and scale-clad auxiliaries, is likewise unknowable. It may be suggested that scale would have been generally more appropriate for cavalry as they were particularly exposed to arrows; scale was probably a better defence than mail against such light projectiles (hence its choice for horse-armours).

The overall pattern of types of armour in use is beyond recovery; Iron mail and scale is underrepresented due to differential corrosion compared with bronze scale. How widely was leather armour used? It is possible that it was as widely used as bronze, at least at Dura, as it would not survive

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outside rare micro-environments like the collapsed floors of Tower 19. Wide use of organic materials for armour in Roman service is an unfashionable idea, but it seems to me quite possible that it was very widespread, especially in the later period; pseudo-scale garments like the Dura cuisses would probably be indistinguishable from metal scale in depictions. In Europe evidence for such armour can only be expected in waterlogged contexts, of which there appear to be few appropriate examples of third century or later date. It may also be worth checking existing collections to see whether individual leather scales lurk unrecognised.

True lamellar armour, distinguished by upward overlapping laced plates, is really absent from the Dura assemblage. The leather cuisses seem to be an adaptation of a lamellar technique designed to resemble scale; the scales fixed top and bottom are a common Roman type bearing a superficial resemblance to lamellar armour. Since it is claimed that true lamellar armour is known from Roman contexts (Robinson 1975 162), the picture at Dura is perhaps one of some very limited Eastern influence on armour, but generally the material belongs to the mainstream of contemporary Roman practice.

It seems fairly clear that segmentate armour was not much used, if at all, by the time of the siege as the only piece found (limb defence 6) was from a context where it could have been deposited in earlier times. There is no sign of lorica segmentata, as would be expected in the mid third century. Such armour certainly had been worn East of the Hellespont; there is proof of this from Pergamum (Conze 1912 327 and fig.122). However, it may never have been very common.

The Roman mail shirts at Dura, so far as can be established, were all simple “pullovers” without additional shoulder reinforcements. Such shirts were standard in the Roman army by the second century (eg, those depicted on the Adamklissi metopes, Robinson 1975 plates 476-9). The same pattern, albeit with long sleeves, was used by the Sassanians.

Greaves were probably only worn by cavalrymen. The greave liner (limb defence 8) is a particularly interesting item, showing that padded garments were worn beneath armour. In the case of scale shirts, the linen backing formed an integral padding. It is not known whether thick undergarments were worn with mail shirts.

Both mail and scale garments show traces of damage and often ham-fisted repairs (although there may be many repairs too good to be detectable). With so many individual components scale armours in particular must have been in constant need of repair, so it is perhaps not surprising to find damaged horse-armours, lacking tie-laces etc, in tower 19 where they are presumed to have been awaiting attention (Rep. VI 439).

A curious detail of the fragmentary trapper 3 is its piercing by a ballista bolt (Rep. VI 439). This is very strange, as artillery is usually assumed to be Roman, and the armour, from its context, was clearly in Roman ownership at the time of deposition. The explanation may simply be that a nervous sentry had shot at a friendly patrol; such accidents are common in war. However, it does raise other interesting possibilities, including the use of captured artillery by the Persians (see part 2.7), or the original
ownership of the trapper. Since both sides used armoured horses, it is feasible that the trapper was captured from the Persians. If so, this would mean that the Sassanians were using armour indistinguishable from that of the Roman defenders (which is certainly the case for mail; see mail shirt 1). In fact, there is as yet no clear evidence that the Sassanians themselves used scale armour; the famous rock carvings show mail. However, it seems that the Parthians had indeed used scale, including scale trappers (Tang-i-Sarvak; Colledge 1977 plate 20a), and it is quite feasible that Persia’s auxiliary contingents also used it.

The possible use of captured equipment by the opposition is a further complication to consider when trying to attribute the various pieces.

Finally, there is the question of the general comparability of the assemblage with those of contemporary Roman Europe. Donald Wright considered Dura to be old-fashioned because of the commonness of mail there, a type of armour which he believed had been largely superseded in Europe by more “modern” scale and segmentate armour (Wright unpub. 63-4). This view is now known to be erroneous, in that both scale and mail appear to have been in wide use in all areas during the early and middle empires, and it is now clear that segmentate body armour (although not limb armour) was a relatively short-lived phenomenon, from the mid-first century to the early third. Consequently, its absence from Dura may be taken to indicate that in armour “fashions”, Dura was fully abreast of the wider imperial trend. Indeed, with the apparent importance of cavalry armour, it may well have been in the forefront of change, as it is probable that many of the developments leading to the heavy cavalry forces of the late empire will have occurred first on the Eastern frontier in just this period.
2.3 Edged weapons (Plates 2.3.A to S)

This section deals with swords and daggers, together with their scabbards. Evidence for scabbards consists mainly of fittings found loose. The pieces represent at least 43 weapons and probably in reality many more; the maximum number, which is probably close to the actual figure, is 70. Time at Yale did not permit a systematic search for and cataloguing of fittings from suspension belts; however, a number were located, and others have been published (in Frisch and Toll 1949; see below), allowing them to be considered in general terms (sections 2.3.6 and 7).

The majority of these pieces are scabbard fittings; scabbard tips (chapes) in iron, bronze, bone or ivory (31 items; plates 2.3.N to S), and scabbard slides in bronze or bone (19 examples; plates 2.3.1 to M). The blades themselves are less well represented. Only 11 whole or fragmentary examples are catalogued (plates 2.3.A to F). A number of separate hilt fittings were also found (8 objects; plates 2.3.G and H).

Among the sword fittings, the preserved proportions of materials used will not, of course, reflect the original ratios. Bronze will be overrepresented in relation iron by virtue of its greater resistance to decay, and perhaps in relation to bone and ivory due to its superior visibility on excavation. It is also worth bearing in mind the possibility of the use of wooden fittings on the Dura scabbards. The all-wood hilt assemblies of blades 2 and 3 are only known from the preservation of wood grain in the corrosion products on the tangs. Use of wood for their chapes and slides might explain the lack of associated metal or bone fittings. Wooden slides appear on some of the scabbards from Nydam (Englehardt 1865 plate VIII nos. 26 and 27). However, caution is needed, as the associations of blade 2 are not certainly known, and it is quite feasible that its fittings were separated during excavation. The same possibility applies to blade 3.

The whole blades and, where they are large enough to be identified, the fragments are mostly of the common Roman two-edged longsword type, the spatha. There is evidence for a range of shapes and sizes of slashing sword in the third century West (e.g. at Künzing; Schönberger and Herrmann 1968 59 Abb 20), including short light blades which may have been called semispathae (Vegetius mil. II,15). However, no such blades were observed in the Dura assemblage. Likewise Dura has produced no recognisable example of the all-iron Ringknauenschwert, a type fairly common in continental Europe from the period of the Marcomannic Wars (Hundt 1952, 1955; Raddatz 1961; Kellner 1966).

Almost all of the chapes (1-29) are of types known or suspected to belong to spathae. Chape 12 was still attached to one when found (blade 1), while disc-chapes such as 14-22 are to be seen on spathae in a number of depictions (on Roman soldiers' tombs see Oldenstein 1976 Abb 13-14). The complete spatha and scabbard from the Khisfine cemetery in Syria had a disc-chape (Trousdale 1975 236 no.51, plates 18d, 19a and b). A parabolic chape like 23-5 was found on the Lyon spatha (Wuilleumier 1950).
fig.1). The same applies to scabbard slides. No examples of _gladius_ with scabbard slides are known to me; they seem to be confined to _spathae_. There is no certain association between any of the slides and the blades from Dura, but a slide identical to no.1 was found on the Lyon weapon, and that on the Khisfine sword was very similar to slide 19. Other weapons represented include a _pugio_ (blade 10) and probably three other daggers (on the basis of scabbard chapes 30 and 31 and hilt fitting 5), a Hellenistic _machaira_ or _kopis_ (blade 11), and two fragments of weapons of unidentified type. The latter include a bronze hilt guard and jade disc-pommel (hilt fittings 6 and 9). The pommel is all that remains of the sword found beside the "Persian" skeleton in the Tower 19 countermine.

2.3.1 Blades (Plates 2.3.A to F)

The complete and fragmentary _spatha_ blades are closely similar to Western weapons (see catalogue for parallels). Surface indications suggest that blade 1 may have been pattern welded, a technique commonly used for the manufacture of Roman swords from the third century AD (Rosenqvist 1968; Ypey 1982), although it is more likely that the blade was fullered (Webster 1982). (For recent work on the metallurgy of Roman swords, see Lang 1988). There is no clue to the structure of the other blades in the absence of X-rays. These might also reveal makers stamps or inlaid marks such as are found on Western examples (Engelhardt 1865 plate VII; Rosenqvist 1968; Keim and Klumbach 1951 37 No.43, Taf. 42). The _spatha_ blades are of lenticular section and range in width from 40mm to 60mm. The three measurable examples (blades 1 to 3) all exhibit the same basic geometry. The middle section of the blade is virtually parallel-edged, but flares slightly towards the shoulders and tapers into a rounded point of parabolic outline. Each has the typical long tang of Roman swords, designed to take not only the grip but a deep guard and large subspherical pommel, traces of which are to be seen on the tangs of blades 2 and 3. Hilt fittings 1-4, 7 and 8 come from these characteristic assemblies, which were used both on the _spatha_ and the shorter _gladius_ (see 2.3.2).

No certain traces of _gladius_ were found at Dura. This short stabbing sword, the traditional sidearm of the legionary, seems to have been gradually going out of use from the second century, as it was progressively replaced by the longer _spatha_, a slashing weapon (Oldenstein 1976 106). Legionaries are depicted with _spathae_ from the time of Severus if not before (Speidel 1976 26-7 and plate 2, 28-9 and plate 3, 130; Oldenstein 1976 Abb.13-14).

The fact that only one reasonably certain fragment of a _pugio_ blade (blade 10) was found at Dura may suggest that these weapons were also going out of use by the mid-third century. No examples of the characteristic bronze-framed scabbards were found either. These weapons were still in circulation in the West at about this time (Schonberger and Herrmann 1968; Herrmann 1969), and there is some indication that variants were appearing. For example, variants with a chape do exist (eg at Mainhardt, _ORLB_ Nr.43 11 No.1 Abb.3, Nr.7). It is possible that the small chapes nos. 30 and 31 are from _pugiones_, but this is quite uncertain and they could be plain daggers not of military pattern. Hilt fitting 5 is from a wide but thin-bladed weapon which may have been a variant type of _pugio_.

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Blade 11 is anomalous within the assemblage, as it is the remains of a single-edged slashing sword resembling a large Gurka kuhkri, of a type known as a machaira or kopis. These weapons were in widespread use during the Hellenistic period, but were obsolete by the first century AD. The presence of an example in the Dura collection is explicable in a number of ways. It may represent a local survival of the type, an heirloom or old weapon from the city armoury (survival of weapons in the latter circumstances is quite possible, as parallel cases of arms surviving for centuries in storage are known from medieval Europe). The most likely explanation is that it is residual, or was actually found in some pre-siege context; it has no recorded provenance. It cannot come from the necropolis, since at the time of the discovery of the weapon, no excavation had yet taken place there.

The spatha, then, was the dominant sword type in use at Dura at the time of the siege. It was a slashing weapon, but was very unlike later medieval broadswords. The latter were usually well balanced, with a heavy metal pommel and a carefully tapering blade. They were generally not particularly heavy, and so could be effectively manoeuvred by hand and wrist. The spatha had very different characteristics. It lacked a heavy pommel, while the blade was of fairly constant section except for the last 150mm or so. The result was an unbalanced weapon which could not very easily be wielded about the wrist without the risk of injury to the arm. It was probably wielded at arm’s length for the most part, like a one-handed axe. This is especially true of the Dura examples, which in cross section are amongst the most massive spathae known. Precise weights are unavailable, but the blades are two or three times as massive as the average medieval broadsword. This was not because the Romans were incapable of making thinner blades with adequate strength; much lighter blades are known elsewhere. There are signs that the blades were deliberately made as heavy as possible, and that lack of balance, with a lot of mass close to the tip, was a conscious decision. Blades 1 and 2 are not only very heavy, but long as well, a combination of features which leads me to believe that these are primarily cavalry weapons, designed for fighting with heavily armoured opponents, such as Sassanian clibanarii. In such cavalry warfare delicate fencing was redundant as being on horseback hindered free movement (even though it is now clear that contemporary saddles, both Roman and Sassanian, provided a very firm seat, despite the absence of stirrups; Connolly 1987; Herrmann 1989). The long, massive spatha was the ideal weapon, allowing maximum reach and, when swung at arm’s length, maximum impetus behind the blow. Then, even if it did not cleave through the opponent’s armour, the blade may well have had sufficient kinetic energy to cause severe injury or to knock him off his mount.

2.3.2 Hilt fittings (Plates 2.3.G and H)

The eight recognisable hilt fittings are also mainly from the characteristic tripartite hilt assemblies of either gladii or spathae; the surviving identifiable blades and fragments are all of the latter type, and as there is no evidence at Dura for gladii, all the Roman hilt fittings are presumed to belong to spathae. While these assemblies all consisted of the same structural elements, the materials used varied from sword to sword. Blades 2 and 3 had hilts entirely of wood. Fittings 1-4 show that a number
of swords had metal plates to reinforce the vulnerable undersides of the guards, which in these cases were probably of wood. The plates have pierced decoration around the edge. The Dura evidence suggests that at this period most spatha hilt assemblies were of wooden components rather than the more familiar bone, and that there apparent rarity in the record is a result of their poor survival potential (although many examples are known from waterlogged contexts at Vindonissa and elsewhere; eg Fellmann 1966).

A single grip from a spatha has been recognised (fitting 7). It is of bone, of sub-square section with a pattern of tear-drop shaped projections on its surface for decoration and grip, very different from the faceted forms of the first century AD.

The crystal pommel (hilt fitting 8) is almost certainly from a Roman spatha, as it was found amidst the bodies of Roman soldiers in the tower 19 countermine (Rep. VI 195, 204), and it has the characteristic onion shape of Roman hilts. Whether it came from one of the known blades, and if so from which, is unclear (see the discussion in the catalogue). However, pommels of such showy materials are not known in the West. They do appear outside the empire, in central and east Asia (eg Trousdale 1975 104, 111 and fig.91), albeit of discoidal form (see also the jade disk pommel from the mine, hilt fitting 9). The crystal is therefore perhaps from a spatha showing some oriental influence.

The bone grip and the crystal pommel show how ornate the weapons could be. With the exception of the latter, all the above details of hilt construction would be quite at home on spathae from European sites, and suggest that the variety of styles at Dura was as extensive as that in the West, if not greater.

There remain the fittings which do not belong to spathae. Of these, the most important is the jade disc pommel (hilt fitting 9). It is fairly certain that this is from a weapon of oriental type, as it was found beside the so-called Persian skeleton in the Tower 19 mine, with the fragments of a longsword too corroded to be recovered (Rep. VI 194), and its only parallels are Asian (Trousdale 1975 104, 111 and fig 91). Whether it was Sassanian in the strict sense is unknown, but there is at least one Sassanian relief at Bishapur which may portray such a hilt (Herrmann 1981, plate 5). The jade itself was certainly imported from the Far East, from Chinese Turkestan (Rep. VI 194).

The bone guard (fitting 5) has already been discussed. It is from a dagger, possibly a pugio variant. The curious bronze hilt guard with back-turned quillons (fitting 6) is more problematical, not least because it is in Damascus and so is only known to me through a photograph. It was made to take a blade of 60mm width but unrecorded thickness, and so could be from either a sword or a dagger. Its swept quillons vaguely suggest a weapon like the much later scimitar, but the resemblance may be superficial.

2.3.3 Scabbards and scabbard fittings (Plates 2.3.B and I to S)

No intact sword scabbards were found at Dura. However, blades 1 and 2 had been sheathed at burial
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and traces of their scabbards survive. In the case of blade 2, only the wood of the sheath itself is to be seen, but blade 1 also had a bone chape (chape 12) attached when found. None of the other scabbard fittings is associated with any of the recovered blades.

The scabbard fittings consist of protective tips (chapes) and bridge-mounts, more commonly called scabbard slides, through which passed the suspension belt. These components were of bone, ivory, and bronze. Some chapes were of iron. The existence of wooden versions is also likely. This method of attachment seems to have come into use in the Roman Empire in the second century AD (on this see Waurick 1989, especially 51), displacing the earlier system of metal rings attached to a bronze frame around the sides of the scabbard used on gladii (Ulbert 1969b) and early spathae (Berciu 1981 plate 62).

It appears on representations of Roman soldiers from the later second century (Oldenstein 1976 104, 228), although the earliest depictions of scabbard slides on a Roman monument known to me are on the base of Trajan’s Column, probably representing captured Sarmatian or Dacian arms (Trousdale 1975 fig. 88).

The scabbard slide was attached to the front of the sheath, and the belt was passed through it. This meant that the sword was hung between the body and the belt, helping to reduce the load placed on the slide itself. The belt was not a waist belt but a baldric (balteus), fittings for which are known (section 2.3.6. Terentius and his men are depicted wearing such baldrics; plate 1.E). It was slung over the right shoulder, so that the sword hung on the left side. The baldric allowed the weapon to be slung quite high, so that the long blade did not trip the wearer. It normally hung vertically with the pommel in front of the left armpit, but the position of the slide, often not far above the centre of gravity, allowed it to be readily swung forwards for drawing and sheathing.

Relatively little is known about the structure of the sheath itself, although what evidence there is suggests that it was usually made of wood (traces on blades 1-4, 6). A sword with a scabbard of solid ivory is known from a cemetery site in Syria (Trousdale 1975 236 No. 5.1, plates 18d and 19a-b), but nothing like it was found at Dura. Only sword 2 is well enough preserved to make it possible to reconstruct the sheath (plate 2.4.B). The basic structure seems to have consisted of a thin lath of knotty wood on each face of the blade. How the laths were held together is uncertain, but the answer may lie in the traces of textile found adhering to the surface of the wood at a number of points. It may be that the sheathed sword had been wrapped in textile, eg a cloak, at burial. However, the threads in the cloth share a consistent alignment, so it is suggested that the sheath was made in the following manner. Firstly, the wooden laths were cut and bent to shape and positioned against the greased surfaces of the blade. The whole was then wrapped in a spiral strip of glue-soaked cloth which, when dry, would produce a strong and light scabbard. The closest parallel for this structure known to me is on an early spatha from Romania, which also has a wood-cored scabbard wrapped in textile, but the structure is more complex as it involves a bronze frame and leather binding (Berciu 1981 162).

Other scabbards had different structures. At least one chape still contains the end of a leather-bound sheath (chape 15). Representations from elsewhere suggest that some kind of light edge binding was used, perhaps of bronze channelling. A median spine is also often to be seen (chapes 1 to 7, 9, 10, 13,
Evidence from the late Roman period in Denmark shows that at least in Europe scabbards could be of plain, presumably polished wood; the longitudinal strips were carved integrally (Englehardt 1869 Taf.16 and plate 6, nos.10 and 13). Similar pieces are likely at Dura. Slide 18 has a groove down the back to accommodate a median ridge, proving that they were present on Scabbards at Dura too. No evidence was found for metal edge-bindings at Dura, so it may be assumed that they were no longer in use.

2.3.4 Scabbard chapes (Plates 2.3.N to S)

The chape was attached, usually by rivetting, to the tip of the scabbard. Except for some obscured by corrosion or only partially preserved, all chapes still possess rivets, empty rivet holes or decorative apertures through which rivets could be passed (as seen on examples from Denmark, Englehardt 1869 Taf.9 nos.203, 208). Glue may also have been used, while bronze chapes could be securely attached without recourse to either means. Provided that they were made to fit tightly, they could be annealed, slipped into position and hammered, simultaneously hardening the metal and giving them a firm purchase.

The variety in the size of the aperture in the chape to take the blade reflects the shape of the tip of the blade rather than its overall dimensions, so that a small chape does not necessarily belong to a short, light blade. There are insufficient known associations between blades and chapes to make such statements.

The three basic types of chape preserved at Dura, the peltate (1-13), discoidal (14-22) and parabolic forms (23-25) are all common in the West. However, the commonest of all the European types is completely absent. This is the bone box-chape, a squarish form which flares slightly towards the bottom. It usually has median and edge ridges and peltate apertures (Oldenstein 1976 Taf. 25-27). The closest example at Dura is the iron and bronze chape 29. There seem to be enough chapes from the site for the absence of this form to be more than chance. Seven of the 29 spatha chapes are of bone or ivory, proving that conditions were conducive to their survival, so it seems probable that the box type was not in use at Dura at the time of the siege.

At least one of the iron disc-chapes from Dura has bronze inlaid decoration on its surface (chape 14), like examples from Germany (Hundt 1953). The appearance of such chapes at Dura is interesting as it was thought that they were largely confined to Germany.

The original proportions of chapes of bone, ivory, bronze and iron used cannot be recovered, but it is reasonable to suggest that there was a far higher proportion of iron examples than now appears to be the case. The possibility of the use of wood for making chapes was raised in 2.3.3.
2.3.5 Scabbard slides (Plates 2.3.I to M)

Wood may have been used for the manufacture of scabbard slides, but the surviving examples from Dura are of bronze and bone. Iron slides are well known from third century contexts in Germany (Hundt 1966; Oldenstein 1976 102 Taf.15 Nos. 66-100), and were found in the Danish bog-deposits (Englehardt 1869 Taf.6 Nr.10; Taf.7 Nr.35-37). These were thought to be a type specific to Germany (Oldenstein 1976 106-8), but at least three examples have been found in Britain (at Canterbury, Webster 1982 fig.100d; and Caerleon, Nash-Williams 1930 74 fig.24f; and now Vindolanda, Jackson 1985 132 and fig 47, no.5). Their apparent absence from Dura may be due to localisation of their distribution to Europe. However, since iron chapes are common enough at the site, it is suspected that they were in fact present, but corrosion destroyed many and rendered any survivors fragmentary and hard to identify. It is possible that some await identification in the boxes of miscellaneous iron fragments at Yale.

The most common Durene slide type, a bronze form represented by slides 1-11, is widely known in the West (Oldenstein 1976 nos.34,40-44 etc.; Nash-Williams 1932 fig.36 nos.2-11; Wuilleumier 1950 fig.2), but Dura lacks the other common European type which has a ring terminal (Oldenstein 1976 nos.55-57; Webster 1971 nos. 82-3). It is difficult to be certain that the assemblage is large enough to make it statistically probable that the apparent absence of this type is not due to the chances of preservation. However, the Dura assemblage resembles the European in having a few basic types and some more individualistic pieces.

The attachment of the slide to the sheath is problematical. The forces which it had to resist did not tend to pull it away from the blade; being on the outside, its main function was to stop the baldric sliding up the scabbard. For this reason, slides 1-10 had fixing pins which penetrated the wood of the scabbard. (For an iron example in situ on a scabbard from Nydam cf. Hundt 1960 Abb.7). On European bronze examples these studs were usually just integral projections of the basic casting (Oldenstein 1976 105 and Taf 12-14). The Dura examples had stronger iron pins set in them, but it seems unlikely that these alone were sufficiently strong to hold the weight of the weapon, especially if the wood of the scabbard split along the grain. It seems very likely that some kind of additional binding was required. On the common bronze examples such as nos.1 to 10 this would run over the upper terminal and over the lower end between the bridge and the bottom terminal. This is suggested in Oldenstein’s reconstruction (1976 Abb.11-12). Traces of iron corrosion at the base of the upper terminal of slide 7 suggests that in that particular case iron wire was used. Binding of the lower end in the manner described would also explain the way in which slides 2-10 were broken; wrenching off the baldric (perhaps during combat or, more likely, during the looting of bodies) would snap the slide at its weakest point, just above or below the lower end of the bridge, leaving the lower terminal still attached to the scabbard.

Slides 14-19 lack securing pins. Nos.15 and 18 can only have been affixed by some kind of binding around the scabbard, whilst 17 and 19 have special apertures for cords or wires. The latter pair of bone slides also have projecting tongues at top and bottom, which presumably were somehow slipped into the structure of the scabbard itself. It has been suggested that they were slipped under a leather
covering to the sheath (Trousdale 1975), or that they were glued to the wood (Oldenstein 1976 101), but it is equally likely that they were secured under the median ridge, however that was attached to the scabbard (see the example worn on the scabbards of the Tetrarchs in Venice; they are identical to no.17. Delbrueck 1932 Taf 31-2). This method of fixing must have been strong, as slide 16 had no apertures for cords, but relied on the tongues alone. No.13 had both tongues and iron locating pins.

2.3.6 Baldric fittings (Plate 2.3.T)

The original research design, probably erroneously, did not include an exhaustive search for, and cataloguing of, sword-belt fittings. However, a number have been published and several others were identified at Yale. It is at least clear from the Terentius mural that the broad, over-shoulder swordbelt or baldric was in use at Dura, as in the West in the third century. A number of the characteristic fasteners, consisting of a broad metal plate with a stout loop attached to the back, were recovered from the site (see below).

No intact belt was identified at Dura, but the type is well understood from other finds (especially Englehardt's Vimose find; Oldenstein 1976 Abb.10), and depictions. The fasteners were worn on the front of the broad belt, on the chest, and the belt passed over the right shoulder, and down across the back. It narrowed considerably, and passed through the scabbard slide and up to the rear of the fastener, where it was apparently tied. How usual it was for the belt to be wrapped around the scabbard as suggested by Oldenstein (on the basis of a single archaeological find and subsequent medieval practice, 1976 228 and Abb.11 and 12; here followed, plate 2.3.B), is unclear. This has the advantage of spreading the load of the sword onto a greater length of the belt.

In fact the depictional evidence seems to show that it was far more normal for the belt to pass through the slide without wrapping round the scabbard (eg, the tomb of Aurelius Suro, Oldenstein 1976 Abb.14,2; a Persian depiction of a Roman emperor from Bishapur, Herrmann 1977 93); and a late Roman statue from Ravenna, Delbrueck 1932 Taf.50-51). Sassanian reliefs suggest that the same was true for their sword belts too (Herrmann 1981, plate V). In fact, the scabbard slide was widely used across Asia and depictions do not show the belt wrapping around the scabbard, which would partly defeat the object of the slide, ie allowing the sword to be moved along the belt (Trousdale 1975).

The Dura examples of baldric fasteners (not in the catalogue; the following numbers are those of Frisch and Toll 1949) include a splendid silver openwork piece (1938.4498; Frisch and Toll 1949 2 and plate VII), and several plainer bronze items, probably from baldrics, some of which are published (Frisch and Toll 1949, pierced bronzes 1 to 8). Nos. 1 to 3 consist of trumpet-form openwork clearly of Celtic inspiration, and very interesting to see so far East. Parallels exist from Böhming and Zugmantel (Oldenstein 1976, Nr 902 and 903). The openwork nos. 5 and 6, with their peltate designs, are close to another piece from Zugmantel (Oldenstein 1976 Nr.1134).
Three unpublished examples of a different type were found at Yale (nos. 1938.3427; 3433 and 3425); these clearly represent model shields very like the oval plank shields nos. 1 to 5, complete with bosses. No exact parallels for these are forthcoming, but circular ones of very similar appearance are known from the West (eg Niederbieber, Oldenstein 1976, nr 1118).

No. 4 exhibits eight-fold symmetry in a pattern reminiscent of that seen on the back of shield 2, (plate 2.4.Z) and may conceivably reflect a shield painting.

The heavy strap terminals seen on this type of baldric were not noted in the assemblage, but it is likely that a search would produce some.

2.3.7 Swords at Dura

The Dura sword material is dominated by remains from long slashing swords, or spathae. There is no sign at all of the earlier gladius, which in the West was obsolete by the third century. The Dura evidence is consistent with its disappearance too. The apparent presence of a single pugio fragment is again not surprising; they were still known, but apparently also obsolescent, in contemporary Europe.

The only items not readily identifiable as Roman are the kopis (blade 11), and the jade pommel. The former is a relic of earlier times, and may be dismissed as an heirloom or residual. The latter, coming from the sword associated with the "Persian" skeleton, may be presumed to belong to the sword of one of the attackers. It is a great shame that none of the blade with which it was found can be identified, but as it is little more can be said about this small representative of the edged weapons of the besiegers.

Considering the rest as an essentially Roman assemblage, it fits very well with what is known of the contemporary comparable archaeology of the Rhine, Danube and British limites. The differences are subtle, and in detail. Others may be more apparent than real; the perceived absence of Ringknaufschwerter could be due to the poor preservation of much of the iron. The known swords appear to be notably heavy, although in the absence of weight and other data, it is hard to make precise comparisons. Nevertheless, it certainly appears that some of the blades are extraordinarily massive even by Roman standards, probably to make them effective against the heavily armoured Sassanian cavalry. Some are little more than sharpened iron clubs.

There are a number of fairly splendid items such as the silver baldric mount discussed above, and especially the crystal pommel (hilt fitting 8). The latter is Roman in shape, but without close parallel, and could represent an orientalising feature (perhaps copying semi-precious stone mountings like the jade piece), but Roman soldiers were quite capable of flamboyance on their own initiative. In fact, it is hard to identify much that is unequivocally orientalising in this assemblage.
Scabbard fittings show some interesting differences. The chapes and slides would almost all excite no comment if found in Europe, and so are part of the standard Roman milieu. However, there are some interesting absences of forms seen in the West, notably bone box chapes, ring-topped bronze slides, and iron slides. The latter is explicable in terms of differential preservation, or failure to identify badly corroded fragments, but the other cases are more interesting. Could it be that they were not in fashion in the East? Or that they were unit-specific, or at least tended to be associated with certain units or types of unit, and that these were absent from the site? Unfortunately even the Dura assemblage proves not to be not large enough to be certain that their absence is real rather than apparent, so these questions can be raised, but not answered.

The baldric mounts, especially those exhibiting “trumpet” decoration of Western, Celtic origin have excited comment (eg Oldenstein 1976 77). It has been suggested that these, and many of the other metal fittings so similar to their Western counterparts, were mostly imported, with some local copying (Frisch and Toll 1949 1). However, I find the idea that Syria relied on imports from Europe highly implausible; their presence is far more likely to be explained in terms of Western troops bringing their fashions to the East on expeditions (of which there were many in the third century; see part 3.3.7), resulting in local copying. In this way fashions would quickly have spread throughout the provincial armies. Their perceived rarity in the East, and consequent exotic appearance, is discussed further in part 3.3.9.

The archaeological evidence shows that swords at Dura were carried on baldrics. Whether all swords were carried in this way is not certain; contemporary Sassanian, Palmyrene and Hatrene practice was for suspension from a waistbelt (Trousdale 1975 figs 65 to 73; Safar and Mustafa, 1974), which makes good sense for a cavalryman. Indeed it seems that the Roman baldric with scabbard slide was adapted from the earlier waistbelt encountered on the Eastern, and Danubian frontiers (for a general survey see Trousdale 1975, esp. 58), and the waist-mounted sword was back in vogue among the Romans in the fourth century (eg the Venice Tetrarchs; Delbrueck 1932 Taf 47; the Stilicho diptych, Trousdale 1975 fig.89). It is possible that Roman cavalrymen at Dura were already using waistbelts, especially if they were of oriental origin (eg Palmyrenes), although no evidence for such belts has yet been identified.

Perhaps the most interesting aspect of the Dura material is the emphasis on the use of wood, for hilt assemblies and perhaps for scabbard fittings; this is something certainly attested in the West but it is often forgotten due to poor survival and the plethora of bone and metal pieces.

In summary, the swords from Dura comprise a good Roman assemblage with a few exotica, perhaps somewhat adapted to local conditions in the great weight of some of the blades. However, this will only become clear when specialist work can be carried out on the iron fragments, when this remarkable material may reveal its full potential.
2.4. Shields (plates 2.4.A to AS).

Cumont's publication, and the Yale archives and collection contain a substantial body of data on shields, including a number of largely complete shield-boards with the only intact examples of Roman shield painting so far discovered.

There is a total of twenty-one recorded shield bosses from the site, six fragments of iron reinforcing bars from the backs of shields and at least twenty-four whole or fragmentary shield boards. The collection thus represents up to about fifty different shields. No shield was found absolutely complete; all the intact boards lacked bosses, and the oval plank shields also lacked other metal fittings.

2.4.1 Shield types

At least four different types of shield are represented archaeologically at Dura. The most common is the large broad oval shield, with its longer axis vertical, constructed of thin planks or laths of wood. It was wielded by a single grip in the centre covered by a metal boss. At least thirteen of these boards are represented (nos. 1-8 and 10-14) and no. 9 was very probably constructed in the same way. It will be argued that almost all of the bosses come from this type as well.

The second type is the rectangular, or rather semicylindrical plywood shield or scutum. The complete board found in Tower 19 is justly one of the most famous finds from the city (no. 15, plates 2.4.AK to AM). Another, fragmentary one was found by Cumont (1926 262; no. 16) and an unpublished fragment of a third survives at Yale (no. 17; plate 2.4.AN). Like the oval shield, the scutum was wielded by a single handle behind the central metal boss, at least one example of which was found (boss 21; plate 2.4.Q).

The third form is more difficult to define, as neither of the two examples recorded can now be located (nos. 19 and 20, plate 2.4.AO). The shield board was an oval, but according to the orientation of the figured decoration on the face, the long axis was horizontal. It is not known how large they were. The sketches preserved at Yale show that this type lacked a central boss, although a system of (rivet ?) holes around the centre indicates that these, too, were held by a single grip. Shield 19 was of plywood, again distinguishing it from other oval shields.

The last type belongs to a quite different tradition of shield construction, consisting of rough wooden
sticks woven through a single sheet of rawhide. Three largely complete examples of these basically rectangular shields were recovered along with fragments of a fourth (nos.21-24, plates 2.4, AP and AQ).

Many fragments of shields mentioned in the various Reports cannot now be traced in the Yale collections or archive. Consequently, the information recorded about them cannot now be verified, and so the following discussion generally includes only what can be shown from the surviving objects.

Among the most important of the missing discoveries are the fragments of painted shields found in room F of the Palmyrene Gate (Rep. II 7) and in the Tower of the Palmyrene Gods (Tower 1; Rep. II 11). These were described as follows:

"Apparently they were made of three pieces of light wood (about 0.01m thick) covered on both sides with leather. One of the side boards measured 0.80m on the outer edge, 1.03m in the center, and 0.15m wide, the ends rounding up at the top and bottom. Fragments of the centre board, 0.16m wide, seemed to place the total width at about half a meter. Fragments from the edge showed the leather folded over to run beneath the shield in some places. Other fragments showed the leather covering of both sides linked with small bands of leather 0.02m or 0.03m wide running over the edge. The threads of wool which bound the junction were still in place. Fragments of leather showed that one of the shields was brilliantly adorned with bands of blue, yellow, and red, 0.03m to 0.05m wide, separated by narrow bands of black, the decoration diversified in one part with a checkerboard pattern of bright yellow and red, the squares made about 0.01m square." (Rep. II 72)

These are quite clearly fragments of oval plank shields of the same general dimensions as those found in later seasons (shields 1 to 5 etc.). It is possible that some of these fragments are those here called shield 10, but this identification cannot be proved.

"The remains of a wooden shield covered with painted parchment" were found in Tower 15 in the 1930-31 season (Rep. IV 10). Fragmentary shields 11, 12 and 17 are all in a box labelled "shield fragments, 1930-31 season". Some or all of them may be equated with the published note, but again certainty is impossible.

The Temple of Zeus Kyrios (Blocks M8 and N7) produced "fragments of a wooden shield, the design representing part of a circular geometric decoration around the boss" (Rep. VII/VIII 305). The survival of five complete oval plank boards (shields 1 to 5) buried in the embankment may
overemphasise the type through this single fortuitous discovery, but given the fact that so many of the fragments clearly belong to the same form it is likely that this type did indeed predominate. The existence of the little-understood bossless ovals (nos. 19 and 20) demonstrates that unfamiliar types were in use.

Depictions of shields at Dura show a variety of forms, but one must be aware of the inherent doubts surrounding such evidence (See section 1.15). The clearest are those from the synagogue, where both large ovals and smaller, roughly hexagonal shields are seen (plate 1.G). In depictions, gods are represented usually with oval shields or small circular targes (eg the relief of Asadu, Rep. VI plate XXX,1; the dromedary god from the Temple of Adonis, Rep. VII/VIII plate XXXI,2). The latter type is often depicted in Palmyrene art on representations of horsemen or camel riders in local dress (Colledge 1976, plates 27, 37, 44, 129 and 143). None of these small targes was found at Dura, but the bossless ovals (shields 19 and 20) could be romanised versions (see 2.4.10).

2.4.2 Boss types (plates 2.4.A to R).

Of the twenty-one known bosses, fourteen are bronze and seven iron. The latter is probably greatly underrepresented due to differential rates of preservation. The original ratio of bronze to iron is not recoverable. That many, perhaps all of the bronze bosses certainly or probably came from the Tower 19 countermine proves that bronze bosses were not considered too flimsy for combat and were not confined to parade shields; although in the desperate conditions of a siege, all available equipment may well have been used.

Most of the bosses are circular or exhibit radial symmetry (as nos.15 to 18). Only one, now lost, had a rectangular flange (no.21). It is usually assumed that the latter type belongs to the rectangular scutum, and round bosses to the lighter, usually oval auxiliary shield. There may have been exceptions to this, but as a general rule it seems to hold well. The arrangement of decoration on the painted shields shows that it was true at Dura. The scutum (shield 15) has space for a rectangular boss, the oval shields (nos.1 and 2) for circular ones.

The round bosses share the same basic form, with a roughly hemispherical bowl large enough to clear the fist holding the grip within. The flange around it is broad, to spread the stress of the (usually) four fixing rivets which pierced it to hold it to the board. Within this general pattern there is considerable variation, of shape and metal (iron, or copper alloy varying from a red metal to typical Roman yellow brass, probably with a high zinc content). The profile of the bowl is in several cases quite low, especially among the iron ones, presumably due to the difficulties of forging a small, deep bowl. Others are actually ballooned outwards from the base (eg nos.15 and 16, plates 2.4.M and N). Boss 20 had a peculiar cylindrical projection of unknown function at its apex (plate 2.4.Q).
The complete bosses are basically circular in plan, except no.21 and no.3 which is distinctly ovoid (plates 2.4.C and D). Most have simple annular flanges of constant width, but a few have their edges worked to produce an eight-pointed star in outline (nos.15 to 18, plates 2.4.M to P).

The bosses were presumably made by spinning, except the ovoid no.3 which bears the marks of a planishing hammer on its interior. This shows that it was made by sinking into a former rather than raising over a stake (plate 2.4.R).

Surface embellishment is confined to inscribed concentric rings, usually in pairs, except on boss 2 which has knife-cuts around the edges (plates 2.4.A and B), and the small raised bosses around the points and edges of the star-shaped examples.

Many of the bosses at Yale lack provenances. On the other hand, the report of the excavation of the Tower 19 countermine shows clearly that many bosses were found there (Rep. VI 194-5, 197, 204, figs 16-18). Except for boss 21, there is no evidence that any bosses were found anywhere else, and those bosses which are provenanced come from the right area (L7-W; bosses 1,3,5,7,8,15,17 and 20). Nos.11 and 19 are explicitly stated to have come from the mine. It seems probable that all the bosses except no.21 are from the mine.

**2.4.3 Construction of oval plank shield boards (plate 2.4.AR).**

The following summary derives from inspection of the surviving examples, which show a degree of variability. However, all share a common basic assembly.

The shield board is made of thin planks of wood, identified as Poplar (*Populus euphratica*). These vary considerably in width, are arranged vertically and glued edge-to-edge. The joints were very carefully planed to leave no gaps (plate 2.4.AR, 1).

In outline the boards are broad ovals, on average around 1.05m high and about 0.90m wide. They were apparently slightly convex, to a degree which cannot now be measured due to post-depositional distortion, but the centre probably stood about 100mm away from the plane of the rim. This geometry was presumably obtained by building up the board over a former. The thickness of the wood is carefully and systematically varied over the surface, from a maximum of 7-9mm at the centre tapering to 3-5mm around the edges. This is so consistent that it must have been at least finished after the board was assembled. However, some preliminary thinning of the timbers will have helped them take up the appropriate curvature, which could have been set by steaming.

The board was presumably given this distinct convexity for the solid practical reason that a flat board of the same weight and thickness as a domed one is far less rigid and much easier to break.
Marks left by the tools used to work the surface of the wood include shallow facets from a very sharp axe or adze, and chatter-marks from a plane or draw-knife (plates 2.4.AE, bottom). The oval outline will have been finished after completion of the shield board, when on a number of examples the edges were bevelled off.

It is clear that the aperture, or rather apertures for the central grip were cut after the board was completed. Two holes were cut, the lower usually a shallow trapezoid in outline, the upper a deeper semicircle to allow room for the knuckles and the back of the hand (eg plates 2.4.W and AR,2). This left a bridge of timber between, which formed the core of the grip. As this handle was horizontal, at right angles to the grain, it was far too weak to serve alone. A sturdy iron grip assembly was added (section 2.4.4).

All the preserved shields and fragments have remains of surface coverings, and most have at least traces of painting. Two distinct surface covering techniques were used.

The first (seen on, for example, shields 6,7,9,10,12; plate 2.4.AR,3 to 4) consisted of a facing of very thin animal skin, so fine that it was described as parchment (Cumont 1926 262; Rep. VI 457). Its precise nature and the species used are unknown; because of the fragmentary nature of the evidence it is not even clear if a single skin was enough to cover the whole shield (in which case the species would probably be calf, as specified for scuta by Polybius; VI,23,3). It was probably applied wet and shrunk on to fit the curved surface.

Whatever the nature of the skin used, it was glued to both surfaces. Between wood and hide was a thick layer of glue, into which was laid a pale, fibrous material, aligned roughly across the grain of the planks. The identity of this fibre is not established, but it is thought to be shredded tendon, a material of high tensile strength and elasticity used for making bows. The purpose of this is fairly clear. Unlike plywood shields, plank boards are prone to splitting along the grain. A heavy layer of high-tensile fibre on each face serves as a powerful split retardant.

All the boards except the fragmentary no.13 have stitching holes around the edge, 5-15mm from the rim and 10-20mm apart. Two twine threads ran through each hole, crossing over and running on opposite surfaces (plate 2.4.AJ, top and AR,4). It is not certain whether in some cases the stitching simply secured the edges of the skin facings. In at least some, if not all, the stitching fixed a strip of leather, 20-30mm wide, around the rim. None of these now survive in situ, but were observed on site (Rep. II 72). The edge of the wood needed a wrap-over binding as it was vulnerable to chipping and splintering from casual knocks and abrasions. However, this technique would not have significantly enhanced resistance to a deliberate blow on the edge of the shield.

The second method of facing (seen on shields 1-5,8,11 and 13) did not employ a skin covering. In most, perhaps all cases the surfaces again had their layer of fibre in a glue matrix, which, once set, was coated with a white plaster-like substance identified as gesso (Rep. VI 368). This treatment sealed the surface of the wood and presumably hid the plank joints, giving a smooth unbroken surface for painting.
The gessoed boards had the same stitching holes for a leather edging, which was sometimes added before the gesso and paint (board no.4) and sometimes after (board no.2).

A variant of the second technique exists, involving a layer of fabric glued to the surface, to which gesso was applied (shields 13 and 14). The fabric presumably served the same purpose as the fibre layer, as well as providing a better surface for the gesso.

The painted decoration is discussed in part 2.4.9.

2.4.4 Iron reinforcing bars/grips from plank shields (plates 2.4.S to U).

As mentioned above, the wooden grip was too weak to serve alone. It is quite clear from a number of the oval plank shields that they had had a strip of iron right across the shield, running along the short axis and along the wooden grip. None was found in situ, but the rivet holes for them were visible on shields 1 to 4, usually four on each side of the centre, about 100-150mm apart. This strip must have been on the back of the shield, because if it was in the front it would interfere with fixing of the boss and obscure the painting. A number of pieces of iron are undoubtedly fragments of these strips which served the double function of transverse reinforcement to the structure as a whole and stout grip (nos.1 to 6). The whole object can be reconstructed as an iron bar of roughly rectangular section, spanning the whole rear face of the shield, held on by eight widely spaced rivets, probably with broad heads to spread the load. In the centre, where the bar ran along the wooden grip core, the bar was flattened out on each side, forming a pair of "wings" which were bent forwards to enclose the wood. The actual grip, then, was of iron and was fixed to the board in eight separate places making for a rugged structure (plate 2.4.AR, 5-6, 12-13).

2.4.5 Attachment of bosses and fittings to plank shields (plates 2.4.U and AR).

Most of the bosses have four holes for rivets spaced equidistantly around the flange. Few have rivets in situ, but those which survive have broad flat or domed heads to spread stress (eg boss 7; plates 2.4.G, top, and H). As none was found attached to a board, the specifics are unclear. For example, it is unknown whether the rivets were simply hammered over behind the board, or whether their shanks were pierced to take split pins allowing easy removal of the boss for maintenance (Oldenstein 1976 73-4 nos 564-583 and Taf 50; Boss B from Mainz has two such rivets in situ, Klumbach 1966 172 and Abb.3).

Lack of decoration or inscriptions makes it impossible to determine the orientation of most of the
bosses, but no.2 is exceptionally informative. Rivetted to its rear side is a narrow iron grip bar (plates 2.4.A and B). This would have sat on the front face of the wooden grip-core, between the forward projecting "wings" of the rear reinforcing bar (plate 2.4.U). If the whole assembly was wrapped in leather, as reinforcing bar 2 suggests (plates 2.4.S, T and U), then boss, board and bar would have been even more tightly integrated (see also plate 2.4.AR,5-7).

Boss 2 shows that, at least in this case, the rivets holding it on were arranged in "x" formation rather than "+", to keep them clear of the transverse iron bar. The same can be inferred for boss 3 on the basis of its shape (plates 2.4.C and D). This was probably the standard arrangement, although the heavily damaged boss 9 may have had its rivets arranged as a "+".

It is clear that only a proportion of bosses had the integral iron grip-bar (nos.2, 8 and 9). Most of the rest certainly never possessed one.

Another fitting, traces of which remain on more than one shield, is a metal ring or loop, rivetted through above and to the (bearer's) left of the centre, probably for a hanging/carrying strap. A complete one was found with shield 1 (plate 2.4.V) and the iron fixing pin for another is to be seen on shield 2 (shown reconstructed in plate 2.4.Z. See also plate 2.4.AR,12-14).

2.4.6 Construction of plywood scuta (plates 2.4.AK to AN).

One complete and two fragmentary shield-boards (nos.15 to 17) hardly constitute a satisfactory basis for generalisation, but they do at least share a common structure.

The complete board from Tower 19 (shield 15, plates 2.4.AK to AM) was found in fragments but originally measured about 1.05m high and 0.85m wide around the curve. In fact the board is not rectangular, being slightly longer down the centre than down the sides; the upper and lower edges are slightly curved. The chord width, measured from the untreated pieces on site, was recorded as 0.66m. The curvature as now seen on the restored board is almost certainly wrong, being too tight. This is a result of the partial sacrificing of the structure for the sake of the painted surface. The whole of the rear face is now covered in modern materials holding the structure together.

The dimensions of the shield found by Cumont (shieldboard 16) are unreliable, as the object was severely distorted by shrivelling.

It is clear that all three scutum boards were made of plywood. The two at Yale which I have inspected (no.15 and the fragmentary no.17) both consist of three ply layers, each of very thin strips of wood, varying from 30 to 150mm wide. The strips in the middle layer are arranged vertically, while those in the facing layers are glued horizontally, i.e. running around the curve. The inner core layer tends to be a little thicker, 2-3mm rather than the 1-2mm of the outer layers, perhaps because they did not need to be curved. The result is that the thickness of wood on each orientation is roughly equal. The total
thickness is 5-6mm, although no.16 may have been thicker unless it was made from only two layers. The wood of no.15 is plane (Platanus orientalis). The surfaces of the wooden strips were left rough to give purchase to glue. The whole assembly must have been built up over a former. The strips are so thin that they could probably have been bent to shape without recourse to soaking or steaming. After completion, the edges were carefully finished to give a smooth, even perimeter with a slightly rounded section. A central grip aperture was then cut. That on no.15 is c120mm across. The handle on the latter was apparently just the thickened middle portion of a wooden strip running horizontally across the back of the shield and across the central hole. It had a “lashing of heavy rawhide” on either side to strengthen it. This strip was one of a number making a light framework on the back of the board. No trace of any of these has survived restoration, but a drawing made on site shows that apart from the central strip there was another along each side of the rectangle, about 90mm in from the edge (plate 2.4. AM). An identical system of strips is to be seen on no.17, probably glued and certainly pegged on with small dowels (plate 2.4.AN, bottom). That purpose is obscure, as they are too light to act as braces or reinforcements, being 20mm wide but only 2-3mm thick. Neither can they have served to stop the ply springing apart, as this was done far more effectively by the stitching around the edge.

According to the published account, the surface of no.15 was covered in “thin red-dyed kid or parchment”, overlain by a layer of fine linen to which the paint is applied. This is certainly wrong, as it is clear that the paint is directly onto the skin. It is argued that the order of the two layers has been accidentally transposed in the publication (see catalogue entry for details). No.16 also had skin facing, fixed on by a layer of fibre and glue. No.17 had a layer of glued fibre, orientated across the grain of the wood (i.e., the fibres were laid on approximately vertically). However, no.17 had no skin facing but a layer of gesso to which the paint was applied. These parallel the two methods of facing used on the oval shields.

No.15 had strips of leather 35-50mm wide sewn over its edges. The stitching for such edging is still in situ on no.17, although the skin itself is gone. It was added after the gesso. As mentioned above, apart from protecting the edge of the wood from wear and tear the edging also prevented the ply from springing open. Extra pieces of leather were attached to the vulnerable corners of no.15 with rawhide, but no trace of these is to be seen on no.17.

The boards were painted, apparently on both sides.

It is clear that no.15 had had its boss attached at some stage, but torn off before burial. It had been held on by four rivets, in the corners of its flange. The shank of one of these was still in the hole when found. All the holes have since been obliterated by the restoration. The space left for the boss in the middle of the decorative paintwork was a rectangle 220mm by 180mm.
2.4.7 Construction of bossless oval shields (plate 2.4.AO).

Little can be said with certainty about the two known shields in this category as neither is in the Yale collection. Shield 19 was a fragmentary oval board of unrecorded size, with its long axis on the horizontal. It "was made of the same sort of plywood as [shield 15] and was apparently covered with cloth or parchment" (Rep. VII/VIII 328 fn.1). The surviving sketch reveals its shape and orientation and the lack of a central grip aperture. The rim has the standard stitching holes for a leather edging strip. Shield 20 apparently possessed the same salient features.

Both boards may have had an arrangement of four holes in a rectangle around the centre of the board, probably to fix a single central grip to the rear face, although other arrangements cannot be ruled out.

No further details of their construction are recoverable.

2.4.8 Construction of wood-and-rawhide shields (plates 2.4.AP to AR and AU).

The essence of the structure of these shields is extremely simple (plate 2.4.AU). A large sheet of skin, presumably rawhide from its physical behaviour, was pierced with a carefully arranged pattern of slits. Through these were threaded roughly carved but straight sticks, (48 in the case of shield 22) 10-15mm thick. (These have been identified as reed canes, but this is incorrect, Rep. II 74.) The sticks were secured by wrapping the skin over their ends and stitching through between them. A similar technique was used down the sides. The structure was prevented from folding up by the attachment of one or two sticks across one end of the assembly, held on by folding the end of the skin over them before sewing.

Assembly would have taken place while the rawhide was wet. As it dried, it shrank and tightened around the wood, the whole structure becoming a rigid, lightweight defence.

The three largely complete examples (nos. 21 to 23, plates 2.4.AP and AQ) show a variety of sizes. No.21 was at least 1.55m high and 0.8m wide, while nos.22 and 23 were just over a metre tall and about half that in width. The latter pair were basically rectangular with a point at one end. The damaged end of no.21 was also almost certainly pointed. It is not possible to tell which way up these boards were used.

The distribution of the slits in the rawhide was carefully worked out to produce a pattern when the sticks were inserted. On no.21 this resulted in a pattern of shallow, flaring "W"s, on 22 and 23 a series of "V"s.

A wooden baton, with twine around each end, was found in association with no. 21 but not actually
attached. It is presumably the handle, but its original position is not known. On no. 22 there is a piece of twine tied around the seventh, eighth and ninth sticks from the left (when the transverse stiffeners are at the back). This might also be associated with the method of carrying.

None of the shields bears any trace of paint.

2.4.9 Shield paintings (plates 2.4.V to AA, AD, AK and AL, AO).

The painted decoration on the shields from Dura is so far unique in the Roman world (Cumont 1926 262-3, 327-337; Rep. VI 456-466; VII/VIII 326-369). The closest parallel is the poorly preserved Hellenistic painted shield facing from Ai Khanoum in Afghanistan, dated to the second century BC. It had a simple border and traces of a figure in the middle. An eye from a human face was tentatively identified (Bernard 1973).

It has been speculated that the designs on the surfaces of Roman shields on various depictions might have been cut out of metal plate and rivetted on (Rep. VII/VIII 330; Webster 1969 129). Indeed there is some evidence for this on the Doncaster shield (Buckland 1978; see also van Driel-Murray 1984 36 fn. 162). Tooled leather facings are also known from Vindonissa (Gansser-Burckhardt 1942 74-9, Abb. 49-51). Clearly a variety of technique were employed at different times and in different places.

Some analytical work has been done on the surface preparations and paints used at Dura, and it seems that at least three media were in use (Rep. VII/VIII 368-9). On the Yale scutum (shield 15), the encaustic technique seen on Egyptian mummy portraits was employed, the colours applied directly onto the skin facing (Rep. VI 457 fn. 60). The resulting waxy surface will have served as a useful weatherproofing (it rains heavily at Dura in the winter; Hopkins 1979 118 for a graphic illustration).

The oval shields were mostly prepared with a gesso, “derived from a rather impure gypsum and probably some lime” (Rep. VII/VIII 368). This was applied to the wood to take the paint. On many fragments of shields, a parchment-like covering replaced the gesso. The paint was either in a water-based or tempera (egg-white) medium. One based on casein (protein derived from curdled milk) also seems to have been employed (Rep. VII/VIII 368-9).

Various pigments and dyes were identified with a greater or lesser degree of certainty, including vermilion, carbon black and “a reddish yellow earth”. The dye indigo was extensively used (Rep. VII/VIII 368-9).

The basic technique was to apply an overall base colour, usually red, to the gesso or skin covering, and then to overlay the detailed decoration. There is little to be gained by reiterating the detailed description and discussion of the individual shields already published. References to these may be
The “traditional” winged thunderbolt legionary symbolism is absent from the Dura scuta (shields 15 and 16. Shield 17’s design is almost obliterated). The thunderbolt is well known on first and early second century monuments (especially Trajan’s Column, Florescu 1969 fig.42; also legionary tombstones such as that of Gnaeus Musius at Mainz, Robinson 1975 plate 468). An actual example of lightning-streak decoration may be seen on a first century shield facing from Vindonissa, but the orientation is hard to understand (Gansser-Burckhardt 1942 Abb.50-1). However, it is difficult to trace after the early second century, and it is quite possible that it was abandoned in the third century or even the later second. It is virtually absent from the Column of Marcus Aurelius (except perhaps in one scene, Caprino et al 1955 Tav.V fig.10), but this may be because the designs were mostly painted on. We are ignorant about legionary shield designs between the second and late fourth century, when specific unit designs are recorded in the Notitia Dignitatum (ed. Seeck 1876). The veracity and trustworthiness of the shield patterns recorded in this remarkable document has recently been challenged (Grigg 1983). I am not convinced that they are of so little value. Independent evidence for late designs discussed below proves that at least in general terms they are representative. Significantly, the winged thunderbolt is absent. It was out of use by the fourth century, and had probably vanished by the mid-third. Consequently the design on shield 15 could well be legionary (Rep. VI 463-5).

The published designs from Dura fall into two groups. Those on the scutum and oval shields 1 and 2 are essentially made up of concentric bands around the boss. The same basic geometry seems to have been shared by the shields discovered by Cumont (shields 6, 7 and 9). The wreath-like band around the centre is divided into eight equal parts, an eight-fold symmetry reflecting that of the star-shaped bosses.

Shield 3 is a rather different conception, with a single large human figure placed centrally, and apparently no concentric bands. The painting was lost around the edges, so there could have been a border (Rep. VII/VIII 363).

Shields 19 and 20 share features of both types, with dominant central figures surrounded by concentric rings of decoration.

A third type, hitherto undescribed, is also now known, on the back of shield 2. It is fragmentary, and as the shield cannot be turned over was very difficult to study (see catalogue). However, it proved possible to record it via a photomosaic, from which a reconstruction has been painted (plates 2.4.Y and Z). The design is radial, consisting of eight spokes each made up of several heart-shaped motifs. This again echoes the eight-fold radial symmetry.

There are obvious affinities between these designs and those depicted on auxiliary shields on Trajan’s Column. The wreath-like band around the centre on shields 1,2,15,19 and 20 is reminiscent of the Laurel crown around the boss on a number of the Column shields (plate 2.4.AS nos.1-10). The basic
conception of the scutum design a "wreath" with eagle above and lion below, is almost identical to several Column shields, which which have the wolf and twins or a space instead of the lion (plate 2.4.AS nos.11-15). The stars which flank the lion and occur between the spokes of the design on the back of shield 2 are also common motifs on the Column (plate 2.4.AS nos. 3, 6 and 20), and appear on the shields of the Praetorians on the Cancellaria reliefs (Bianchi Bandinelli and Torelli 1976 no.105).

Nothing on the Column parallels the fussy detail of the figural decoration of the "Homeric" and "Amazon" shields (nos.1 and 2), or the remarkable itinerary shield (no.9). There is no parallel for the Warrior God shield (no.3) or the bold spoked design on the reverse of shield 2. However the heart-shaped motif does occur (plate 2.4.A.S nos.16 and 17).

Many features are better paralleled on late third and fourth century depictions. For example, shields with large human figures as the main device occur on the Arch of Galerius (Laubscher 1975 taf. 34, 38 and 56) and in the Notitia Dignitatum (ND Or. V,21; 24;39,60,69). Shields with an eagle over the boss also occur in both sources (Laubscher 1975 taf. 42; ND Or. VIII,7; 10). Figures over the boss flanked by victories, with animals at the bottom also occur in the manuscript (ND Or. VI,14; 15). One of the shields on the Arch of Galerius also has a lion under the boss like shield 15 (Laubscher 1975 taf. 2), while another on the slightly later Piazza Armerina mosaics has a boar in the same place (Carandini et al. 1982 fig.126). The Arch of Constantine bears a shield with a victory over the boss and an animal head motif below (apparently not published). Clearly these designs form a milieu which was already established in the early second century and which lasted to the beginning of the fifth, while other shield designs like the thunderbolt came and went.

The radial design on the reverse of shield 2 is a simple bright and bold geometric design which is particularly close to a number of Notitia designs. Bold concentric or radial designs are very common among the shields depicted in its pages. While none have spokes of heart motifs, a number have spokes of strange curvilinear form which may be a garbled form of a similar motif (ND Or. VII 7-8; VIII 19). Bold, simple geometric forms may have been coming into fashion earlier in the third century. The tombstone of Flavius Trypho at Apamea shows an oval shield with border and a bold cross motif (Balby 1988 plate XIII,3); however the depiction is crude and could represent some detail of construction rather than blazonry.

The shield devices found at Dura look back to the auxiliary designs of the second century, and foreshadow those of the late empire.

A number of intriguing questions remain. How far were the shield patterns governed by personal choice, or were they unit-specific? Are the ornately-decorated shields actually parade pieces? Were fighting shields given a simpler, more easily recognisable motif? There is nothing inherently unlikely in the idea that the relatively uncomplicated design on the scutum is a unit design, perhaps belonging to a legion. The lion could well have been a legionary badge, in this case possibly legio XVI Flavia Firma or III Cyrenaica (Rep. VI 463-5).
There is limited direct evidence that Roman regiments had their own distinctive shield badges. The Notitia shows one design per regiment, and these are bold, bright designs readily identifiable at a distance. There is a record of Germans identifying Roman units by their shield devices in the fourth century (Amm.XVI,12,6). Claudian refers to "...the brave regiment of Leones, to whose name their shields bear witness" (Bel.Gild.A23). For an earlier but uncertain period Vegetius records that each cohort of a legion had its own distinctive shield (Veg.II,18). This makes sense as the cohort was the tactical unit, and under most circumstances it was more important to distinguish between cohorts than between legions. It may have been that each cohort had shields in a distinctive colour, but all shared a common thunderbolt design. That the latter may have been legion-specific is suggested by two carvings from Mainz. The shield of the aquilifer if XIV Gemina whose tombstone predates the departure of the legion for Britain has exactly the same arrangement of wings, lightning and *tabulae ansatae* as that seen on a relief from the principia carved after the return of the legion to Mainz in the Flavian period (Ritterling 1925 1729-1733; Korber 1912 6). The shields with dominant single figures, nos.3,19 and 20 could also be unit specific, but it is hard to believe that whole cohorts had shields depicting Greeks and Amazons or road-maps! These probably do indeed represent parade shields, or in the case of the former two shields, for the ritual cavalry sports described by Arrian in the *hippika gymnasia*. Possession of parade shields of course implies that some soldiers had at least two shields, which is confirmed by a letter found in Egypt. A soldier, writing to summon his wife to join him at his posting, wrote "when you come, bring...my shield [hoplon] - just the new one - and my helmet..." (P.Mich.214; trans. Casson 1974 177).

It is possible that the buried, decorated shields were such second, parade or sports shields, and that the simple design on the reverse of shield 2 is actually the regimental badge, normally painted on the front of fighting shields.

### 2.4.10 Shields at Dura.

The two bossed wooden forms, the oval plank shield and the rectangular *scutum*, both clearly belong to the Roman tradition of shield-making. Shields wielded by a single central grip protected by a boss were typical of Celtic Europe, Germany and Italy in the first millennium BC (James unpub; Todd 1975 168). This contrasts with the well known Greek *hoplon*, a bossless round shield attached to the forearm.

Literature and depictions make it clear that there were two basic types of shield in use in the early imperial army. On the one hand there is the great semicylindrical *scutum*, traditional arm of the legionary. This evolved from an earlier longer form, described by Polybius (I,22,5; VI,23,3) and depicted on the Altar of Domitius Ahenobarbus (Robinson 1975 plates 463-4). An actual example has been found in the Fayum (Kimmig 1940). The rectangular form probably developed under Augustus (it appears on the reliefs on the mausoleum of Plancus, 20-10BC; Fellmann 1957 31). It is then depicted
on military tombstones and monuments into the second century, most notably on Trajan’s Column.

The second type is really a group of forms, all of which were apparently lighter than the scutum. They were really distinguished from it by not being all-enveloping body-shields. Most were oval, according to the monuments (eg on Trajan’s Column, Florescu 1969 fig 42; on auxiliary cavalry tombstones, Robinson 1975 plates 298, 301, 302), but long hexagonal forms are also often seen (eg Trajan’s Column, Florescu 1969 fig.43). The archaeological record has produced evidence for oval shields (Groenmann van Waateringe 1963) and other shapes, especially a flat board with straight sides and rounded ends (Valkenburg and Caerleon, Van Driel-Murray 1988 fig.2; and, dubiously, Doncaster Buckland 1978).

These shields were apparently the arms of the auxiliary infantry and cavalry in at least the first two centuries AD. The contemporary technical term for them is obscure. The terms clipeus and parma for shields other than the scutum continue to occur in Latin authors to the fourth century (eg Amm. XXIX,5,39; XXXI,5,9), but may already have become literary archaisms by the Augustan period (Livy 8,8,3). Greek authors also describe the two types of shield. Josephus says that the pedites singulares carried the aspis, generally translated as a round shield but probably meaning an oval one here. The cavalry carry the thureos, a large flat shield, which was probably oval as it is clearly distinguished from the thureos epimenes, or rectangular shield of the “rest of the phalanx”, ie the legions (BJ III 94-97). If there actually was a fixed technical vocabulary for shield types other than the scutum, it is not recoverable. In Egypt a common soldier writing to his wife used the word hoplon to describe his shield (P.Mich.214).

The two bossed types at Dura clearly correspond to the traditional division. However, due to the scarcity of comparable evidence, it is difficult to assess how typical the material is. This is especially true of scuta, as no intact boards are known elsewhere. Leather facings from two possible first century AD scuta were found at Vindonissa, but these had rounded corners and may have been from flat shields (Gansser-Burckhardt 1942 74-8 nos.LV and LVIII Abb.49-53). However, the intact board (shield 15) had had a rectangular boss corresponding with the fine examples from Europe (especially the examples from South Shields, Klumbach 1966 175 and Taf.14; and Vindonissa, Klumbach 1966 178, Taf.15: Thomas 1971 36), and its plywood structure also agrees with the description given by Polybius (VI,23,3) as interpreted by Rostovtzeff (Rep. VI 461). Shield 15 even corresponds with Polybius’ description of the facing technique, fabric first, then skin (contra Rep. VI 461).

Pliny actually lists the best timbers for making a shield (scutum):

“...the most flexible, and consequently the most suitable for making shields, are those in which an incision draws together at once and closes up its own wound, and which consequently is the more obstinate in allowing steel to penetrate; this class contains the vine, agnus castus, willow, lime, birch, elder and both kinds of poplar. Of these woods the lightest and consequently the most useful are the agnus castus and willow... Plane has flexibility, but of a moist kind, like alder; a drier flexibility belongs to elm, ash, mulberry and
Shields 15 is of plane, and the plank shields are of poplar, corresponding well with Pliny’s observations, which underline the deep empirical knowledge of the properties of materials available at the time. This knowledge was responsible for the adoption of plywood for strength, which certainly goes back to the late republic (the Fayum scutum is of ply, Kimmig 1940), and if Rostovtzeff interpreted Polybius correctly, it was already in use in the third century BC. It was probably a standard technique, occurring again in the early empire at Doncaster (Buckland 1978).

Given this, it is somewhat surprising to find shields of simple plank construction at Dura, a technique unparalleled elsewhere although this could be due to the paucity of the evidence. Why such an apparently weak technique was used is hard to explain, but I would suggest that it was the only practicable way to make a dome-shaped shield board, the advantages of which may well have outweighed the abandonment of plywood. Generally, the early imperial shields other than scuta seem to have been flat. This was the case with the Doncaster shield (Buckland 1978), and depictions seem to comply with the exception of the shield of the Mainz aquilifer (Robinson 1975 plate 468). As the scutum shows, plywood can be made curved in one direction, but it is much harder to build it curved in two planes. Plank construction allowed the assembly of the required dome-like board, which has all the advantages of strength and rigidity over a flat board conferred by the form. The increased proneness to splitting caused by abandoning ply was probably largely offset by the tough fibre facing layers. There is thus no reason to think the plank shields too weak for anything other than ceremonial use. Fragments were found in the Tower 19 countermining, where they had evidently been used for fighting.

The metal fittings are generally typical of contemporary Roman practice. The circular iron or bronze boss with hemispherical bowl and four fixing holes is a common type found in forts from Scotland to the lower Danube (James unpub. for gazetteer to 1979; also catalogue, boss 1). Most of the Durene bosses are indistinguishable from European examples, even in fine detail. Overall, the group consists of a core of the standard type, with a number of more exotic variants, notably the star-shaped bosses (nos. 15 to 18). This general pattern is also seen in Europe. However, there are important differences. The star bosses cannot be exactly paralleled in Europe. If they occurred in the same proportions in Europe that they do at Dura, several should have been found by now. The type may therefore be a variant local to Syria, or even to the city. On the other hand, there are no pointed bosses at Dura. This type is well attested in Europe, but may also have been a localised variant, confined to lower Germany (James unpub. 16). However, star-shaped bosses and other unusual forms may be depicted on Trajan’s Column (plate 2.4.AS, nos. 21 to 25).

It was also disappointing that none of the bronze bosses preserved inscriptions or complex surface decoration such as are common on European bosses (Klumbach 1966; MacMullen 1960). However, most if not all of these bosses were from fighting shields, if their provenance is correctly understood, in which case costly embellishment may have been avoided. Further, the absence of inscriptions from such a tiny sample of bosses in good enough condition to preserve them is not significant.

The association of the bosses and oval shields with iron reinforcing/grip bars is also paralleled in
Europe, notably on the Doncaster shield (Buckland 1978). Fragments are known from many other sites (see catalogue). Doncaster appears to be unique in having a vertically-orientated grip; all the Dura examples, and the far earlier Fayum shield, have horizontal grips. I suspect that the Doncaster reconstruction may turn out to be erroneous, or at least unreliable if the evidence were to be reviewed, and that in fact Roman shields were always held by a horizontal grip.

A common find on European military sites is bronze edge binding strip from shields (eg Colchester, c.AD60, Hawkes and Hull 1947 337 and fig.63; Hod Hill, Claudian, Richmond 1968 114 and fig.57; Straubing, Walke 1965 152 Taf.105). This was already in use in the time of Polybius (Polybius VI,23,4; also Plutarch Camillus XL,4) and was still in use down to the time of the fall of Dura (Künzing, earlier third century, Garbsch 1978 52 no.17). It is completely lacking at Dura, where shields had a stitched leather edging. This could be an oriental variation (the much earlier Fayum scutum also has leather edging, Kimmig 1940) but it is clear that metal bindings were not universally employed even in the West. The Doncaster shield lacks them (Buckland 1978).

It is particularly hard to assess how typical the Dura shields are in terms of shape and above all size. With such limited comparative archaeology we are forced back onto representations with all their inherent pitfalls (part 1.15). For example, it has been said that the scuta of the first two centuries AD seems to have been smaller than the Dura example, on the basis of representations. "It rarely exceeds 0.85m in length" (Rep. VI 462 fn.75). However, this is to ignore the practice of reducing the size of the shield so as not to obscure the figure. Representations are no reliable guide to shield size, but are probably rather better for shape. With regard to oval shields, those actually found in Europe do include long ovals such as are found on Trajan's Column, but the known examples are often far larger than the depictions would suggest. Shield covers from Valkenburg represent boards up to 1.5m tall (Groenmann van Waateringe 1967 70 figs 16 and 17). Given this background, the size of the Dura shields is not exceptional.

On the other hand, the shape of the oval shields is obviously different from those found in earlier contexts or depictions, being much broader. They are actually identical in shape (and indicated size) to depictions of shields from the Tetrarchy and later times (eg the Arch of Galerius, Laubscher 1975; the Geneva silver dish, Toynbee 1964). Late shields were certainly convex. Ammianus describes them as "patula...et incurva", enough for soldiers to use them as floats to cross water obstacles (Amm. XXIV,6,7). The development of such broad forms can now be traced back to the Severan period, for example on military tombstones in Istanbul (Coulston 1987; tomb of an unknown individual, plate 1; Aprilius Spicatus, plate 2; Aurelius Suros, plate 3). This evidence suggests that the Dura oval shields were typical of their period, at least in the East. It would be interesting to know if these other late shields were also of planks rather than ply, but none have been found and the only description of their construction is not sufficiently precise (Amm. XXI,2,1).

It is virtually certain that the oval plank shields were used in the fighting. They are the predominant type at Dura, and parts on one or more were found in the tower 19 countermine with the bodies (plate 1.C, bottom, "shield slat", and perhaps the "planks" in plate 1.D). It may be that the painted shields
discarded under the rampart were regarded as valueless for fighting not because they were made of planks, but because they lacked the “anti-split” layers of fibre/glue and skin covering.

So far I have deliberately avoided the question of attribution of the two shield types to unit types. At first sight the *scuta* may be attributed to legionaries (Rep. VI 461) and the oval shields to auxiliaries, as both were in garrison at Dura in the third century (see section 3). However, the situation is not so simple. The idea that there was a rigid distinction between auxiliary and legionary equipment has been largely fostered by the rather conventionalised scenes on Trajan’s Column (compare with the metopes of Adamklissi), in reality things may have been more fluid than is usually thought. Of relevance here are the units of auxiliaries described as *scutata*, on the Danube (CIL XVI 110, AD154) and in Egypt (ILS 2611 and NDO r.XXXI 59).

The general picture gleaned from the monuments and to some extent from the archaeology is that in the second century such distinctions of equipment as had existed were breaking down. Increasingly, legionaries are depicted with oval shields. In this respect, as also in armour and weapons, they were increasingly indistinguishable from auxiliaries. The *scutum* hardly appears at all on the Column of Marcus Aurelius (Caprino et al. 1955) and is completely absent from the Arch of Severus in Rome (Brilliant 1967). The impression that the *scutum* was redundant by AD200 is confirmed by the appearance of oval shields on legionary tombstones of the period (Coulston 1983, plates 1 to 3). However, Dio mentions rectangular *scuta* in a third century context (*aspsi tais koilais tais soleneoides*, “shields hollowed and channel-like”, XLIX,30,1). This, and the appearance of such shields at Dura as late as the 250s, seems to contradict the representational evidence, but it may be that these shields stayed in use in the East longer because they were suited to local conditions, offering superior protection against arrows. (According to Caesar, one *scutum* stopped 120 arrows, attesting the strength and effectiveness of the design; BG III 53.)

Alternatively, some may have been retained specially for the testudo formation to which they were especially suited (Van Driel-Murray 1988 58). It is in the testudo that they make their main appearance on the Column of Marcus (Caprino et al 1955 Tav.XXXIV; also XLIX and LXI). The formation remained in use into the fourth century (Amm.XVI,12,44; XX,11,8; XXVI,6,16 etc.). The latest representation known to me appears on the Arch of Galerius, but it is unclear which side is using them in the battle scene (Laubscher 1975 32 Taf 15,1)! Their appearance might be no more than antiquarianism. Finally, it is conceivable that they may have been retained for ceremonial use only, but the discovery of parts of at least four (shields 15 to 17 and boss 21) may imply general use. But were they used by legionaries alone? Only an inscription on a shield naming a unit could have proved the point.

The two basic shield types seem to have been closely related to the other weapons and modes of fighting. Traditionally, the legionaries fought in close order (Tac Hist II,22), making a continuous wall of shields which were used to bunch opponents together where they could be dispatched by the short gladius, wielded in the confined space to thrust between the shields. This pushing-match warfare is described in various passages (Tac Hist II,42). On the other hand, the lighter shield was used in open
order fighting, in conjunction with spear or gladius, or increasingly in the second century, with the spatha. It was used offensively, the boss serving as a mailed fist (Tac. Hist. IV,29; Tac. Ag. 36; Livy IX, xli, 118). It is difficult to see how a cumbersome body shield like the scutum could have been used with the long spatha which is the only Roman sword type attested at Dura.

Before leaving the unequivocally Roman shield types, it should be noted that no examples of removable shield covers were found. Such covers are mentioned by Caesar (BG II,21,5; see also Dio LVI,3) and fragments have been identified at a number of European sites (Birdoswald, McIntyre and Richmond 1934 fig.7,i and 8,8-9; Hardknott, Charlesworth and Thomson 1973; Valkenburg, Vechten and Velsen, Groenmann-van Waateringe 1967 52-73; van Driel-Murray and Gechter 1984 30-35 for Valkenburg and Van Driel-Murray 1988 for Caerleon). I believe that it is very likely that covers were employed at Dura (the elaborate shield paintings would not have lasted long without them). Their apparent absence may be due to the failure of the excavators to recognise them or to recover them, or to their unfortunate absence from any of the very localised microenvironments along the walls (most notably tower 19 and the mine which brought it down) where they might have survived. Given that for most of the year the climate is very dry at Dura, it may well be that shield-covers were made of textile rather than leather.

On the currently available evidence, then, the Roman shield types appear to be quite typical of mid-third century imperial fashion. The apparent oddity and archaism of the scuta is probably more due to our ignorance of the effect of local conditions, and of the limitations of the archaeological record elsewhere, than to any inherent “old-fashionedness” in the East (contra Wright, unpub., 77).

The third shield type at Dura, the bossless oval of unknown size (shields 19 and 20; plate 2.4.AO) is difficult to parallel. The use of plywood in no.19, the edge stitching and general aspect of the surface decoration of both show that the type is clearly related to the Roman tradition, and in these features probably derives from it. However, it is a type not certainly known elsewhere from archaeology, depictions or literature. Lacking any inorganic parts, it is unlikely to be archaeologically detectable in most soil conditions.

If the interpretation of the holes around the centre as fixings for a single grip behind the centre is correct, then a connection with the local small desert targe is suggested. This is seen on many depictions at Dura and at Palmyra, whence it is clear that it is a local shield type with no boss but a single grip (Colledge 1976 plate 27; See part 2.4.1). These seem to have been used by horsemen and camel riders.

The best explanation of shields 19 and 20 is that they are romanised versions of such bucklers, effectively hybrids both in structure, and in the case of shield 19, in decoration. Its central figure is in the local style rather than the imported classicizing style of the bossed shields. Perhaps a shield of this form is to be seen in a depiction in the Temple of the Gaddé (Rep. VII/VIII fig.72).

The wood-and-rawhide shields represent a totally different tradition of shield design. It is reasonably certain that this tradition was already established in Northern Mesopotamia a millennium before
the fall of Dura. Shields of identical construction are shown on a number of Assyrian reliefs (Hrouda 1965 24). A variety of forms and sizes are shown, including circular and rectangular shields, and much larger versions, the height of a man and standing on the ground for archers to shelter behind like a medieval pavise (also suggested by Wright, unpub. 81).

The technique was not only very ancient, but widespread. Shields of identical construction have been found in Siberian tombs (Rudenko 1953 plate LXVII; 1960 plate LXI; British Museum 1978 no.30).

Such shields may well have remained in use in Mesopotamia to the Roman period. Round ones, at least, seem to have been used by the Palmyrenes (Schlumberger 1951 plate XLI; College 1976 plates 27, 37, 44, 129 and 143). They may have been used in Achemenid Persia (Ghirshman 1964 plate 242), and it seems that later they were used by the Sassanians, even though depictions of Sassanian warriors show them without shields. This is probably because the heavily armoured cavalry needed no extra protection, and the horse archers could not carry a shield. However, Ammianus describes Persian shields, probably carried by their foot archers and low-grade levy infantry. They are described as “firmly woven of osier and covered with thick layers of rawhide”, which could easily be a slight misinterpretation of the Dura shields (Amm. XXIV,2,10). The Durene examples could therefore have belonged to either the defenders or the attackers or both. Such lightweight and cheap arrow defences would have been valuable to both armies. No.21 is so large that it was too large for hand-to-hand fighting and was probably an archer’s pavise (Rep. II 75). Ammianus mentions Persian hurdles and mantlets of “wicker”, which may be identical to this (Amm.XIX,7,3).

Shields were apparently being made at Dura. Some of the boards were incomplete; shields 1 to 3 had never been given bosses. The buried painted shields had been cannibalised for parts first (nos. 1 to 4 had had iron reinforcing bars removed before burial). Boss 3 shows signs of reuse, and shield 4 had had two bosses during its life. The possibility that there was a specialist shield-painter’s workshop at Dura was raised in the original publication (Rep. VII/VIII 331; the painter’s style is Syrian, fn. 7). Such a shield painter is recorded at Bostra, apparently attached to, rather than a soldier of, III Cyrenaica (Bowersock 1971, 230; 1983 96 fn. 19; Speidel 1977 fn. 18).

In summary, there is a very large degree of similarity, indeed identity, with shields from the North-Western Roman limites. It is difficult to assess whether some of the perceived differences (eg in boss-shapes, or use of metal edging) are to be explained in terms of chronological developments across the empire; local fashion; or the incompleteness of the surviving archaeological record. The strange shields 19 and 20 certainly seem to represent romano-oriental hybridisation of equipment but, as ever, it is unclear whether these shields were actually made for Roman troops sensu strictu, or for Palmyrenes or other local troops.

The rawhide shields (21-24) clearly are foreign to the Roman tradition, but once again, although literature makes it clear that Sassanian troops used such shields, there long-established use across the region, and the uninformative nature of their contexts (where known), allow for them to have been
used by Persians, local levies or even Romans as siege-fighting equipment.
2.5 Shafted weapons (plates 2.5.A and B)

There is remarkably little evidence for hand-held or hand-thrown shafted weapons (ie spears and javelins) in the city. There is a single definite spearhead (no.1) and a handful of sockets (nos.2 to 4) plus three objects thought to be spiked ferrules (nos. 5 to 7). In addition, a possible broken spearshaft was recorded at the site (no.8) but is not now to be found.

This state of affairs is unfortunate, as it appears that the third century was a period of considerable innovation and change in this area. The traditional infantry pilum seems to have gone out of use, while a variety of new weapons make their appearance by the end of the third century. Perhaps the best known is the plumbata or martiobarbulus, a small barbed and fletched dart widely used in the fourth century, but apparently developed during the Tetrarchy if not before (Veg. Mil. XVII, iii, 14. Many have been found, eg at Wroxeter; Musty and Barker 1974). Another example is the light javelin carried several at a time by the lanciarii, specialist legionary javelineers who also feature during the Tetrarchy, but whom may now be traced to an origin in the early third century with the discovery of the tomb of a trainee lanciarius at Apamea (Balty 1988 99 and 101). No trace of such arms was found at Dura, neither were there any remains from the contius or heavy cavalry lance. Such weapons were used by Partho-Sassanian heavy cavalry and are depicted in use, held in typical underarm, usually two-handed manner, in the Synagogue paintings (plate 1.G). They were used by Roman cavalry regiments from the second century and occasionally appear on tombstones such as that of Adiutor from Tipasa in Mauretania and another from Gerulata in Pannonia (Speidel 1987 figs 3 and 4).

Wright believed that the pilum was still in use and that some of the tanged bodkin heads were fragments of such weapons (unpub. 133). However, this is almost certainly mistaken on archaeological grounds alone; the tangs of the surviving pieces are all too thin to come from long pilum heads, and in any case several are complete. None has a tang long enough to allow such an identification.

The similarity of the ferrules in form to socketed bodkin bolt heads, and the overlapping of socket diameters with the size of catapult ammunition makes it possible that some of the latter are in fact ferrules. Particular candidates are bolts nos. 23 and 35 to 40. The round-sectioned examples nos. 38 to 40 are particularly likely to be ferrules, by comparison with bronze examples from Europe which cannot really be anything else (A particularly fine Greek example is displayed in the British Museum; GR 1919.7-14.1). It may be that the heavy, diamond sectioned projectile points here described as bolt-heads nos.52-60 are in fact ferrules or more probably javelin heads, although their relative bluntness suggests that their present identification is the most likely.

Whatever the case with the bodkins, the general absence of larger spearheads is surprising. It seems highly likely that such weapons were used in large numbers by both sides. The best explanation for their virtual absence from the surviving assemblage is that they were not present where the best deposits were laid down, ie in the rooms of Tower 19 and the cramped mine beneath it, although
according to du Mesnil two "têtes des javelots en fer" were found on the floor of the countermine, 1944
23 fig 9D. It would be most interesting to know the form of these pieces, which cannot now be identified.
Perhaps they were some kind of special, short-shafted weapon for mine fighting, where wielding long
slashing swords was not very practicable.

Most of the presumably abundant spearheads were probably looted, or lost to corrosion (most of the
swords are represented only by relatively resistant bronze fittings).

Perhaps the most interesting item in this meagre group is no.5, which is difficult to make sense of.
It could be some kind of special weapon, perhaps a boat-hook-like device for toppling siege ladders.
The projecting side bar could, however, simply be a tread for pushing it into the ground, in which case
it may be the base of a standard. Such winged groundspikes are seen on a number of tombstones, such
as that of Aurelius Diogenes from Chester (Anderson 1984 plate 6), or the fourth-century monument
to Lepontius at Strasbourg (Espérendieu 1918 No.5496).
2.6. Bows, arrows and archery tackle
(plates 2.6.A to M).

Archaeological evidence for archery is abundant at Dura, although it consists almost entirely of parts of arrows. The bows themselves are represented by just four bone bow laths, and there is also a solitary archer's thumb-ring. For the arrows there are 22 fragments of shafts, and at least 46 iron and 22 bronze arrowheads were found during the excavations, representing up to 90 projectiles. None is complete, and no metal head was found attached to a shaft, although some had traces of wood grain preserved in the corrosion products on the tang.

2.6.1 Bows (plates 2.6.A to C,H,L to P).

The handful of bone laths from composite reflex bows (plate 2.6.H.1-4 and 2.6.L) are not particularly diagnostic in themselves, inasmuch as these objects are found all over the empire, including Britain (eg Bar Hill, Robertson et al 1975 56 and fig.18; South Shields, Allason and Miket 1984 37 ad 39, nos.2.16 and 2.18; Coulston 1985 224-234 for gazetteer). It is not possible to determine with certainty exactly which form or forms of bow were in use in the empire, as no complete examples survive and depictions are unreliable (Raising 1967 65; Coulston 1985 234-238 for discussion). It may be assumed that, like other composite bows, Roman ones were basically of wood, with horn on the inside (belly) to resist compression, and a layer of tendon in glue on the outside (back) of the bow to resist tension. Strong bone nock-plates, or laths, were attached to the tips. (For the details of construction of this type of bow and its method of operation see especially Coulston 1985 345-259). This basic construction is extremely widespread in time and space, from the Mediterranean to Japan, and may be traced back to neolithic times (Raising 1967 146-8). It was in use in Egypt during the Old Kingdom and in Greece by the time of Homer (Raising 1967 70,97). A fragment of Roman date has been found at Belmesa in Egypt (Coulston 1985 233-4).

Composite bows can be immensely powerful, shooting arrows to prodigious distances. Recorded figures for Turkish bows reach 800 yards (Payne-Gallway 1907 23). The record set in California in 1953 was 850.67 yards (777.51m; Raising 1967 31).

The best available parallel for the Dura material is the almost complete bow from the cemetery at Baghouz, about thirty miles down the Euphrates from Dura (plates 2.6.A to C; Brown 1937; Raising 1967 105 and fig.52). Known as the Yrzi bow after the part of the cemetery where it was found, it
is dated to the Parthian period by associated finds, (ie first century BC to the third century AD). This unique weapon is preserved at Yale.

When found, part of one limb was missing, but the other was intact. As reconstructed, the bow measures 1.275m across the chord and, like all reflex bows, when unstrung the tips point forwards. The wooden core was made in four parts, beautifully scarfed together. The central part is made of oak and elm, the limbs of a third, unidentified wood. In the opinion of Mr. E. McEwen (an expert on the history and construction of the composite bow), this was not for any reason other than local shortage of materials and maximum use of scraps and offcuts. Such a structure offers no mechanical advantages (pers. comm.).

Traces of the horn on the belly and the tendon on the back survive in places. The four bone laths were still in position at the tips of the stave. The whole was wrapped around with a further layer of shredded tendon in glue to bind the components tightly together. The outer surfaces of the bone laths were roughened to give it purchase, a feature to be seen on one of the Dura laths (no.3, plate 2.6.H and I). Brown suggested that there had probably been an overall decorative covering to protect the structure, which is very sensitive to damp and insect attack. Such painted coverings are certainly a feature of modern reflex bows from the middle and far east.

Mr. McEwen has made a replica of the Yrzi bow, which gives an idea of the power and sophistication of the weapons in use in the Dura region in the classical period. Its draw weight is approximately 80lb., which requires considerable strength to draw fully. For comparison, medieval English yew longbows had draw weights of up to 100 or 120lb. Shooting with the Yrzi replica shows it to be a very efficient weapon.

For what they are worth, the depictions of bows from Dura (our only evidence for their appearance) show a considerable variety of types (plate 2.6.M). Some of the representations are more competently executed than others, but since they were drawn in a city where bows were everyday tools of the hunt and of warfare, I am tempted to give them some general credence, notwithstanding the ever-present danger of the use of artistic conventions. The variety of types may well be due to the variety of dates and of cultural influences at work in the city (Parthian, Roman, Sassanian, Hellenistic, Syrian, Palmyrene etc.). There is, of course, no reason why a range of types should not have been in use at Dura simultaneously.

Several depictions seem to show bows closely similar to the Yrzi form, with an unbroken sinuous curve when strung (plate 2.6.M, especially nos. 4, 6 and 10). Others show a second distinctive type, with a set-back handle, a sharp outward turn of each limb and straight bow ears (nos. 1 and 9). This is much more like the modern Turkish and other Asian bows. The probable appearance of such a bow, based on the Dura depictions and modern examples, is shown in plate 2.6.B. To which type of bow the Dura laths belonged cannot be determined.

No evidence was recovered relating to bowstrings. In later times, these were made from silk, or in
England hemp. Gut or hide were used in the Middle East in recent centuries (E. McEwen, pers. comm.).

To a large extent, arrows had to be matched in size, weight and balance to the particular bow, and the bow had to be matched to the archer in depth and weight of draw. For example, a short, strong archer requires a bow with different properties to those required by a tall, weaker archer. Weight of draw is determined by the construction of the bow, especially by the thicknesses of horn and tendon layers, and curvature. These factors can be juggled to get a weapon of appropriate power, and depth of draw to allow the archer the proper stance at release. The Dura depictions (plates 2.4.M) consistently show that the arrow was drawn across the chest, to the region of the right armpit, rather than, for example, to the ear (as with the medieval English longbow). However, this could simply be artistic convention.

2.6.2 Arrows (plates 2.6.D to K).

There are no complete arrows from Dura, but fragments of all parts of the arrow are preserved, from arrowheads to fletching. Arrowheads of both bronze and iron were recovered in some numbers.

2.6.3 Bronze arrowheads (plates 2.6.D and F)

Among the bronze arrowheads, a considerable range of types is represented. These fall into two broad groups. Firstly, there are flat, two-bladed types with tangs and no barbs (nos. 1-6). The remainder (nos.7-22) are cast heads with three blades, all socketed except for no.7. Size and proportion vary considerably, especially in the length and profile of the blades. Barbs are lacking, except on nos.21 and 22.

The presence of so many bronze arrowheads is surprising, as the writer knows of no evidence for the use of bronze rather than iron in the Roman empire as late as the third century AD. Some of them are unquestionably residual. No.1, for example, is of a well known Bronze Age type. Nos.8-22 are three-bladed socketed types thought to be of Scythian origin (Sulimirski 1954) which remained in use during the Achemenid and early Hellenistic periods. It is therefore considered likely that all the bronze arrowheads are residual and date to several centuries before the destruction of the city. None of the heads has a context sufficiently trustworthy to prove that they were current at the time of the siege.

Bronze arrowheads are easily lost, relatively resistant to decay and are readily spotted during excavation due to their colour. This may partly explain their numbers. All the bronze arrowheads may therefore be dismissed from discussion of the Roman occupation and the siege as being residual.
2.6.4 Iron arrowheads (plates 2.6.E and F)

With two exceptions (nos.1 and 2) all of the iron arrowheads are of the common tanged type with three triangular blades and more or less well defined barbs. The blades are usually placed symmetrically about the axis. These heads must have been very difficult to forge, due to their small size, awkward shape and the need for precision of manufacture. Nos., 1 and 2 are flat two bladed heads. No.1 resembles post-medieval Turkish types (E.McEwen, pers. comm.), and may be a surface find. The bulk of the collection show considerable variation on the three blade theme, especially in size, but also in shape and proportions. The graph in plate 2.6.K expresses width of blade against length, and therefore proportion. There is a distinct clustering of blade length around 35-40mm, with a range from 25 to 65mm. How far this pattern represents the preferences of individual archers, or whether different arrowheads performed different tasks is unclear. No.1 may will be an armour piercing form, and the strange double-barbed no.33 could be designed for hunting. The seven plain heads found together in tomb 24 (Rep. IX, part II, 57, and plate XLVI) had apparently been in a quiver with no.33. It is noticeable from the photograph that they are all extremely similar in size and shape as one would expect, for to shoot consistently an archer needs arrows of consistent weight, balance and aerodynamic performance.

Three-bladed tanged iron arrowheads are extremely common across the ancient world over a prolonged period. A recent paper by Erdmann has reviewed the evidence, and traced these heads, at least in the eastern Mediterranean world and the Caucasus, far back into the first millennium BC (1976 6). They seem to have increased in popularity down to the Roman period, during which they were ubiquitous on military sites. Such arrowheads were used by the Roman republican army, and were found at Numantia (von Groller 1927 252, Taf.34, nos.31-34). Erdmann provides an extensive list of the vast amount of comparative material from early imperial forts in Britain and on the German and upper Danubian limites (1976 7-8; cf. also Davies 1977, and now Zanier 1988). As Erdmann points out, presence or absence of barbing (presence of which may be defined as the angle between the rear edge of each blade and the tang being less than 90 degrees) is not chronologically significant (1976 9), and is in any case difficult to assess due to corrosion, which fact makes me sceptical of the usefulness of the typology now proposed by Zanier (1988 5-6, Abb.1).

Rather closer to Dura are the parallels from caves in the Judaean desert, belonging to the Bar Kochba period (early second century AD; Aharoni 1961 20 and plate 9B; Avigad 1962 178 and plate 18C; Yadin 1963b 91 nos.38-40) and to the Jewish War (Masada, Yadin 1966 16 and plate 23b; and Gamla, dated to AD67, Gutman 1981 34).

The same type was also in use in the Iranian area from the Hellenistic period onwards (eg, Ai Khanoum, 2nd century BC, Bernard 1973 196 and fig.41). It is therefore probable that both sides were using these heads at Dura during the siege, and that some of those recovered by excavation are incoming Sassanian ones, although these cannot be distinguished.

It is not known how long these arrowheads remained in use, but they seem to have disappeared by the medieval period. This is surprising, as three-bladed heads are generally more accurate than flat,
two-bladed types. Arrowhead blades act as aerodynamic surfaces, and two-bladed heads are larger and more prone to the effect of crosswinds than three-bladed heads of the same mass. This tendency to drift off-track downwind, a phenomenon known as wind-planing, makes two-blade arrows less accurate under many circumstances than three-bladed types (E. McEwen, pers. comm.).

2.6.5 Arrowshafts (plate 2.6.G to K)

All the surviving fragments of shafts exhibit a common construction (2.6.G to K). All consisted of a basic reed cane about 9mm in diameter (the stele), with a wooden forepart (footing) of tamarisk (at least in the case of shaft 13), inserted into the end of the cane and projecting from it 100 to 130mm. The sharpened wooden tang inserted into the soft pith of the cane was around 50-60mm long (plates 2.6.G and H). The joint between wood and reed was often carefully shaved flush, a process which roughened the surface of the reed and gave purchase to the whipping of glued fibre (said to be shredded tendon) which enveloped the joint and prevented the cane splitting.

Addition of a footing of harder material to the front of the arrowshaft is extremely common practice around the world. Until the introduction of aluminium shafts good quality target arrows were still given a footing of beefwood, while reed arrows with tendon-bound wooden footings very similar to the Durene examples were made by native Americans (Pope 1962 74 no.7 and plate 11, etc). In the middle east, such reed and wood shafts were already ancient in the third century AD (Rep. VI, 454; wooden footed arrows were found in Tutankhamun’s tomb, Carter 1963 vol.III 139 and plate xlvi, and in the Judaean desert, dating to the early imperial period, Yadin 1963b 91 no.40; 1966 16 and plate 23b).

The purpose of the wooden footings on the Dura arrows is not altogether clear. According to the published account, they were to aid the addition of socketed iron heads, which could not be directly attached to the reed as it could not be shaped into a point and tended to split (Rep. VI, 453). However, the only socketed iron heads found were much too heavy to be arrowheads, and are certainly from catapult bolts. The arrowheads in use during the siege were tanged. However, these too would need a wooden footing, as the tang could get little purchase on the soft core of the reed. The cane would also hinder penetration of the target, as it could not be tapered behind the arrowhead. A wooden footing could be, and was. Shaft fragments 11 to 13 are tapered to the minimum width necessary to hold the tang, and were cut off square. No.11, and perhaps no.12, show signs that they had had tangs driven in (plate 2.6.G).

The joint between arrowhead and footing would also have needed a tendon binding, to minimise the splitting seen on no.11, and such binding survives on nos.3 and 9. The latter pair, however, show no traces of ever having had a tang inserted, and are in fact pointed at the end, a feature which they share with all the remaining recovered footings (nos. 1-10). This would make it exceedingly difficult to fit a tanged head to the shaft. In the absence of socketed arrowheads at the time of the siege (unless the bronze heads were indeed used, which is highly improbable), some other explanation of nos. 1-
10 must be sought. The best explanation is that these were not intended to have a metal head at all (plate 2.6.K).

Wooden tipped arrowheads were in fact very common in the ancient world, and are much more effective than one might think. They are quite capable of transfixing and killing game or unarmoured men, especially at short range. This is illustrated in a gruesome manner by the discovery of the bodies of men killed in a siege in ancient Egypt. They had been shot at very close range by the defenders with arrows tipped only with wood, admittedly ebony. However, these were capable of penetrating the skull (Winlock 1945 11-14 and plates V-VII). It is probably erroneous to assume that all arrows had metal tips in the Roman period, as this was not the case either before or since. Arrows tipped with a wide variety of materials, including bronze, ivory and glass as well as wood were found in Tutankhamun’s tomb (Carter 1963 vol.III 139 and plate xlvi).

It may be that in Roman times wooden tips were confined to target shooting and hunting, and were only used in fighting as an emergency measure. However, the care with which they are finished, and the fact that the arrow maker had leisure to paint them does not smack of desperate measures to replace dwindling ammunition stocks. Rather it may be that it was not felt that the unarmoured Persian infantry (who presumably did the donkey work and bore the brunt of the siege work) were not worth precious iron arrowheads. These were probably reserved for the more senior armour-clad Persian warriors. However, it remains quite possible that some of the arrows, eg. nos.3,9 and 13, were in a state of assembly when deposited and were intended to receive metal heads.

Several shaftments (the rear part of the arrow, comprising the fletching and the nock) are preserved (shaft fragments 14-19, plates 2.6.I and J). The structure of the Dura shaftments was first discussed in Rep. VI,435ff. The following analysis differs from it as a result of my own inspection of the objects preserved at Yale. The method of assembly of all the recovered shaftments was as follows. The end of the shaft was first prepared by roughening the glossy surface of the reed cane, perhaps with sand, to give purchase to glue. The reed was apparently cut at a natural joint, so that the nock could be cut where the cane was solid in section. Before the nock was opened, the last few centimetres of the cane were bound around with glued tendon binding. This prevented the cane splitting when the nock was cut, or when the arrow was placed on the bowstring. Red, black and sometimes white or pink painted decoration (the ‘cresting’) was then added before fletching.

The purpose of the various creasing applied to the shaftments and footings of the Dura arrows is of course unknown. In modern target shooting distinctive creasing patterns allow easy identification of competitors’ arrows. It is possible that the Dura creasing were also personal designs, but equally may have been unit specific, or purely decorative. It is possible that they had some kind of magical significance. The patterns on the nocks of nos. 16 and 17 may represent eyes (plates 2.6.I and J).

The intact fletching of no.14 (plate 2.6.I and J) is, to my knowledge, unique in the empire. The three vanes are long and low, reaching their maximum height forwards, tapering gently and then curving in steeply at the rear end which reaches the edge of the nock. Vanes of similar form are seen on the arrows
grasped by Shapur in one of the Bishapur reliefs (Herrmann 1981 plate 4b). The feathers seem to have been white but are now discoloured. The species has not been identified. They are held on by glue alone, and are spaced equidistantly about the shaft with a recognisable cock feather at ninety degrees to the axis of the nock (in what is now regarded as the western style of fletching; plate 2.6.K).

There is no sign that the feathers were deliberately “corkscrewed” about the shaft to impart spin. Spin provides stability and so enhances accuracy, at the expense of increased aerodynamic drag. However, the natural curvature and twist in the feathers would be sufficient to make the shaft rotate in flight without such measures (plate 2.6.I, no. 14, end view). There is no sign of any colour differentiation among the vanes to enable rapid location of the cock feather in shooting, but this may be due to the ageing of the feathers. The other shaftments, which have all lost their vanes, do possess traces of the positions of the feathers, and usually the bases of the feathers themselves. Shafts 15-17 also seem to share the “western” style of fletching, while nos.18 and 19 appear to have been fletched in the “oriental” style, in which one of the feathers is on the axis of the nock (plate 2.6.K). When found, shaft 15 still had part of its fletching intact, but this was subsequently lost.

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The approximate size can be estimated, as it depends on the style of draw used by the archer and his stature. The depictions at Dura (plate 2.6.M) consistently show arrows drawn back across the chest to the region of the right armpit, so the arrows must have been as long as the distance between the outstretched left fist and the right side of the chest, plus a few centimetres for the arrowhead which projected beyond the bow. This will obviously vary between archers, but a figure in the region of 800 to 900mm is suggested. According to Mr. E. McEwen the Yrzi bow replica requires arrows of 850-900mm (pers. comm.). Reconstructions of an iron-tipped and a wooden tipped arrow are presented in plate 2.6.K.

A further point of interest is whether these arrows belonged to the attackers or the defenders. Red and black seem to have been the standard colours for arrow crestings from Judaea (Aharoni 1961 20 and plate 9A and C) to China (Stein 1928 257 nos.LC.v.031-4). Sassanian representations show that contemporary Persian fletching was similar to that seen on no.14 (Ghirshmann 1962 plates 165-6; Herrmann 1977 plate 3; 1981 fig.1 and plate 4; 1983 plates 10-12). However, the provenance of nos.14-16, which were all sealed between the collapsed floors of tower 19 make it almost certain that these belong to the defenders, as the tower was destroyed and these deposits laid down before the fall of the city, and it is unlikely that they could have been shot into the windowless lower rooms of the tower by the attackers (James 1987 81). They, and the closely similar no.17 are therefore regarded as belonging to the Roman side.

The remaining pair of shaftments, nos.18 and 19, are different. As has been mentioned, they seem to have a different fletching geometry, and also have different nocks. Theirs are square-cut, in contrast to the curved shape of the wings of the nocks on nos.14-17 (2.6.I and J). They also have distinctive broad red or pink cresting bands. It is tempting to regard these as incoming Sassanian arrows, but the apparent provenance of no.19, which seems to be the arrow found in the Temple of Azzanathkona (Rep. V, 166) makes this simple equation unlikely. The shaft was apparently deeply buried in a room where it would be very surprising to find a Persian arrow. In consequence, it does not seem possible
to differentiate between Roman and Persian arrows.

2.6.6 Archery tackle (plates 2.6.H, I and L).

The only object in the collection pertaining to archery other than the remains of bows and arrows is a broken thumbring of polished bone (plate 2.6.I, no.5 and 2.6.L; Rep. II 73). This is a particularly important find, as it is almost the only direct evidence that the so-called Mongolian release (Morse 1885), in which the bowstring is pulled back by the thumb, was in use in the Roman empire, or at least on its borders, as early as the third century AD. Unfortunately, no details are known of its exact provenance, which raises doubts about whether it belongs to the time of the siege, or whether it was deposited later. Its fine condition suggests that it had been deeply buried, and therefore is unlikely to have been a casual surface find. However, there is other evidence that the thumbring was used at Dura and this is discussed in part 2.6.7 (also see James 1987).

No archaeological remains of quivers or bowcases were recovered at Dura, or at least, none were recognised with any degree of certainty. A bone plaque, decorated with a relief depicting elks, has been argued to be from a bow-case (Rep. VII/VIII 376-381, fig 85, plate XXXIX, 1). However, the depictional evidence suggests that bow-cases were soft and flexible; perhaps this was from a quiver of the type discussed below, but this is very far from certain.

The group of eight arrowheads found in tomb 24 had been held tightly together, for some had fused to each other (nos.14-16 and 33-35, plate 2.6.E; Rep. IX part ii, 57 and plate XLVI). They had probably been in a quiver of some organic material, most likely leather, of which no trace survived.

The depictions of mounted archers from Dura show quivers slung behind the right leg of the rider (plate 2.6.M). They hang low, the arrows uncovered, the shaftments exposed and in easy reach of the rider’s right hand. There is no sign that they were hung from a belt. From their position they seem to be fixed to the horse harness, which was certainly the practice at Palmyra (Colledge 1976 plate 102). Little can be said about their construction. In shape they are tapered slightly from top to bottom, to allow plenty of space for the fletching at the top. They were of round rather than box section (plate 2.6.M, no.8), and would have been about 600mm high (the length of the arrow minus the fletching), and, if the depicted proportions are right, about 150mm across at the top and c100mm at the bottom. Most of the depictions show bands around the top, middle, and bottom of the quiver, with circles between. Whether these features are functional, or just decorative, is unknown. They may well be ties for bowcases (see below).

Quivers of closely similar form, slung in the same position but from a loose waist-belt, are seen on early Sassanian rock-carvings (eg, Herrmann 1977 77). One of the Dura graffiti (plate 2.6.M, no.2) shows a mounted archer apparently with a quiver slung across his shoulders in the manner more normally expected of foot-archers.
Some representations from Dura show horse-archers not engaged in shooting, and consequently without a bow in their hands (plate 2.6.M no.8). In each example, behind the quiver is an object which is almost certainly a bow in its case. From the curved rear edge of the bowcase, it is clear that the bow was unstrung when packed away. This is not strictly necessary for composite bows, which, unlike self bows can be left strung for extended periods without damage (E. McEwen, pers. comm.). The bowcase was probably of fabric or some other flexible material which could be folded up and stowed away when the bow was in use. This is confirmed by the surface appearance of the bowcases depicted in the synagogue, which looks like much-folded and crumpled cloth. It would also account for the absence of bowcases on the other horse-archer depictions, all of which show riders shooting. From its position on the horse the bowcase was presumably tied to the back of the quiver, and this is apparently confirmed by a Palmyrene relief showing a bowcase with ties (Colledge 1976 plate 43). If the interpretation is correct, and the bow is unstrung when packed away (as the shape of the bow-case seen in plate 2.6.M, no.8 implies), then the bows were evidently similar to the Yrzi bow (Plate 2.6.A), with a gentle unstrung curve, in contrast to the extreme curvature exhibited by more recent bows (plate 2.6.B, bottom right).

2.6.7 Archery at Dura

The horse-archer dominated warfare in the Middle East from the Parthian period onwards and it is no accident that all known depictions of archery at Dura show mounted bowmen, engaged in warfare or hunting (plate 2.6.M). Before Dura fell to the Romans, it was garrisoned by Palmyrene archers (Welles et al 1959 24), and under Roman domination it continued to be manned by forces largely comprised of bowmen, including the cohors II Ulpia equitata civium Romanorum sagittariorum. Its best known unit, cohors XX Palmyrenorum also probably included a high proportion of archers, although there is no clear evidence that it was entitled sagittariorum (Welles et al. 1959 24, contra Zanier 1988). However, it is pointless to speculate which units owned the arrows found in the excavation, if only because archery was a skill taught to legionaries as well as auxiliaries (eg Baity 1988 101 for a legionary archer buried at Apamea). It is not even possible to distinguish Sassanian arrows from Roman, as was discussed in part 2.6.5. The Parthians and later the Sassanians were also largely dependent on bowmen, especially horse-archers, in warfare (eg, Dio xl 15). However, some general comments may be made about archery at Dura, from the historical background and inference from the archaeological remains.

The desert archers who probably made up a large proportion of cohors XX Palmyrenorum would have been shooting with the bow since childhood, on foot or horseback. Depictions of mounted archers, shooting at full gallop often turning round to shoot backwards from the saddle (the famous “Parthian shot”; Rostovtzeff 1943a) are common in the ancient world. Such manoeuvres were spectacular, although according to Mr. E. McEwen, an experienced archer who regularly shoots from horseback, it is actually easier to shoot at the gallop than at the trot or canter, as the much smoother motion of
the horse more than compensates for the increased speed when it comes to accuracy, even in the absence of stirrups (Plate 2.6.C; see Connolly 1986 and Herrmann 1989 on the secure seat provided by Roman and Partho-Sassanian saddles).

It is likely that many archers at least fletched their own arrows, and may well have made their own shafts, but the complex wrought iron heads would probably have required a skilled blacksmith. Units like XX Palmyrenorum may well have had their own specialist arrowsmith, and probably a bowyer as well. It requires great skill and experience to make a composite reflex bow. It is a time-consuming business, taking several months from start to finish. For example, layers of tendon applied to the back of the bow each take six weeks to dry out, and there must usually be at least two such layers (information from E. McEwen, pers. comm.; Coulston 1985 248-259).

The exact method of shooting used at Dura may be identified with some degree of confidence. In most parts of the world, the bowstring is drawn back with the fingers. A particularly common method of drawing is for the first three fingers to rest on the string, with the nock of the arrow between the index and middle finger. This is the so-called Mediterranean release, which is thought to have been the one in standard use in the classical world (plate 2.6.C; Rausing 1967 28).

However, the discovery of a broken thumbring at Dura implies that the 'Mongolian release', in which the string is drawn back by the thumb, was used during the siege by one side or both (plate 2.6.C, H and L). The lack of provenance for the object seems to cast doubt on whether it really pertains to the siege or is intrusive, having been dropped on the site in a later period; the thumbring was thought not to have reached the Roman empire before the fourth century (Coulston 1985 275-8). Unfortunately the depictions, which might be expected to shed light on the matter, do not in fact do so (plate 2.6.M). All except no.1, the hunting mural from the mithraeum, are too crude to show such detail, and no.1 is damaged in the relevant area.

However, the design of the arrows prove not only that the Mongolian release was used at Dura, but also that it was used by the defenders (Rep. VI 453; James 1987). It will be noted that the traces of fletching on all the preserved shaftments extend right back to the edge of the nock (plates 2.6.I and J). If the bowstring was drawn with the fingers, holding the arrow to the string, the rear end of the fletching would be crushed, clearly an absurdity (Rep. VI, 453). In fact, in areas where the string is drawn in this way (eg, modern Europe) the fletching is stopped short of the nock, leaving a space of 25mm or more to allow the fingers to fit between vanes and string (Payne-Gallway 1907 13). Clearly the Dura arrows, many of which as we have seen certainly belong to the defenders, were shot using the Mongolian release. The thumb, of course, cannot hold the arrow, which rests on the string above it. A ring, such as that recovered from Dura, is worn over the ball of the thumb to protect the skin as the string slides over it (Morse 1885 16; von Luschan 1891).

A further problem arises from this. It is difficult to see why the arrow should not fall off the string, as it is not held in place when the bow is drawn. If the central part of the bowstring is thickened, the nock can be wedged onto it, using the spring imparted to the wings of the nock by the tendon binding.
Mr. E. McEwen finds that a knot of thread around the bowstring, against which the arrow is pushed by the thumb, is quite adequate (pers. comm.).

Finally, there is the question of which side of the bow the arrow passed. Traditionally, in England the arrow rests on the left side of the bow, with the cock-feather away from the archer's body. In oriental archery, the arrow has no cock-feather, and the bow is held upright, the arrow passing to the right of the bow. As both types of fletching are represented at Dura, perhaps both methods were used.

Such early evidence for the Mongolian release actually in use in the Roman empire is certainly very interesting, as it was thought to have reached the Mediterranean world with the Huns in the fifth century (J. Coulston 1985 275-8), even though thumbrings from China show that it was known in Asia before the Han period (Pope-Hennessy 1923 74-6 and plate 50; Rawson and Ayers 1975 63 no.171). Whether it was in general use among Roman sagittarii is unknown, but the fact that no Roman thumbrings have been identified in Europe suggests that it was confined to the eastern frontier zone, despite the transfer of many units of oriental archers to the west over the centuries. Unfortunately, the rare detailed depictions of archers from western sites do nothing to resolve the matter. The Housesteads archer tombstone lacks sufficient detail (Webster 1985 plate XVI), while the portrayals of oriental archers on Trajan's Column are as prone to the distortions of Hellenistic artistic convention as any of the other figures, and so are untrustworthy (Webster 1985 plate XXI; Watson 1969 plate 1; see also part 1.15).
2.7 Torsion artillery

The use of torsion artillery, especially in siege warfare, was standard in the Roman world. The machines themselves are in many ways quite well understood, as a result of study of surviving technical treatises (eg, Marsden 1969), of the ever expanding archaeological record (especially the work of Baatz; see below), and of experimental reconstructions at the Saalburg and elsewhere (Schramm 1980). Large quantities of what is clearly catapult ammunition have been recovered from Dura, so it is evident that artillery played a major role in the siege. Both arrow-shooters and stone throwers of various sizes were used.

2.7.1 Machines

No parts of machines were recognised in the collections. This was disappointing, given the recent spate of new discoveries and the recognition of components in existing collections (including, among others, Hatra, Gornea and Orsova, Baatz 1978; Cremona, Baatz 1980; Lyon, Baatz and Feugere 1981; Ephra, Baatz 1982; Pityus, Baatz 1988; to which may be added probable catapult washers I have seen from Burgh Castle in Norwich Castle museum). However, this is not particularly surprising. Catapults are not likely to have become buried in the siege except in exceptional circumstances like the collapse of Tower 19, and any surviving the fall of the city would very likely have been removed by the victors.

It is quite possible that some of the great quantity of unidentified lumps of metal come from casings or other parts of machines, yet to be commonly recognised. So far, the only characteristic components regularly identified are washers, iron spring frames and now perhaps winder ratchets (Ephra; Baatz 1982 227). Trigger mechanisms, for instance, have yet to be recognised anywhere and probably will not be until a machine is found complete with stock and slider.

However, some remains may have been found at Dura, but not preserved. "...Several skeins of sinew, ready made,...[were] found in several of the towers. These were about one foot long, according to Professor F.E.Brown who discovered them..." (Wright, unpublished 179). Unfortunately, there are no details other than this personal communication. No note of these was found in the Dura archive. This is particularly distressing, as if these really were from machines, they would be the first actual catapult springs to be identified. The description of their size, and the identification of the material used is too vague to draw any reliable conclusions about the size or nature of the machines involved - if indeed the interpretation is correct.
2.7.2 Artillery bolts (plates 2.7.A to AE)

A considerable number of wooden projectile shafts were discovered during the course of the excavations. One at least had an iron head attached when found (No.6, and possibly also No.26; see catalogue). These were eventually identified as bolts from light arrow shooting machines, and there seems to be every reason to accept the identification. To date, these are the only substantially complete bolts ever found, although a few fragments are known from Europe (Haltem, Dahm 1903, Schramm 1905; Vindonissa, Simonett 1942). I have identified another wooden foreshaft for a bolt remarkably similar to the Rhine discoveries, from Qasr Ibrim, now in the collections of the British Museum's Department of Egyptian Antiquities (unpublished; no. 78.3.21/52).

The known shafts and iron tips represent up to 102 projectiles.

2.7.3 Iron bolt heads (Plates 2.7.A to L)

Many loose iron projectile points were found. Most of these were socketed, while some were tanged. Evidently too heavy to be from ordinary arrows, they were variously identified as bolt tips or javelin heads. A total of 64 can be accounted for at Yale, the Higgins, and the Royal Ontario Museum. Several distinctive types can be identified. There are three main variants, i.e. socketed bodkins, tanged bodkins, and leaf-shaped heads. There is also a solitary example of a specialised type of ammunition, identified as an incendiary head.

It was not possible to weigh the pieces due to the unavailability of accurate scales, although the tremendous variation in completeness and degree of oxidation removes much of the value of such data with regard to identifying possible ammunition modules or calibres; this is discussed in part 2.7.14. However, an unspecified number of heads found in the second season weighed between 39.0g and 62.1g (Rep. II 72) while 17 found in the sixth season weighed between 50.6 and 62.3g (Rep. VI 455).

Many of the socketed bodkins had been attached to wooden shafts before deposition. Some retained pieces of the shaft, or at least traces of wood grain, in the socket (eg nos.4,5 and 9). Some just retained the fixing nail in situ (nos.1-3). Many have empty nail-holes. Some have no nail-holes at all. A group of these were apparently found together in the Palmyrene Gate, and it was suggested that they had just come from the forge, and were not yet ready for (Rep. II 7). It is noteworthy that none of the leaf-shaped tips has a trace of a fixing hole, suggesting perhaps that this is a feature characteristic of the type.

Some bodkins were damaged at the tip in a manner suggesting that they had been shot (eg No. 8).
2.7.4 Socketed bodkins (Plates 2.7.A to C and E to J)

The commonest type was the socketed bodkin, generally with an elongated pyramidal head and a split socket, usually with traces of a fixing nail. Some examples are identifiable (Nos.1 to 38 and 62). Three had heads of circular section (Nos.38-40). These may not be from artillery bolts, but may have served some other purpose, such as ferrules from javelins. Some others may also have been butts from shafted weapons. For example, the unwaisted Nos. 35 to 37 had unusually large sockets. Their similarity to an object interpreted as a groundspike, probably from a standard, emphasises the difficulty of identification (part 2.5, shafted weapons no.6). The socketed bodkin shape was used for spear butts long before the invention of artillery (Erdmann 1982). The socketed bodkin shape was used for spear butts long before the invention of artillery (Erdmann 1982). Finds of iron and bronze ferrules of this basic form from many Roman forts shows that the practice continued. But while their size and the simplicity of their shape makes the function of these objects far from absolutely certain, the small size of most of the Durene examples, and the fact that many bolt shafts and no javelin shafts were found, means that in general the identification may be accepted (Rep. II 72). The issue is further complicated by the discovery of two heads, possibly socketed bodkins, in the tower 19 countermine where they can hardly have been employed on catapult quarrels. It is possible that they were employed on makeshift weapons designed for fighting in the confined spaces of the mine (see part 2.5).

2.7.5 Tanged bodkins (Plates 2.7.C and E)

Some 13 examples were identified (Nos. 41-51 and 63-4). The fragmentary bolts from Europe also had tanged heads (see part 2.7.2). At least one wooden shaft from Dura had also had one (No.12; Plate 2.7.R). This is a very common type in the Roman Empire (see catalogue for parallels).

2.7.6 Leaf-shaped bolts (Plates 2.7.D and K)

The strange, diamond-sectioned Nos.52 to 60 might appear at first sight to be javelin heads, but their general size, and especially the diameter of their sockets, makes it far more likely that they are also from a variety of catapult quarrel. Some have distinct shoulders (nos. 53 and 58).

This type is in fact also known on Roman sites in the West (see catalogue), but is not commonly recognised as a bolt type, perhaps because it is easily confused with medieval crossbow projectile forms.
2.7.7 Incendiary bolt (Plates 2.7.D and L)

One of the most remarkable objects in the Yale collection is an incendiary head, a form of specialised ammunition for siege warfare, presumably used for destruction of siege engines or defensive works and buildings in the town (No.61; James, 1983). There can be little doubt about the identification, as it corresponds perfectly with descriptions in ancient sources (Brok 1978; Malleolus, Amm. 23.4.14-15; and in a third century context, Eusebius, F. Gr. Hist. 1015.481, 2-29).

The socket diameter matches the standard bolts found at Dura. However, it is possible that the shaft used with this head had to be longer, or needed larger flights, to overcome the destabilising effect of the additional mass and aerodynamic drag engendered by the cage and combustibles so near the front end. In any case, its range would probably have been less than that of conventional bolts due to these factors.

This find of an incendiary bolt remains unique, although bow-shot incendiary arrowheads have been known for many years (See James 1983 for full discussion).

2.7.8 Wooden bolt shafts (Plates 2.7.M to AD)

The Reports record the discovery of a considerable number of bolt shafts at Dura, at the Palmyrene Gate (Rep. I 18; II 72-3), in the Temple of the Palmyrene Gods (Rep. II 72-3) and elsewhere (Rep. III 78-9). The "18 wooden javelins" found in tower 15 were probably also bolt shafts (Rep. IV 10). The best-known examples are from Tower 19 (Rep. VI 455-6, plate XXIV,2).

Great difficulty was encountered in trying to equate objects at Yale with museum records, but most were eventually accounted for. There are 24 shafts at Yale, plus one transferred by exchange to the Royal Ontario Museum, and 2 on loan to the Higgins. The archive records that 9 were given to Damascus Museum, but no details of these are preserved. With the additional pair published by Cumont (1926 260-1), at least 38 whole or fragmentary shafts are accounted for.

No absolutely complete bolt was found. At least one (No.6), and allegedly two (No.26) were found with socketed bodkins attached, but in the former case the head is now separated and can no longer be certainly identified, while in the latter the association is dubious. In both cases, the vanes were missing.

As with the heads, it was not possible to weigh the shafts, but once again most are broken and all have had their masses significantly altered by desiccation and/or biological attack, so any statistical analysis of weight would be pointless. However, as a general guide, the largely complete but flightless shaft No.26 weighs 42.5g (J. Hayes, pers. comm.). It may well have weighed 50% more when freshly cut due to water content.
2.7.9 Head attachments

Few of the bolts are complete at the fore end. Many preserve little more than the "shaftment" (tail and flights). There are no isolated foreparts, presumably because they were far harder to recognise during the excavation, lacking the characteristic vanes.

Only a handful are well enough preserved to be certain how the iron heads were fitted. Nos. 6 (found with a head attached, although this is now lost), 17-19 and 26 were whittled into a point for a socketed head (plates 2.7.T and U). Nos. 17 and 18 bear bruising to the wood and traces of fixing nails. Others seem to have had socketed heads snapped from them (eg nos. 20 and 21; plate 2.7.V).

At least one was square-cut at the front and had had a tanged head driven in (No. 12; plate 2.7.R). One of those found by Cumont may have been treated in the same way, although the excavator thought that it had had a jointed, two-part shaft (No. 28; Plate 2.7.AB; Cumont 1926 260-1). Certainly, all the earlier bolts mentioned in part 2.7.2 were of composite construction.

2.7.10 Stabilisers

The shafts were provided with either two or three stabilisers or vanes near the tail. These were made of wood rather than feathers, perhaps because feathers simply were not robust enough to stand up to the strong accelerations experienced at launch, or the powerful forces encountered during free flight.

Those with a pair of vanes had them aligned in the horizontal plane. Triple-vane quarrels did not exhibit radial symmetry. There was a vertical stabiliser on the dorsal surface, while the other two were again in the horizontal plane. This left the entire ventral surface of the projectile free of encumbrance, evidently to allow it to sit low in the slider, helping to hold it straight during launch.

The vanes were attached by one of two methods. They were either fixed in saw-cut grooves or housed in mortices. The simplest had two vanes in the horizontal plane, pushed into sawn grooves (Nos. 14-22, 24-29; plates 2.7.S to W). These flights were cut from thin sheets of wood, the grain aligned with a backward sweep, in imitation of the barbs of a feather. The "wingplan" is also strongly swept, with trailing edges ending in points.

The most complex type had three vanes, housed in deep mortices Nos. 2-8; plates 2.7.M to P). The horizontal flights were of a single piece of wood, pushed through a mortice which pierced the shaft from one side to the other. The grain of this piece was perpendicular to the axis of the projectile. The wingplan expanded towards the rear, but was more rounded than that of the simpler type. The vertical stabiliser was in a second mortice cut from the dorsal surface down to the transverse mortice. The vane was of the same outline as the other two and also had perpendicular grain.
There are also intermediate forms. No. 23 is a bolt with only two vanes, but these are made from a single piece of wood in a mortice, while a three-vane quarrel with groove-fixed horizontal stabilisers, and a morticed dorsal was also identified (No. 6).

2.7.11 Manufacture of catapult quarrels

Unsurprisingly there is evidence that bolts were being made at Dura during the siege; presumably they were expended as fast as they could be made to keep the attackers at bay. Quantities of complete, but unattached heads were found in the Palmyrene Gate (Rep. II 7). Lacking fixing holes, they presumably awaited the boring of these ready for rivetting to wooden shafts. Iron quarrel-head 12 appears actually to be two socketed bodkins, one in the socket of the other, perhaps from such a store of loose heads. Wooden bolt shaft no. 1 lacks attachments for stabilising vanes, and likewise appears to be only partly finished.

2.7.12 Manufacture of heads

Both the tanged and socketed bodkins are extremely simple forgings, easily made from a simple billet of iron. The pyramidal point and square section tang needs no explanation. The socket was made by hammering the billet so that it thinned and splayed towards the rear end. It was then simply hammered over into a cone shape. The seam was left open, presumably both for economy of effort and to allow the socket some spring to grip the shaft tightly. As noted above some examples were found lacking holes for fixing nails, but it may be that nails were sometimes dispensed with, especially in the siege emergency.

2.7.13 Manufacture of shafts (Plate 2.7.AC).

Production of wooden quarrel shafts was a more complex affair. Several different woods were identified, ie Ash, Birch and Pine (Rep. VI 455), Tamarisk (Cumont 1926) and Maple, the latter used for vanes (Rep. VI 455). Both small branches and billets from larger logs appear to have been employed.

A billet of wood was cut to approximate length, sometimes with a saw (No. 23). This was then carved to approximate shape, with a very sharp knife, drawknife, or perhaps chisel. Varying degrees of competence and care are revealed by the surface finish of the pieces, which often show facetting. One at least still retains some bark (No. 10).
The basic shape of the shaft is a very elongated cone, expanding from the approximate diameter of the tip (c. 12 to 20 mm), up to the tail edge which sat against the horizontal catapult string at launch. The thicker wood at the tail also accommodated the jointing of the wooden vanes.

While many of the shafts are fragmentary, and distorted by post-depositional factors, there does seem to be evidence for deliberate refinements beyond this basic shape. Some longer bolts seem to be slightly waisted, expanding slightly just behind the head (Nos. 20 and 21). Perhaps more generally, the bolts seem to have been shaped so that the lower edge was parallel with the line of flight, presumably so that they left the slider at the correct flight attitude, not slightly nose-down as would have been the case with a symmetrical cone shape (see plate 2.7.AC).

The front end was cut square if it was to receive a tanged head, or trimmed to a conical point if intended for a socket. Sometimes the latter operation was very carefully executed (eg. Nos. 19(?) and 26), but often it is extremely crude, consisting of the rough whittling of a faceted point (eg Nos. 12, 18, 20 and 21). This may indicate that sometimes the end was cut as a separate operation, only when the head was fitted. This would allow for the considerable variation in the detailed shape of sockets.

The tail was formed by paring down the sides of the conical rough-out, to leave the flat-sided upright tongue against which the string would bear. The thickest part of the resulting form, now several centimetres from the rear, would house the vanes. An unfinished bolt, at this stage of manufacture, was recovered from the site (No. 1). The simplest way to affix the horizontal stabilisers was to cut a longitudinal groove in each side with a saw, and wedge the flights in. There is no indication of glue. It is a simple and elegant solution, and evidently effective. The strongly swept vanes were given thinned leading edges, which would help to reduce drag.

The alternative and slower method was to cut mortices, presumably with a thin chisel or knife. A mortice right through the bolt for the one-piece horizontal stabiliser was accompanied by a vertical one for the dorsal fin. The latter was sometimes wedged with extra wood chips because the mortice was too big (No. 2). Again, leading and trailing edges of the vanes were carefully thinned.

There is no certain case of any of these shafts being painted (although see No. 14).

2.7.14 Metrology of catapult quarrels (Plate 2.7.AD)

Metrology is a very dangerous area, requiring the most vigorous method if anything useful is to be deduced regarding measurements or modules which might have been used in the production of items such as these quarrels. We are dealing with analysis of statistical patterns which are only likely to be unequivocal with numerically large samples consisting of effectively complete pieces.

To begin with, it is reasonable to expect that there were indeed specific sizes of ammunition. It appears...
that a very common size for bolts, used in Hellenistic experiments, was a length of three spans (about 27 in, c.675mm; Marsden, 1969 38, although his source is unclear). Indeed the name became attached to a particular type of standard arrow-shooter (Baatz and Feugere 1981 208). It appears that on early machines the bolt had to be long enough for its tip to project through the small aperture in the catapult spring-frame; this was to remove the danger of the bolt bouncing back off the frame if the machine did not discharge properly (due to such factors as asymmetrically tensioned springs causing the bolt to pull sideways out of the launching groove when the trigger was released), with consequent risk to the crew. The size of the bolt therefore depended on the size of the machine, according to a system of relative proportions recorded by Vitruvius and others (Marsden 1969). However, a new catapult design with a wide frame, which appeared in the early empire, removed the need for this, as tumbling, mis-shot bolts could escape the machine safely through the frame. This allowed the bolt to be much shorter (Baatz and Feugere 1981 208); indeed the same machine could shoot bolts of different sizes if required. In the early sixth century Procopius describes artillery bolts as half the length of an arrow [i.e. 400-450mm?], four times wider, with wooden vanes and a long iron point (V,21,16). This corresponds very well with the Durene evidence.

It is likely that ammunition sizes were standardised on practical grounds even if the form of the machines, with an open slider, allowed a broad range of sizes to be shot. An overriding factor is predictability of fall of shot, a prerequisite for accuracy. This was not necessary against massed targets, but to pick off individuals, or to shoot into a small window at long range, it was essential. To achieve this it would be necessary to produce bolts to a common standard as accurately as possible, so that they would exhibit the same aerodynamic behaviour and follow a predictable trajectory to the target. Even if, in the context of the siege, rate of fire was more important than accuracy, ease of storage and handling would still encourage the employment of standard sizes.

The Dura sample of wooden bolt shafts, while constituting more than 90% of the total so far known in the Roman world, is, at around thirty measurable examples, still too small for firm conclusions to be drawn. In addition, a number of the bolts are highly fragmentary and are therefore of very limited assistance. However, many shafts are either complete, or nearly so, such that certain of their original dimensions do appear to be recoverable.

It is interesting that a number of the bolts may clearly be seen to have broken at the same point, namely just about where the shaft begins to be tapered and originally disappeared from view into the split socket of the iron tip (e.g. nos. 6, 7, 20 and 21). Other examples may plausibly be thought to have broken at the same point but are less clear (e.g. nos. 16, 22 and 23). Why this should be is not evident. It seems that it is unlikely to be entirely due to accident that so many are broken at this point rather than in the middle of the shaft (due to collapsing of the towers where most were probably found). It appears more likely that the iron heads were deliberately snapped off and the shafts discarded, perhaps during the looting of the city after its fall.

Whatever the reason, it does appear that we have some grounds for directly comparing the size of this group of shafts through the use of their shared dimension, from the tip of the tail to the beginning of
the tapered nose, which equates roughly with the start of the socket of the iron head. (Of course the heads themselves are of various sizes, and it is reasonable to suppose that any actual modules established were based on the entire length of the bolt including the head; however, the heads tend to be of broadly similar size, and if there were indeed modules it is quite likely that different sized shafts were matched with proportionate sized heads, so it seems valid at least to look at the shaft sizes in the way proposed).

The “tail-to-taper” dimension is actually hard to measure very precisely even in those cases where the knife facets are clear, as there is no sharp carination where the shaft begins to taper into the point, but a rather gradual change of profile. The figures given are therefore accurate to no better than the nearest half-centimetre. A further source of accumulative error is the fact that these dimensions had to be measured from my drawings, which themselves are on paper and not a dimensionally stable medium.

If the dimensions are noted against a scale of millimetres, a pattern emerges. There appear to be several clusters and, significantly, these are quite regularly spaced. Several other bolts can be added in, including the two intact shafts intended to take tanged heads (nos. 12 and 28), and approximate sizes can be given for two bolts with burnt tails (nos. 6 and 7). Fairly close size ranges can be assigned to the latter pair by looking at the lengths of the tail facets cut out of the more intact shafts. The result of adding these in appears to enhance the clarity of the clusters, at about 290-300mm, 330mm, 355-365mm, 395-400mm and 425-435mm. It should be noted that the increments between clusters are far larger than the ±2.5mm accuracy of most of the measurements, so they are not an artefact of the way the dimensions were measured.

It is quite evident that between these figures and the original intentions of the manufacturers lie numerous sources of accumulative error. However, if there had been strong patterning in projectile dimensions, the accumulative error would tend to blur it, making the pattern closer to an apparently purely random spread. The fact that clustering at fairly regular intervals is still discernible is evidence that there were deliberate modules, and is a fairly good guide to the increments between them. However, it must be re-emphasised that the original modules aimed at very probably included the length of the iron tip, which cannot be allowed for here with sufficient accuracy to produce significant results. Even if we could add this allowance, with such a small sample and the other problems such as shrinkage of the wood due to drying, accuracy of original measurement, accuracy of my drawing, instability of the paper etc, etc, we cannot deduce exactly what these modules were (in terms of millimetres, or, originally, Greek spans, Roman feet, or whatever).

However, it can at least be suggested that the observed pattern derives from the use of a range of fixed sizes increasing by increments of a dimension between 33mm and 36mm. This does not appear readily to correspond to any obvious known unit such as dactyls.

Even if the Dura evidence is admitted accurately to reflect several specific categories of ammunition of approximately recoverable size, it does not follow that we can conclude that there was an
equivalent number of different sizes of arrow-shooting machines (plus the stone-throwers) in use among the defenders and, perhaps, the attackers. It is quite possible that each machine used several different types of ammunition for different targets or conditions (perhaps the socketed- and tanged-headed types were distinguished for some such reason). The best evidence for this is the incendiary bolt head (no. 61). There is no reason to assume other than that this was a special type of projectile shot from an otherwise standard machine when necessary. However, its greater weight forward may well have required the counterbalancing of a longer shaft than that used for standard ammunition for the same machine.

The possibility of attempting a similar metrological analysis of the iron bolt heads was considered. However, it seems likely that if there had been any attempt to make bolt-heads according to well-defined modules, the most likely critical dimension would have been the weight of the billet from which each head was worked. These could have been quite easily kept within close confines by cutting measured lengths from iron bars of standard section. Given the difficulties and possible variations in skill of the subsequent forging, it is doubtful whether there would be sufficient patterning in spatial dimensions to detect modules; that is bolts made from near-identical amounts of iron could have widely differing lengths and relative proportions of head and socket or tang; indeed a preliminary plot of lengths showed little discernible patterning. Unfortunately the critical measurements of weight could not be made at Yale due to lack of equipment; but in fact the original weights are no longer measurable in any case, due to physical damage and especially weight changes caused by corrosion. Many of the heads contain nails and even fragments of the wooden shaft in the socket, so that the weight of the head alone could not be measured. Consequently it was judged that this avenue of approach would not produce meaningful results, even if the necessary weight data could be assembled.

Whatever may be the truth about the metrology of the Dura bolts, the tentative conclusions should only be applied to any further discoveries elsewhere with great care, as in any case Dura was a city under siege, probably manufacturing and consuming vast quantities of ammunition. The standards of manufacture may therefore have been quite untypical of those applied elsewhere, when there may have been time to sand and precisely shape bolts to an immaculate standard, like the early imperial pieces from Haltern, Vindonissa and now Qasr Ibrim (see part 2.7.2). These latter may have been the actual norm in the Roman army.

**2.7.15 Stone projectiles (Plate 2.7.AE)**

Large numbers of stone balls were recovered at Dura, and are mentioned in the Reports although only a handful actually survive at Yale, all contextless. Such balls are usually explained as artillery projectiles, although Roman troops are known to have been trained to throw stones by hand, a technique which could be very effective especially in the conditions of a siege (Baatz 1966). However, whether it was necessary for hand-thrown stones to be so carefully shaped is doubtful, and in the case of well-
formed stone spheres an identification as artillery ammunition seems preferable.

Some 35 balls said to weigh 6-7kg were found in the second season in the upper citadel and around the Palmyrene Gate (Rep. II 14), whilst others 120 to 150mm in diameter and weighing “several pounds” were recovered “close to the palace on the west side” (Rep. II 55). It seems likely that, given the considerable size and reasonable standardisation of these stones that they should be regarded as projectiles for artillery. More were found around Tower 14 and the Tower 15 ramp (presumably shot by the defenders; Rep. IV 10) and “a number of stone balls of two different sizes used by the slingers [sic]” was recovered from within Tower 16 (Rep. IV 11). Further examples were discovered in the defences at the Temple of Aphlad (Rep. V 101). Three balls of gypsum were found on House E4 (Rep. VI 28).

There is no sign at Dura of any systematic recording of the weights or other details of these projectiles, which, except for the unrepresentative handful catalogued here, do not appear to have been preserved. Little useful can be said on such thin data, beyond the unsurprising fact that stone-throwers appear to have been used during the siege.

2.7.16 Artillery at Dura.

It is clear that a variety of machines was in use at Dura, at least by the defenders, including probably at least two sizes of arrow-shooters (given the great disparity in sizes between, for examples, quarrels 19 and 22).

It is far more difficult to decide whether the attackers also employed artillery, as many bolts are not accurately provenanced, and so could either have been shot in by the attackers or dropped by the defenders.

There are grounds for thinking that the Sassanians did not use artillery as a matter of course. They lacked the professional military structure and, perhaps, the specialised technical base to maintain a regular body of artillerymen. However, there are instructive parallels. In the fourth century, the Sassanians demonstrated that they were willing and able to employ captured Roman artillery (and perhaps crews) in sieges (eg in the fourth century at Amida the Persians used artillery captured at Singara; Amm XIX 2, 7; 5, 1; 7, 4).

The historical context of the siege of Dura (part 3.3.5) makes it entirely possible that catapults captured at other centres during the recent wars could have been used by the Persians. However, the possibility that there was some local capability in the manufacture and use of artillery in at least some parts of the Sassanian empire should not be entirely ruled out. Earlier in the third century the quasi-independent Mesopotamian city of Hatra showed particular skill in its use during the Severan period (Dio LXXVI 11, 2) and a machine has been found there (Baatz 1978). Given this, it is possible that some
of the quarrel shafts are of Sassanian or at least Persian allied origin. A century after the siege of Dura Julian, besieging the Persian city of Bersabora in Mesopotamia apparently found it defended by machines (Zosimus III 18).

Nevertheless, it remains impossible to assign individual pieces to attackers or defenders. All the bolt head types except the incendiary can be shown to have been used by Rome in Europe, and also appear on Persian sites. The quarrel shafts are effectively unparalleled anywhere, making it hard to assess their significance. It is possible, for instance, that the three-vaned morticed shafts are Persian and the two-vaned grooved shafts are the Roman type, but there are too many other possibilities for this to be seriously suggested. For example, the differences could be connected with the types of machine employed, or more likely with the type of head and the length of the quarrel shaft. Length, and the form and mass of the head, would affect the amount of stabilising surface needed at the tail to ensure true flight. For example, the relatively nose-heavy, high-drag incendiary head would require more stabilisation than a slim bodkin.

Other factors, peculiar to the circumstances of the siege, may well impinge, and militate against generalisation about Roman catapult quarrels on the basis of the Dura evidence. The high rates of ammunition use which are to be expected in the prolonged and intensive fighting during the siege may well have led to cutting of corners, and employment of production methods not normally used. So, for instance, regular peacetime stocks may have consisted of the relatively elaborate morticed three-vane shafts, made at leisure as a routine duty. Mass production to replenish stocks during the siege could be responsible for the appearance of the simple, sometimes crude bolts with only two vanes. Fixing the flights in saw-cuts would be far quicker than cutting the mortices seen on some examples. It is noteworthy that the Augustan bolts from Haltern were extremely carefully finished, with complex, accurately made joints (Dahm 1903; Schramm 1905; see also evidence from Vindonissa, Simonett 1942 15, and now Qasr Ibrim, see part 2.7.2).

Little can be said about the types of machines employed, except that the archaeological evidence is compatible with the expected range of light and heavy arrow-shooters, and stone-throwing artillery. It would be particularly interesting to know whether the single-armed onager had been introduced. It was standard in the fourth century (Amm.XX,7,9; XXIII,4), but at Hatra, destroyed less than twenty years before Dura, two-armed stone-throwers were still used (Baatz 1978), showing that the new type, if already in use, was not yet universal.

The quarrels give only the barest idea of the scale of the machines that shot them, as developments in catapult design which took place early in the imperial period meant that bolt length was no longer connected to machine size by precise formulae - or at least, not the established Hellenistic formulae (Baatz and Feugere 1981 208). The distinctive characteristic of the later arrowshooters is a wide frame, placing the springs far apart, giving the gunner a good field of view and reducing the danger of mis-shot bolts ricocheting off the frame (Baatz pers. comm.). The possibility that these late, iron framed machines had arms which swung inwards, between the frames rather than outwards, has been discounted by Baatz but, in my opinion, remains an attractive possibility. Such machines would be
useful in confined spaces, such as on walls or in towers. Catapults could be as dangerous to their crews as to the enemy; Ammianus records an accident with an onager (Amm XXIV 4 28); the inswinging design would considerably reduce such risks.

Most of the Dura shafts represent bolts about 0.5m long, from medium or light arrow-shooters, which were small enough to be easily moved, if not wielded by one man like a crossbow, hence their name, manuballistae. A dramatic eyewitness account of their portability and firepower is given by Ammianus. During the siege of Amida a tower captured by Persian bowmen was swept clear by five light arrow shooters, which decimated the bowmen, sometimes killing two with one bolt (Amm. XIX,5,5).

The unusual leaf-shaped bolt heads strongly resemble medieval crossbow projectiles. This may not be coincidental. It is entirely possible that conventional crossbows, drawing their power from a stiff, conventional bow rather than torsion springs, were in use at Dura. (Wright suggested crossbows on the spurious grounds that the wooden quarrels were not strong enough for torsion catapults; unpub 178). Certainly crossbows are clearly depicted in third century reliefs from Gaul (Esperandieu 1908 nos.1679 and 1683; Coulston 1985 259-263). Components from such machines, namely the characteristically shaped trigger nuts, have tentatively been identified from Roman sites (at Carnuntum, RLO 10 1909 63 fig 22 no.5; Macgregor 1976). Torsion artillery itself developed from heavy crossbows such as the gastraphetes (Marsden 1971 97 and diagram 5). There is no evidence that crossbows were used in the intervening centuries, although they appear in Vegetius (II,15 and IV,22). Baatz has suggested that they were not put to military use, but his grounds are unclear (1966, footnotes 56 and 62). A further interesting possibility is that the interest in the crossbow may have been reawakened in early imperial times as a result of indirect contacts with Han China, where the crossbow was highly developed (Horwitz 1917).

The Chinese developed exotic weapons such as the repeating crossbow, with a lever mechanism and gravity fed magazine on top of the slider (Horwitz 1917 174-6, Abb.32-34). Repeating catapults using the same principle were known in Hellenistic times (Marsden 1969 75), so it is possible that such weapons were employed at Dura. Certainly the Hatrenes are reputed to have had machines which fired two bolts at once (Dio LXXVI,11,2). It is interesting to note that the bolts with only two vanes would be suitable for a gravity-fed repeating ballista, or crossbow.
PART 3; ANALYSIS

3.1 An overview of the assemblage

The assemblage of weapons and armour from Dura is impressive, but it must be remembered that it is only a tiny sample in relation to the total which must have been present during the siege. Of course it is also a sample biased towards durable materials, and in many areas sufficiently small to raise suspicion that the absence of certain expected categories of items is due to chance. Nevertheless it has proved possible to extract a very large amount of information from what remains, and the immediate observations and conclusions relating to each class of weapon have been explored in the foregoing thematic chapters. What follows is a consideration of the attribution and significance of the collection as a whole.

3.1.1 Wright’s view of the assemblage

First it is necessary to consider Donald Wright’s ideas regarding the significance of the assemblage (which he seems to have regarded as essentially Roman), because his is the only considered overview of the material since the original excavations. Moreover his conclusions, or perhaps rather the views expressed at various points, use terminology similar to my own but with very different meanings. Consequently it is necessary to examine them to distinguish them from my own views.

He worked under a number of presuppositions which were not explained or justified, but which coloured his approach to his rather sketchy analysis of the Dura armour. (It is, however, of paramount importance to remember that he was writing before the seminal work of H. Russel Robinson who triggered the subsequent explosion of research into Roman arms - including my own work.)

Firstly Wright believed that there were “pure” Eastern and Western traditions of armour (unpub. iv), by which he apparently meant that he believed that Roman legions transferred to the East ceased to develop their equipment but became frozen in the style of the Early Empire. There were special developments in the East such as heavy cavalry (unpub. vii), but he believed that the East became progressively more old-fashioned, and did not keep up with supposed advances in the West. “...It seems certain that the material which is easily identified with the Western [by which he apparently means European Roman] tradition is often of a type which is older than the armour of the same class used in the West at the same time” (Wright unpub. vi). He explained this supposed “time lag” in terms of the distance of Dura from the “center of Western military developments”, assuming that it would take long periods for improvements to reach the Eastern frontier.
The basis for this interpretation is unclear. Presumably it derives from a combination of factors, including the ancient contempt for the Eastern army which still colours modern thinking (see part 1.5), and perhaps an unconscious assumption that all good things must come from the West. This “occidentocentric” view was apparently supported by Wright’s conception of the types of equipment in use in the West at the time of the fall of Dura, particularly armour.

It is clear from his analysis that he held a number of basic beliefs about the history of Roman armour. He thought that mail had been the standard in the Early empire, but that it had been progressively replaced in the West by scale, and most notably by lorica segmentata among the Western legions, and that the latter in particular was the “up-to-date” armour in the mid-third century (unpub. 63-4). The absence of segmentate armour, and the presence of considerable quantities of “obsolete” mail (which he apparently thought belonged to Eastern legionaries still using early Imperial patterns of equipment; unpub. 63-4; 221) therefore demonstrated the old-fashioned nature of Eastern equipment.

Other elements, such as the existence of the scutum were employed to support his view (unpub. 77), although the “up-to-date” nature of the sword types, and in particular the big oval shields did not fit and puzzled him (unpub. 108, 78).

Wright’s interpretation rested on a fundamental misconception of the history of Roman armour, which is now much better known; or at least, we better understand the areas of ignorance. No-one would now argue that mail was declining in use and being replaced by scale or segmentate armour in the third century. The current picture, on the contrary, is of the disappearance of lorica segmentata in the early part of the third century, with mail and scale once more predominating. According to this view, Dura is perfectly up to date with developments elsewhere. The scutum is the only hint of “old-fashionedness”, and again this might be a result of our limited knowledge of shield-types and their use in this period. In view of this, Wright’s analysis must be regarded as ill-founded.

3.2 Attribution of equipment to combatant forces

During the course of the present study it was hoped from the outset that it would be possible to assign the weapons to the combatant forces, to gain an appreciation of the arms of the Eastern Roman defenders and perhaps the Persian attackers. It was intended that this separation would be achieved as far as possible on grounds, and in part this has proved feasible. This is most notably the case with the tower 19 assemblage, and also the underlying mine material, which on spatial grounds can reasonably be divided between Romans on the one hand and a Persian with his weapons on the other.

However, much of the remainder proved to be lacking in satisfactory provenance, but it was still hoped to assign most of it by comparison with parallel material, from the Roman Empire on the one hand and Persia on the other. This again has to some extent proved successful. Much of the material
may reasonably be identified as Roman because of the existence of European Roman military parallels, both of forms (eg many of the helmet fragments) and classical decoration (eg sword fittings). Contemporaneous depictions from beyond the site have also helped, for example in elucidating the form of Sassanid sword fittings.

Even so the overall picture has proved to be more complex. Some of the material is almost certainly residual, most notably the bronze arrowheads. Some of the rest of the unprovenanced material may well predate the siege, but it is unlikely that this applies to very many pieces; it appears that rubbish was not much allowed to accumulate inside the town, which according to the published accounts exhibited no great depth of stratigraphy during the excavations, except around the defences where the emergency rampart had recently been thrown up.

Other material is not readily paralleled, such as the reed shields. It is tempting to regard anything not identifiably Roman as consequently Persian, but closer scrutiny shows this to be very unwise. Many of these items may be unparalleled in Roman Europe solely due to survival, eg 1 shields. The leather cuisses can only be assigned to the Roman side on grounds of context; their only parallels are in Central Asia.

Of still greater significance is the fact that, even if items can be paralleled at Roman fort sites in the West, they may still not be certainly Roman. This applies particularly to plain, functional items like scale armour. While scales may be exactly paralleled in Europe, we do not know for certain that exactly the same basic forms were not widely used in Persia; mail was certainly used by both sides, as depictions show. This is a fundamental point. We are actually profoundly ignorant of most aspects of Sassanian arms and armour, in archaeological terms; we know less of them than was known of Roman weapons 200 years ago. Until far more armour is excavated from well-dated, unambiguously Persian contexts, we cannot be certain of the "Romanity" of much of the armour from Dura. Indeed, similar arguments apply to many other items, not least artillery bolts. It is believed on historical grounds that the Persians did not normally use artillery.

This brings us onto further, deeper problems. Such discussion as there has been in the past has tended to assume that the arms are those of the Roman garrison, with a small contribution from the attacking Persians, most notably the sword, mail shirt and helmet from the tower 19 countermine. But what, in this context, do these "ethnic" terms mean? It is easy to assume that, for example, the Sassanian army was homogeneous in the way that the Roman army is still often (erroneously) imagined to have been. However, our limited knowledge suggests that nothing could be further from the truth, and that Persian royal armies consisted of contingents from all parts of the empire, from Central Asia to Mesopotamia (Frye 1983 154; Lukonin 1983), so that a wide range of local traditions and styles is to be expected. Even when one can be fairly confident that an item at Dura belongs to the attackers (eg the countermine helmet), to which of these presumed but unattested contingents may it have belonged? A Mesopotamian, an exiled Armenian, a Persian grandee?

And indeed similar arguments can be applied to the Roman garrison. In this context the surviving
documentary material, discussed below, shows that in much of the third century the Durene garrison consisted of troops from the semi-independent desert state of Palmyra. Might not some of the more exotic items, such as the rawhide shields, belong to them rather than the attackers?

To this one must add the further possible complication of the question of captured equipment. Had the leather scale cuisses and the armoured trappers not been found in a context sealed before the city fell, it is very likely that they would have been labelled as Persian, on the grounds that they are either unparalleled in the Roman empire (eg the leather cuisses) or a form of armour otherwise only certainly known among the Persians at this date (eg the armoured trappers). And indeed in strict terms, the context shows only that they were in Roman possession at the time of the fall of the city; it is possible that some of these items were actually pieces captured from the Persians; the strange case of the artillery bolt shot into trapper 3 makes the point. Either this trapper was captured from the Persians, or the Persians did indeed have artillery after all, with projectiles identical to those used by the Romans. A further alternative is that they used captured Roman artillery, and it is even possible that a nervous Roman sentry shot at a friendly patrol. This example is very hard to interpret, but does serve to emphasise that the story behind the deposition of the assemblage is likely to be much more complex that might usually be assumed, and to be far beyond detailed recovery by archaeological means.

Attribution of archaeological material to ethnic groups is of course a general problem fraught with difficulties, and the risk of circular arguments and non-sequiturs. The way forward for a deeper and more secure understanding of the ownership of the Dura armour is for much wider excavation and research on the Roman and Persian military sites of the Middle East. In addition there needs to be a careful cumulative construction of a case for what constituted the repertoires of arms of the various peoples during the early centuries AD, a background against which Dura can be usefully compared.

### 3.2.1 Roman regional identity and orientalisation

If we except that, despite the caveats, much of the material can indeed be paralleled in Roman Europe and can be shown or may be assumed to belong to the defenders, how does it compare with known Roman assemblages elsewhere? Specifically, can we find signs of orientalisation, and local fashions? This was one of the most important questions posed at the beginning of the study.

Unfortunately the answer is far from clear. There are areas of complete identity between the Dura assemblage and the European background, for example in the design of so-called auxiliary cavalry helmets (helmets 2 to 6) which are quite indistinguishable from those found in the West. The same applies to many of the sword-fittings, which have a distinctive repertoire of shapes and decoration. Oh the other hand, there are some interesting differences between Dura and the generalised European background. For example, there are no bone box-chapes, a type common in Europe. Is this because the type was not used in the East? It is equally possible that it was confined to units not present at Dura; or that it had gone out of fashion; or that it is absent solely due to the chances of preservation,
and the type was in fact known at Dura. Sadly, even with such a large assemblage, each class of artefact is represented in numbers insufficient for statistical certainty. The virtual absence of spears and javelins from the assemblage indicates that it is possible for whole classes of arms to virtually disappear (or completely vanish, in the case of catapults), so it is dangerous to rely on absences.

As has been seen, many of the more spectacular pieces are organic, and cannot be paralleled in the West because no complete shield boards, or armoured trappers, or even whole catapult bolts, survive in Europe, thus ruling out comparison.

An important potential source of information regarding military fashions and influences are the small bronzes, the fibulae, belt fittings and other items found at the site (Frisch and Toll 1949; For early crossbow brooches, which at this date are not certainly items of military uniform, see Zabehliky 1980). These need not be considered here in detail as they are for the most part not strictly arms and armour and have already been published. Nonetheless such items as brooches and belt fittings are often thought to be stylistic indicators which may be specific to certain regions and times. It is among such items that local fashions might be most easily detected, and indeed they have been in the West (Oldenstein 1985 85).

One of the particularly striking points about the Dura assemblage of such pieces is how similar they are, individually and collectively, to material from military sites in Britain, and on the Rhine and Danube frontiers (Frisch and Toll 1949 1-2). It has been observed that if a small finds specialist was given this assemblage and asked to guess where it came from, he or she would place it on the Rhine or Danube frontier with little hesitation (C. Johns and V. Rigby, pers. comm.). Perhaps the most striking examples are the enamelled and trumpetform pieces, in techniques and styles which are thought to have originated in Britain or perhaps Gaul (Frisch and Toll 1949 3-5, nos 1-3, 9, 17, 31, 69, and others). Were such pieces largely imported from Europe and copied locally (Frisch and Toll 1949 1-2)? Or did local fashions spread rapidly around the empire, perhaps partly by personnel movements (Oldenstein 1976 77; 1985 85-6; see below, part 3.3.7)?

A further possible avenue of investigation is to look at depictions of soldiers from the site. Of the many depictions of soldiers at Dura, few are to be heavily relied on as authentic and accurate representations of the appearance of the garrison because most are crude graffiti or show signs of “contamination” by artistic conventions (see part 1.15).

The clearest depiction of Roman troops is the famous mural in the temple of the Palmyrene Gods showing Julius Terentius, tribune of cohors XX Palmyrenorum, conducting a sacrifice (Plate 1.E). The following description is based on Cumont’s publication. The mural itself is at Yale, but early conservation efforts have made it hard to see details today.

Evidently there are conventional elements in the scene (the figures of the three gods and the Tyche), and the scene is arranged with a frontal formality and rigidity which is certainly at home in the East, but which was within a couple of generations to become a standard feature of Tetrarchic imperial
Nevertheless the details of the uniforms of the soldiers tally perfectly with those represented on the fine military tombstones of the third century from Europe (Oldenstein 1976 Abb.13-14; Speidel 1976; Coulston 1987) and now from Apamea in Syria (Balcy 1988). The simplest solution is that the figures of Terentius and his soldiers were indeed drawn from life, and show that the Dura garrison wore the same general type of uniform as the rest of the Roman army in the mid-third century.

The men do not wear armour, but the so-called “camp dress”. Around the waist is the military belt (cingulum). This again appears to be the standard type of the period, with the characteristic strap ends, probably drawn through a central ring-buckle, tucked back into the belt and allowed to hang in a shallow loop on each side. Terentius is clearly wearing a broad baldric, again of red leather, perhaps with an intricate metal fitting picked out in white (unless it is chipping on the painting). From this is suspended a sword, the hilt and pommel of which is apparent below the left arm. The top of the pommel is just level with the armpit. The rest of the sword is obscured by the folds of his cloak, but it may be assumed to be a spatha. Several other soldiers are evidently wearing bradrics of brown leather. Cloaks are universally worn, pinned by a fibula of unclear type at the right shoulder.

The painting, believed to date to the 230s (Rostovtzeff 1938 72; Rep. IX,1 176-185), shows that at that time the garrison were wearing perfectly standard Roman military uniform, such as that seen on contemporary tombstones, and even depicted on the Persian monuments. Indeed Rostovtzeff (1938) noted that Terentius and his men are dressed in Roman fashion, but wondered if these are infantrymen, with perhaps the cavalry of XX Palmyrenorum dressed in oriental outfits. It seems to me likely that this mural shows that even an “ethnic” unit like XX Palmyrenorum wore standard Roman uniform; however, this does not guarantee that their fighting equipment was not of oriental design.

The overall subjective impression is of a solid Roman assemblage the components of which, the remarkable organic elements excepted, would excite little surprise if found in Europe. Perhaps some hints of “Syrianization” are to be seen in the style of the shield paintings, and in the iconography of the Warrior God shield (shieldboard 3) and the unusual figure on cuirasse plate 4, but otherwise the exotic appearance of the assemblage may just be due to the unusual preservation; perhaps not only horse armours, but bossless oval shields and even rawhide shields were known on the Danube. It is worthy of note that even the strange laced leather armour could well have been common in third century Roman Europe; perhaps this is a Roman adaptation of an oriental technique, just as lorica segmentata is thought to have been. On monumental representations such armour would be virtually indistinguishable from scale.

Such local differences and specialisations as there may have been are likely to be due to the exigencies of the local tactical environment and climate on the one hand, and to the peculiarities and origins of the constituent units of the garrison on the other. The question of the constitution of the garrison at the time of the siege has been much discussed, and it is to this that we now turn.
3.3 The composition of the Roman garrison

To understand fully the Roman arms from Dura, it is necessary to try to identify the types of troops, and if possible the regiments, which used them. Much is known about the history of the garrison at the city. Considerable quantities of epigraphic material were discovered, and, most unusually, many papyri came to light. The names of the various units and contingents are known, as well as much about the establishment and routine of one of the units, the cohors XX Palmyrenorum. The possibility that the various types of weapons might be related back to the garrison units is now considered.

3.3.1 Direct evidence

It is quite common for items of bronze equipment found on European sites to bear punched or scratched identification labels giving details of the owner's name, and perhaps rank, post, century or turma, and unit (MacMullen 1960). Examples occur on helmets, shield bosses (eg the umbo of Junius Dubitatus of Legio VIII Augusta from the Tyne at South Shields, or that of Verus the capsarius from Mainz). Inscribed bronze studs and tabulae ansatae from other equipment are also occasionally found (Oldenstein 1976 190-3 Tafn. 59-61, nos. 741,744, 755-779). Leather shield covers are also known to bear labels (eg from Valkenburg; Groenmann-Van Waateringe 1967 56-7, No.6, Fig.10).

Unfortunately, no such identifying inscriptions have been found at Dura so far. This is not necessarily significant, in that only a handful of objects might reasonably be expected to bear them, ie the bronze umbones, but only two or three of these are well enough preserved for any inscription to be visible. There were no complete bronze helmets. A fragmentary inscription was seen on the scutum at the time of its excavation, but it was indecipherable and is now invisible (Rep. VI 466).

An alternative approach is to use the types of equipment represented as a guide to the units stationed in the town. Obvious points here are the presence of rectangular scuta, traditionally regarded as the characteristic defence of the legionary; helmets normally identified as cavalry types, perhaps to be linked with the presence of horse-armour and cuisses in Tower 19, and the “cavalry sports” cuirasses, all of which seem to point towards a substantial presence of mounted troops; the large quantities of arrows and artillery bolts, which according to conventional thinking would suggest auxiliary archers and legionaries manning artillery. This picture of a mixed garrison superficially accords well with what is known from the epigraphic and papyrological evidence.

3.3.2 Documentary evidence

The rich find of military papyri has been fully published (Welles et al. 1959). Unfortunately the final report on the inscriptions has not appeared, but the military ones have been provisionally published.
in the *Preliminary Reports*. The evidence for the composition of the garrison which these sources provide has been discussed elsewhere (Rostovtzeff 1938; Welles 1951; Welles et al. 1959; Dabrowa 1981).

Dura was a Roman garrison town for about ninety years, a period which breaks down into two distinct phases. The earlier, from the annexation of the city in 165 to the reign of Severus, saw a small garrison in the city, apparently consisting of a body of Palmyrene archers. These do not appear to have been part of the regular army, but seem to have been *symmachiairi*; they are not mentioned later and it is possible that they came to form the nucleus of the later *cohors XX Palmyrenorum* (Welles et al. 1959 24, 26-7).

The second period was marked by a major expansion of the garrison in the last years of Severus and the reign of Caracalla. The entire northern quarter of the city was taken over by the military. The zone was walled off, and the blocks of private houses turned into barracks or demolished to make way for military buildings such as a *principia* (the so-called *praetorium*), an amphitheatre, baths and ultimately the palace of the *dux ripae* (see Rostovtzeff 1938 24-5 and note 14; Dabrowa 1981; Welles 1951 257-8). The amphitheatre, a somewhat ramshackle affair made out of a single insula to avoid impinging on the pre-existing street grid, appears to have been unable to hold more than about a thousand men (*Rep.* VI 76). These spatial constraints mean that it can be no reliable guide to the size of the garrison.

Legions other than those of Syria left inscriptions at Dura at this period. These included elements of *III Cyrenaica* (*Rep.* IV 68-71 no.168), and possibly *X Fretensis* (Welles et al. 1959 25). However, these units are not attested at the site later, so it is thought that they were temporarily stationed at Dura in connection with Caracalla's Eastern operations, and did not form part of the later "peacetime" garrison.

### 3.3.3 The structure of the garrison, from AD200 to the 250s

*Cohors II Ulpia equitata civium Romanorum sagittariorum* was apparently stationed at Dura from the time of Commodus onwards (inscription dated AD185-192; Welles 1959 24 note 5, and 26; *Rep.* I 32-4; *dipinto* dated 194, *Rep.* V 226-9 no.561).

Elements of the two legions of Syria Coele, *IV Scythica* and *XVI Flavia Firma*, are mentioned at Dura over an extended period. Legionaries from these units built the Middle Mithraeum in 209-211 (*Rep.* VII/VIII 85-6, no 847). *Legio XVI Flavia Firma* is last mentioned under Gordian (Welles et al. 1959, document 43). Part of *IV Scythica* was stationed at Dura in 254, soon before the siege ("the local vexillation of legio IV Scythica [Valeriana] Galliena"; Welles et al., 1959, document 32).

Exactly how many legionaries were at Dura at any given time it is impossible to say on this meagre
evidence. The size of a vexillation was highly variable; figures of 1,000 or 2,000 men are attested in this broad period (Saxer 1967 119; Holder 1982 40. These mainly refer to campaign vexillations, although semi-permanent garrison vexillations appear as early as the reign of Hadrian, in Africa, Saxer 1967 127). Presumably such figures represent whole cohorts, two and four respectively. It seems unlikely that any garrison vexillation at Dura would consist of less than a cohort of a single legion, and it is barely credible that there could have been as many as a four-cohort vexillation from each legion. This gives us a credible range of about 500 to 4,000 legionaries at Dura, with the most likely strength being 1,000 to 2,000 men.

The best known unit at Dura, which we may be sure was permanently based there as it is mentioned several times from 208 onwards and part of its archives were found in the city, was cohors XX Palmyrenorum (Welles et al. 1959 26-8 etc; Kennedy 1983). It was a milliary cohors equitata of unusually large size, according to its records; its strength approached or exceeded a thousand, at least at times, and it included a small number of dromedarii for good measure (Welles et al. 1959 30-1 and documents 82 and 89; Document 100, as reconstructed by Welles, may represent a strength of about 1200 men). It may have been styled sagittariorum but this is doubtful (Welles et al. 1959 26 note 1).

Its apparent importance as a part of the garrison may be overestimated as a result of its largely fortuitous and disproportionately strong representation among the written records. It seems that the principia (the so-called praetorium) was reserved for the legionaries (Rep. V 216, 219). The headquarters of XX Palmyrenorum was relegated, apparently, to the requisitioned Temple of Azzanathkona (Rep. V, 216, 219). The garrison was therefore probably larger than has often been thought, with XX Palmyrenorum as only one of several elements.

The latest reference to XX Palmyrenorum is a list of men and mounts. One of the men lost his horse on a date equivalent to August 31, AD251, so the document may be placed soon after (Welles et al. 1959, document 97). It is generally assumed that this unit was still in residence a few years later at the time of the siege, during which it was presumably destroyed (eg Welles et al. 1959 27).

It is possible that cohors II Ulpia equitata was also still in garrison in the early decades of the third century, but dated references to it are absent after AD194. This is before XX Palmyrenorum appears in the records, so it may well be that the latter replaced II Ulpia, taking over the temple headquarters (Rep. V 229).

Other units mentioned at Dura do not seem to have been part of the garrison, but were probably stationed nearby (cohors III Augusta Thracum mentioned in 227, P.Dura 19, see Rep. VII/VIII 433-441; cohors XII Palaestinorum in 232, P.Dura 15, see Rep. VI 433-5).

On the other hand, it is also clear that at times, if not regularly, elements of XX Palmyrenorum were outposted elsewhere, for example at a location called Becchufrein (Welles et al 1959 27, docs 100, and 101; Fink 1971 15). This has been plausibly identified with the recently excavated fortress.
downstream at the modern site of Kifrin, which was destroyed in the 230s or 240s (Invernizzi 1986, 1989).

Recently Speidel has argued that the Dura garrison at the time of Severus was an elite force, and that the only effective troops that the emperor had available at the siege of Hatra were not, as usually translated, “European” but from [Dura-] Europos (1984, esp. 307-9); the point turns on the reading of an inscription from Dura, and especially on interpreting Dio, and his theory has been attacked by Kennedy (1986). Whatever the true identity of the troops at Hatra, it appears that Dura’s Cohors XX Palmyrenorum was indeed an unusual unit, in terms of its size and also its unusual pattern of recruitment. At least from 219 to 222, for which period records survive, all recruits and transfers to the regiment first served as singulares of the provincial governor, where presumably they underwent particularly exacting training before posting to Dura (Speidel 1984 308).

It is clear that by the 240s the Dura garrison was a large force and the kingpin of an extraordinary new command, that of the dux ripae (Gilliam 1941 158; 174). This post foreshadows the territorial ducates of the fourth century, and seems to have been a local command over the forces of the frontier between Syria Coele and Persia. However, it differed from the later commands in that it was apparently confined to a single province (there is no indication that the dux had authority over troops in Mesopotamia), and that the dux was subordinate to the provincial governor (Gilliam 1941 165; 169-70). It is likely that this command was established because the provincial and legionary commanders were based so far to the rear; it ensured that, with incursions likely at any time, there was a unified local command structure allowing quick response rather than constant referrals to Antioch with attendant delays.

To summarise, the Dura garrison of say, the 230s and 240s cannot be listed in detail, but appears to have consisted of a powerful, perhaps elite force, a quick-reaction mixed brigade under the dux ripae (Gilliam 1941 170-1). It seems to have comprised standing vexillations of one or both Syrian legions, IV Scythica and XVI Flavia Firma; the document of 254, mentioning the “local vexillation” of the latter, suggests they were more-or-less permanently detached (Welles et al 1959 doc 32; this process foreshadows the gradual fragmentation of legions over the following century). So, we may assume 1,000 to 2,000 legionaries (perhaps more at times), plus the extraordinary milliary cohors XX Palmyrenorum, with the possibility of vexillations of other auxiliary units, maybe only in times of emergency.

This is a very substantial force, of the order of 3,000 men at a guess. This broad estimate is supported by a consideration of the size of the military encampment at Dura, which is approximately 10ha, about half the size of a legionary base. Clearly this is the crudest of guides, as the camp was full of converted buildings and so may have housed densities of troops very different from those of purpose-built forts; however, when one also considers other accommodation such as the wall towers, the citadel, and the fact that “private” houses were also used for billets (Welles 1951 259-60; Dabrowa 1981 65-6), it is clear that Dura housed thousands, rather than hundreds, of troops.
3.3.4 The garrison at the time of the siege

There seems to have been an implicit assumption in the past that the garrison which was caught in the siege and destruction of the city was essentially the same as the "peacetime" complement discussed in 3.3.3 (eg Welles et al. 1959 27 on XX Palmyrenorum; Wright, unpub, 216, 221-2). However, there are strong grounds for challenging this supposition.

The siege itself was a single episode in the series of wars which raged on the frontier during the mid-third century. Dura was part of a much wider military picture, in which Persian invasion threatened repeatedly. Under these circumstances, rapid and frequent redeployments of units are to be expected, as the Roman command attempted to forestall or respond to military action by the Shah. It is very probable that the garrison of such an important strategic centre as Dura was affected by this, with various elements arriving or being withdrawn.

Late changes in the garrison have been suggested before. In AD251 an altar inscription records the arrival of vexillations of cohors II Paphlagonum and cohors II Ulpia equitata, the latter evidently now based elsewhere (Welles et al. 1959 25-6). This indicates that reinforcements may have been transferred to Dura, but how many and for how long is unknown.

Furthermore, the dated papyrological and epigraphic evidence stops short of the date of the siege. The latest mention of legionaries is in AD254 (Welles et al. 1959 document 32) while cohors XX Palmyrenorum is not attested after late 251 (Welles et al. 1959 document 97). Any changes in the garrison in, say, 254 or 255 have left no trace.

At a more immediate level, there is the likelihood of tactical redeployments as the Persians approached the city (assuming they were detected). The cavalry would have been vital to monitor the Persians' approach, but would have been a liability if shut up in the town during the siege. It is likely that cavalry units would have been withdrawn upstream when an attack on the town appeared imminent. The presence of horse-armour in Tower 19 is not an objection; it has been argued that the bardings were damaged and awaiting repair, and so were of no use at the time. Other items of presumed cavalry equipment found in the city may simply have been pressed into emergency use (eg the helmets and "cavalry sports" cuirasses). Alternatively, the common view that these latter items were used solely by horsemen may be too narrow, or just wrong.

This latter point emphasises the fact that the types of weapons deposited at Dura are, on close inspection, no trustworthy guide to the kinds of troops present. Widespread use of bows, for example, does not prove the presence of auxiliary sagittarii, for at least some legionaries were trained in archery (for the tomb of a legionary archer at Apamea, see Balty 1988 101). In any case, in a siege anyone capable of shooting may well have been pressed into service. Conversely, use of artillery need not imply legionaries (such as the legionary artilleryman buried at Apamea; Balty 1988 101); by the third century, auxiliaries also seem to have used it at High Rochester at least. It has been argued that this was the exception that proved the rule, but Baatz's arguments seem to be based on absence of evidence,
and are largely derived from what is known of the West in the first and second century AD (Baatz 1966). This may not apply to the sketchily-understood and very different tactical situation at Dura in the third century.

The presence of several rectangular *scuta* is actually more of a puzzle than a guide. While apparently an indicator of legionaries, all the representations of these troops from the early third century show them with large oval shields (see Coulston 1983 plates 1 to 3). This change was underway in the mid-second century, as the Column of Marcus Aurelius shows; the only legionaries with rectangular shields on its reliefs are in *testudo* formations. The retention of rectangular shields at Dura a century after they had gone out of fashion in Europe is curious. It has been suggested that the painted example from Dura is an isolated survival, but the identification of two others in the assemblage rules this out.

The problem is complicated by the decoration on the *scutum*, which is not the traditional legioinary thunderbolt symbol, but a composite design closer to auxilary devices on Trajan’s Column (Florescu 1969 abb. 41). Is this therefore an auxiliary shield? At least one unit of auxiliary *scutarii* is known (CohorsII Hispana scutata Cyrenaicum, mentioned on a diploma from Rumania, CIL. 16 110, AD154; M. Roxan pers. comm.). Several explanations present themselves. Perhaps it may yet be shown that in certain respects the Eastern army was “old fashioned”, as Wright believed (unpub. 77 etc). Alternatively, perhaps this type survived in the East because it was especially useful, as a defence against arrows or for some such reason. We cannot ignore the other possibility that some were simply retained as parade pieces, as splendid and as functionless as the bearskins of the Brigade of Guards today. The Praetorian Guard retained archaic ceremonial armour well into the imperial period; on the Cancellaria reliefs they are shown in Attic helmets and carrying republican oval *scuta* (if the depiction is trustworthy; see part 1.15). The other painted shields, and the many “cavalry sports” helmets from the Empire show that Roman troops were addicted to such impractical display.

Evidently, the arms themselves can be very misleading at Dura. By the third century, the equipment of auxiliaries and legionaries had converged, with longsword, round shield, spear and mail or scale armour common to both. This was part of a more general trend of convergence as *auxilia* became more Romanised; in the third century, they were effectively an all-citizen arm. Well before the siege of Dura, it became difficult to distinguish legionaries from auxiliaries by their equipment. Indeed, it now appears that the distinction between the two was never as hard and fast as many modern interpretations of Trajan’s Column have assumed (on this see Maxfield 1986; Coulston 1989).

To summarise, neither the epigraphy, papyrology nor the arms themselves give reliable information on the constituents of the garrison during the siege, ie the men to whom the weapons belonged. There is an unbridgeable gulf of several war-torn years between the available documentary evidence on the one hand, and the archaeology of the armour on the other. It is not possible to identify unit types, let alone name the contingents. These conclusions are emphasised when the historical background to the siege and the deposition of the weapons are looked at in more detail.
3.3.5 The historical context of the siege

The evidence for the date of the siege is complex, and not our immediate concern. The arguments were considered in James 1985, where it was concluded that the archaeology does not permit the siege to be fixed to a particular year, but it seems to have occurred probably in 255 or 256, possibly in early 257, with late 254 just feasible but unlikely. Using the same evidence, Macdonald has tended towards 257 as the most likely date (1986 63-4). However, this depends on numismatic arguments, namely how one assesses the date of the third and fourth issues of radiates of Valerian from Antioch, which are floating between the dated second issue of 254 and the fifth issue of 257. The latter does not appear at Dura. Macdonald assumes yearly issues, so the fourth issue, which is attested at Dura, would have been minted in 256. Allowing for some delay in the coins entering circulation at Dura, Macdonald concludes that the siege was in 257. However, one may dispute the extent to which such delayed circulation occurred, and in any case it is not a very safe assumption that the fourth issue appeared in AD256; it could have appeared at any stage between 254 and 257 (James 1985 121-2). It remains much safer to assign a fairly broad time-bracket for the fall of the city, say 255-7 (James 1985 121).

The sources and modern research on the historical context of the siege are also considered in James 1985 and now Macdonald 1986. It seems beyond question that the capture of Dura by the Sassanians is mentioned in Shapur’s inscription on the Ka’abah of Zoroaster at Naqsh-i-Rustam (a document referred to as KZ). It was apparently listed as one of the towns taken in Shapur’s second war with Rome which consisted of a major invasion of Syria, the alleged destruction of a Roman army at Barballissus and the capture of Antioch and thirty other cities. The Battle of Barballissus is not mentioned in any Western source, and the date of the second war is disputed. The best, but by no means certain interpretation is that of Baldus (1971), which is followed here. According to his view, the invasion took place in AD253, while there was no emperor in Syria. The Roman provincial garrison was caught unsupported at Barballissus and smashed. Antioch fell in this “Blitzkrieg”, which became a major looting expedition as Shapur ransacked cities and withdrew before Rome could react.

The date of 253 certainly conflicts with the evidence from Dura, which cannot have been destroyed before 254 (Welles et al 1959 doc 32). In fact, the work of Rostovtzeff (1943), Sprengling (1953) and Baldus (1971) has made a good case for the destruction of Dura being separate from the main invasion. The mention of Dura occurs in a short list of cities appended to the account of the second war on KZ, which according to current thinking represents an abortive follow-up campaign after the main invasion (Baldus 1971). The Dura evidence suggests a date around 255-6. Valerian had arrived in Syria by January 255 (Pekary 1962 124; Grenet 1988 141 etc) or perhaps much earlier, in autumn 253 (Balty 1987, 238-9; 1988 103) and in 257 was issuing coins proclaiming victory over the “Parthians” (Carson 1968 133). This evidence seems to fit neatly together to produce a picture of an attempt to re-invade Syria around 255-6, which involved the siege and destruction of Dura and an advance further up the Euphrates road to take Circesium. However, the list stops there, presumably as a result of successful counter-attacks from Valerian, causing the invasion to be abandoned.
3.3.6 Discontinuity; a Persian occupation in AD253

Baldus believed Dura was simply bypassed during Shapur’s major incursion of AD253, Blitzkrieg style. Rostovtzeff implicitly denied the possibility, and proposed that the garrison was withdrawn in the face of the enemy, who peacefully occupied the town; there is certainly no evidence for an assault before the final siege (1943 51). I reviewed the evidence he adduced to support this conclusion in a recent paper (James 1985; by an uncanny coincidence, after forty years of general neglect, another scholar chose to attack Rostovtzeff on the same grounds almost simultaneously, with very similar results; MacDonald 1986). The archaeological evidence presented by Rostovtzeff was entirely spurious. However, the evidence of Parthian and Middle Persian texts from Dura provides the key. At the time I published my own contribution, the readings of the synagogue dipinti and other texts seemed in a hopeless state of confusion, with epigraphists at loggerheads over their meanings. I concluded that until there was some measure of agreement about the readings, the evidence was simply unusable, the disputed readings inadmissible (James 1985 115-6).

This situation has now been changed by a new study (Grenet 1988). Fresh readings of the synagogue texts now seem to make a very solid case for the occupation of Dura by the Persians in 253 and perhaps early 254. This is not the place for an exhaustive review of Grenet’s work, which encompasses new readings of the synagogue graffiti and a reappraisal of the other Parthian and Pehlevi texts from the site.

There is a small group of papyrus documents (one in Parthian, two in Pehlevi) which have been overlooked by all recent writers (myself included). As newly read by Grenet one of the papyri is a letter addressed to a commander, another a transport order sent by Shapur himself (originally published in Welles et al. 1959 no. 153, and no.154; Grenet 1988 136-7). Crucially, Grenet claims that the document mentioning Shapur and military transport was found under the rampart which was built before the final siege (Grenet 1988 138-9 and footnote 39; However, it should be noted that I can find no conclusive evidence that the letter was indeed found under the rampart. The original notice of discovery of the document does not mention the circumstances (Rep. VI 419 no.7, where it is referred to as D. Pg. 37); The Final Report states only that it was found “in Wall Street behind Blocks L7 and L8” (Welles et al. 1959 415). Its survival suggests that it must have been deeply buried, and so it is a reasonable hypothesis that it predates construction of the rampart; however, this is not conclusive proof.).

If we accept that the document was indeed found beneath the rampart, it is certainly most simply explained by a Persian occupation which Grenet, using this and much supplementary evidence, puts in 253, and probably lasting through the winter into 254. He concludes that Shapur installed a satrap and garrison in the town, intending to hold it, but was eventually compelled to withdraw allowing the Romans to reoccupy and strengthen the defences (1988 143-6).

Balty has proposed a variant chronology. The dated synagogue dipinti run from 26 March to 6 October 253, with one outlier, dated 4 February, but without a specified year. Grenet suggests that it is 254,
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and that the Persians wintered at Dura - intending a permanent occupation - in 253/4. Balty proposes that it was actually 4 February 253, and that the Persians had arrived in 252, the year in which, on other evidence, he would place Shapur's invasion (1987 238).

Whichever is correct, it must now be accepted that the Persians occupied Dura for many months in 253, and probably the winter of 252/3 or that of 253/4, or conceivably both, before the Romans forced them to withdraw. It therefore follows that there is a complete discontinuity (in the form of Roman evacuation and Persian occupation) between the great bulk of the epigraphic evidence for the Roman garrison at Dura, and the deposition of most of the arms and armour. Even if Grenet's arguments are rejected, then, if Barballisus was fought in 253, that year marked a major disruption of the Syrian provincial garrison which is unlikely to have left Dura unaffected. Many units may have been wiped out, captured or scattered and it is possible that withdrawn Durene garrison troops may have been among them.

Even if not directly involved in the battle, the garrison at Dura would certainly have been affected by its aftermath, as the government strove to repair the defences of the province. This would be the sort of situation where far-reaching redeployments of troops would occur. Certainly, Syrian legionaries were back at Dura in 254 as we have seen, but what of other units?

Of particular interest is the fate of cohors XX Palmyrenorum, which is not attested after 251. This could, of course, be simply a lacuna in the highly fragmentary record. However, the deposition of part of the records of the unit suggests something else. These were buried beneath the earth rampart, in the Temple of Azzanathkona (Welles et al. 1959 36). More accurately, they seem to have been thrown in as the rampart was started. They certainly were not hidden with intent to recover; they were not in a container, but seem to have been scattered under tons of earth. Their burial at this time has been taken as evidence for the return of the unit to Dura and its presence at the time of the siege (Welles et al. 1959 27), which seems to me to be a glaring non sequitur. It is more likely that they were just rubbish lying around from the time of the now-presumed Roman evacuation; it has been noticed that they were mostly old papers and some types of documents were absent (Welles et al. 1959 36). Perhaps the Persians had already removed the ones containing useful intelligence and the remainder were discarded by the returning Romans because XX Palmyrenorum was now elsewhere, or no longer existed.

The mid-250s were a time of sudden change and upheaval which completely overtakes the fragmentary documentary evidence at Dura, and makes it impossible to use papyri to identify the units to which the deposited arms belonged.
3.3.7 Wars and troop movements; a new Roman garrison?

We shall never know the detailed history of the deployment and fate of the many regiments caught up in the catastrophic Eastern wars of the mid-third century. However, historical sources, and now some spectacular new epigraphic discoveries from Apamea in Syria (Baity 1988) show that it was not only oriental regiments which were involved. It is increasingly clear that substantial numbers of soldiers from the Danube and even further West were frequently sent East as reinforcements.

In fact, the regular appearance of Western troops in Syria antedates the Sassanian crisis. Severus beat Niger in Syria with Danubian troops, and stationed the Western-raised legions I and III Parthica there (Miller 1939). Caracalla also brought European troops East in 215-6 (Baity 1988). Severus Alexander brought troops from not only the Danube but also vexillations from the Rhine to fight Ardashir in 231, returning home in 233 (Ensslin 1939). The newly discovered tombstones at Apamea show that the Italian-based legio II Parthica was in Syria in the latter two expeditions, and it is now clear that it was billeted at Apamea again in 242-4 during Gordian III’s Eastern operations (Baity 1988). Gordian also included troops from Germany in his order of battle (Speidel 1977).

Given this established pattern of European expeditionary forces in Syria, can we assume that the garrison which re-entered Dura on the Persian withdrawal of 253-4, and that which was trapped and destroyed in the city several years later (not necessarily the same body of troops) were oriental units like those which preceded them? It is clear from the divorce document of 254 that a vexillation of IV Scythica returned (Welles et al 1959 doc 32), but was it still there when the city was surrounded as much as two years later? This is a long time in any war, and the 250s were a particularly active decade on the Euphrates frontier. Crucially, there is no epigraphic evidence at all for other contingents; it seems that virtually all that the garrison left were the weapons in question.

There is considerable reason to believe that the disposable forces in Syria at the time of the reoccupation of Dura contained a strong element of European troops. The Persian evacuation was itself presumably occasioned by the arrival of Valerian at Antioch in January 255 or earlier (see above, section 3.3.5), and given the mauling the provincial garrisons had recently suffered (most notably at Barballissus) he must surely have disposed of considerable relief forces which, as so often before, would have been largely Danubian in composition. Sadly there is as yet no epigraphic evidence. However, there is evidence that the practice was still current in the 250s; Apamea has produced tombstones of two cavalrymen from Danubian regiments who were buried there in 252 (Baity 1987 229-31; 1988 102-3), suggesting that Trebonianus Gallus also sent a hitherto-unknown European expeditionary force to the East. I would suggest that eventually epigraphic evidence may be found proving that Valerian, likewise, took Danubian and perhaps other Western troops with him on his first Eastern campaign.

The purpose of the foregoing is to establish the high probability of the presence of European troops in Syria in 254-5, when Dura was being reoccupied and a new garrison assigned. Given its strategic importance, and the dramatic struggle for the city which was soon to ensue, it is quite possible that
the troops put into garrison there included Western contingents, or at least troops from outside the province (the Gallic troops caught at the siege of Amida a century later form an obvious if imperfect parallel; Amm. XVIII,9,1; 6,3-7).

3.3.8 Wright on the siege garrison.

Wright's views on the identity and origin of the troops to whom the equipment belonged are somewhat confusing due to ambiguous terminology, but must be scrutinised here due to their superficial similarity to my own interpretations. He appears to accept the view that the garrison caught in the siege was XX Palmyrenorum and vexillations from legions stationed in the East, but in his text he refers to "Western troops" in the city. This is an important point as it may seem to anticipate my own conclusions. However, careful reading of the text allows his meaning to be ascertained. By "Western troops" he means men from the legions and perhaps other units long stationed in Syria, but "Western" because they were originally raised in the West and in Wright's view were equipped in Western style - wearing "old-fashioned", supposedly Western mail and spatha (Wright, unpub. 216, 221). So, Wright's "Western" troops at Dura were, in his opinion, Syrian legionaries; men in scale armour belonged to XX Palmyrenorum (Wright unpub. 216; 221-2).

However, this neat and simple conclusion rests on flawed presuppositions, an inadequate consideration of the documentary evidence and unsupported equations of equipment and units. It may be safely rejected in its entirety.

3.3.9 European troops at Dura? Testing the idea.

There is a superficially compelling piece of evidence for the idea that the siege garrison included European troops from the assemblage itself. The famous "Map shield" (shield 9) appears to record the itinerary of a route from the Black Sea to Syria, and it has been thought that this records an epic march by the shield's owner (Hopkins 1979 20-1). If so, it is evidence for the arrival of non-Syrian, and perhaps European troops (via the Danube and north Turkish coast) at Dura during the reoccupation. However, this idea has now been effectively demolished by Rebuffat (1986). He argues that the map has more than one route on it, and indeed appears to be copied from a map of the Black Sea and adjacent lands. It could have been selected as a subject for a shield painting because it showed lands where the owner had campaigned, but there must be a host of other possibilities (Rebuffat 1986 89). The shield, then, is not admissible as evidence for a European expeditionary force at Dura.

The very strongly "European military" appearance of the small bronze fittings assemblage appears at first sight to corroborate the idea that the armour looks so European because it is largely that of European soldiers recently transferred in, and that these are their personal fittings. However, there are
obvious fatal flaws in the logic. Firstly, such extensive assemblages of small finds are themselves very rare in the Eastern provinces, if not unknown (see Frisch and Toll 1949). The reasons for this are obscure. There is probably a combination of factors at work here, including poor excavation technique and greater interest in architectural remains than in mundane artefacts. However, this cannot apply to all excavations, and it appears that such items really are much rarer survivals in the East than they are in North West Europe. Perhaps differing methods of rubbish disposal have a role to play; such items may have been deposited off site, where excavations do not take place. Even in Egypt, so prolific of remarkable organic survivals, metal finds may be rare on some sites due to the oxidizing power of the salts in the soil (C. Johns, pers. comm.). It may be that poor preservation is widespread and so is a major factor preventing us establishing a detailed picture of the extent of use of brooches and belts on military and civilian sites in the East, and also the typical repertoire of types employed.

While it is clear that Dura is unusual for an Eastern site in the number of bronze fittings recovered, the dilemma is that we cannot say for certain that the actual range of items represented is atypical of those used by the Eastern army of the mid-third century. Other sites have not produced assemblages against which Dura can be compared to see if it stands out as a Westernising maverick. Until we know much, much more about the broad background of the use of such items in the East, it remains quite possible that Dura only looks odd because the circumstances of deposition were odd, and perhaps are to be contrasted with a more general pattern of poor preservation, careful rubbish disposal, and recycling of metal, on other military sites, leading to the perceived dearth of remains.

It is actually quite possible that the types of brooches and other fittings represented at Dura may have been the universal military fashion throughout the armies of the Empire in the third century, even enamelled and trumpetform pieces supposedly originating in the Celtic West. There is certainly considerable standardisation, so far as one can tell, from Hadrian’s Wall to the Dobrudja. The mechanisms for such standardisation are easily suggested, and do not involve detailed central specification of uniform. Apart from the possibility of arms and harness moving around at least to a limited extent by trade, armies were constantly on the move during this period, and major expeditionary forces came to the East several times in the third century. One of the problems faced by modern NATO commanders is to stop soldiers of different nationality swapping items of kit and even weapons during exercises; the novelty is too great to resist. It seems likely that Roman troops were no different, and enforced mixing of contingents during such campaigns will surely have lead to swapping, sale or theft of each other’s equipment, and copying and adopting of each other’s military fashions. This process would lead to erosion of any nascent regional distinctions between provincial armies (or would at least prevent significant divergence from the ever-evolving norm) and the appearance of Empire-wide styles, especially in periods of intense campaigning such as the 230s to the 250s.

The bronzes then, are tantalising but not very useful in deciding whether the garrison was Syrian, European, or both.

Existing evidence from Dura is not capable of resolving this tantalising question thrown up by work on the historical context; were the soldiers trapped at Dura the long-established garrison, or other
troops, from another province or even from Europe? Resolving this now becomes the key task, for until we can answer the question, we can never be sure of the true place and significance of the weapons assemblage.

3.4 The weapons and warfare at Dura

Detailed accounts of the archaeological evidence for the siege have been published elsewhere (in the *Reports*; du Mesnil du Buisson 1944; Hopkins 1979), so it would be otiose to cover the ground again here. Indeed it appears that the armour itself tells us little we did not already know from documentary sources about the nature of warfare on the Eastern Frontier in the third century. Rather the material illustrates and fills out the literary picture of warfare consisting of sieges, and of movement in which cavalry was very important (Coulston 1986). There are, however, a number of interesting points of detail, such as the apparent case of troops fighting helmetless in the mine. One at least fought wearing fingerrings (still adhering to mail shirt no.4), which might be thought unwise as it could affect the firmness of grip on the weapons. On the other hand, they may have afforded some measure of protection to the fingers, being of iron was also thought to be a lucky material in Roman times, but if this was the reason for sporting them in battle, it was evidently not efficacious on this occasion.

3.5 The appearance of soldiers at Dura; reconstructions (frontispieces to the two volumes)

Two reconstruction paintings are presented, of cavalrymen, based on the material recovered from the site, much of which is definitely or probably cavalry equipment. So far as possible these are portrayed wearing armour attested archaeologically at Dura. One (frontispiece to the plate volume) depicts a medium cavalryman equipped with bronze armour, armed with one of the very heavy *spathae* and a large oval shield decorated with the newly-discovered motif seen on shield 2. The other (frontispiece to this volume) is a largely iron-clad cataphract mounted on an armoured horse and carrying the two-handed lance, the *contus* - he is consequently shieldless.

Reconstructions are a concrete way of presenting conclusions about the material, but have additional value in that production of such drawings (or indeed three-dimensional replicas) prompts further observations about the various items involved, and indeed can generate more research questions which otherwise might well not be asked. These can be points as basic as: How long were scale shirts if used on horseback? Were they short to avoid interfering with the saddle? Were they split for riding? What sort of chamfrons did horses have at Dura, plate ones as shown here or scale ones? Such questions may be in part answerable by future work on this collection, or on new material elsewhere. Other questions are more difficult, as they would need evidence of associations, not preserved even at Dura,
but which might one day be answered if more battlefield sites are excavated. For example, were cuisses normally worn by cavalrymen, or just by cataphracts and clibanarii? Did these heavy cavalrymen of the Roman army already carry bows in Persian style? How far were mixed items of bronze and iron armour worn by single individuals?

It is hoped eventually to produce a larger series of such paintings, both as a concise way of presenting ideas and conclusions, and as a means of generating new questions about the Dura arms.

3.6 Manufacture and repair of weapons at Dura

As a major garrison city, it is very likely on a priori grounds that Dura normally had some weapons manufacturing capacity of its own, or at the very least the ability to repair arms locally. Arms procurement during the principate is understood only in outline. There are a number of cases in which the smiths of cities were instructed to switch to arms manufacture during wartime (Bishop 1985 16-17) and indeed it is likely that there was only a limited specialist arms industry; probably bronze workers and blacksmiths included arms manufacture as part of a far wider general repertoire of production (John Paddock pers. comm.).

It is very likely that by the third century the Roman garrison of Syria, integrated for centuries into the local economy, drew its requirements from a range of local sources, probably including some small-scale specialist contractors (some of whom were probably veterans), in-house production (perhaps of artillery etc), with ordinary "civilian" smiths perhaps executing special private commissions and providing reserve production capacity in wartime. Much production will probably have been urban or suburban, probably at Antioch and other centres where state arms factories, or fabricae are to be found in the fourth century (James 1988; for a discussion of arms procurement in the East, see Coulston 1985 257).

A city the size of Dura would certainly have had metalworkers, and, if it were needed, evidence is to be found in the form of a mould for a seal-box lid from the site (Frisch and Toll 1949 43 no.35, plate IX). Whether the Dura artisans regularly made weapons for the garrison is not clear. Currently it is generally believed that there was little centralisation of production during the Principate; the European evidence suggests that although types and styles of fittings are widespread, die-link evidence implies that manufacture was local, within provinces or even at the level of individual garrison stations (Oldenstein 1985 85-6). Consequently at least some of the garrison’s requirements for the replacement of old, damaged and lost equipment may well have been met locally. This is especially true for archers in the garrison, who needed to be close to their suppliers to allow weapons to be tailored to individual needs (part 2.6.1; Coulston 1985 269), although whether the bowyers were serving soldiers or not is not.

The best evidence for such local enterprise comes from the painted shields (nos. 1-3), decorated
by an artist working in a Romano-Syrian style, and which have led to the postulation of a "shield-painter's shop" serving the garrison in the town (Rep. VII 331). This is possible; a painter (although whether of shields or other items is unspecified) is attested attached to legio III Cyrenaica at Bostra; the phrasing suggests he was probably not a soldier, but this is uncertain (Bowersock, 1971 plate xix; 1983 96 n.19; information from Julian Bbowsher).

It was noted at the time of discovery that the items apparently stored in tower 19 at the time of its collapse all seemed to be incomplete or damaged, and awaiting repair (Rep. VI 439-40).

With regard to the siege itself, evidently once the city was invested all further repairs and production would of necessity be done within the walls, and this may account for some of the crude repairs seen on armour. It may also account for the roughness of finish of the artillery bolts, which may well have been made to a minimum standard of finish to guarantee true flight, and shot almost as fast as they could be produced; there is some reason to believe that the heads and shafts were actually assembled in the towers of the desert wall, where it is presumed the machines for which they were intended were sited. Heads were found lacking fixing-nail holes and so are presumed to be unfinished; at least one bolt is certainly unfinished (shaft 1). Consequently the bolts in particular may be highly unrepresentative of normal standards of finish of such ammunition, but represent emergency production only (see part 2.7.16). It may be wondered which other aspects of the assemblage are also untypical of normal practice and standards due to the desperate circumstances of their use and deposition.

It is possible that the procurement and maintenance of the equipment used in the siege may have been affected by the events of the preceding few years discussed above, namely the near-certainty that the town was occupied by the Sassanians around AD253, probably for some months (part 3.3.6). The Persians had a habit of deporting populations, and especially craftsmen who could be useful to the state, eastwards into their empire (Lieu 1986 476-487); consequently it is quite likely that the local artisans may have been removed from the city before the siege, leaving the garrison to shift for itself.

3.7 Conclusion and prospect

It is plain from studying the Dura archive in depth that many unique opportunities were lost, along with irreplaceable data, due to the standard of excavation, recording and post-exavation treatment. However, to do justice to the memory of the great efforts of a generation of scholars, a staggering wealth of priceless information was recovered and remains available for study today; and even if the techniques of the 1990s had been employed at Dura, our continuing ignorance of the broader context of the assemblage would still leave us unable to answer many of the most pressing questions.

For all its problems the assemblage has proved to be even bigger and richer than originally expected, and the wealth of detailed information about the arms of the third century goes a long way towards
making up for the disappointments of lost stratigraphic information, and the complexities thrown up by the historical background. It has challenged assumptions and given new insights into the types of armour worn in the third century. Some of the inferences drawn here pose important questions to be followed up in other places; for example, were cuisses much more widely worn in the Roman army than is usually thought? And was leather scale or lamellar armour actually widespread in Europe?

Indeed, much of the importance of the site lies in its implications for the Roman West and the Persian Empire. The extraordinary organic preservation allows us to make sense of the far more fragmentary evidence from other contemporary sites in Europe and Asia, for example showing some of the kinds of wooden shafts that were employed with the ubiquitous bodkin bolt heads, and giving us a detailed and often surprising view of the many ways in which scale armour was used.

Further, the unusually well-defined chronology of the material deposited during the siege provides us with an invaluable dating yardstick for material from the Roman Empire and to a lesser degree the Sassanian Empire; Dura helps to date many of its parallels, whose dating is often approximate, or even speculative.

The study of the archaeology of weapons is still often plagued by sloppy use of evidence. Dura has an unusually detailed documentary background, yet even with this it has proved impossible to identify the types of unit besieged at Dura, let alone identify their names or explore other interesting areas such as unit specificity of equipment; such information is simply beyond the capacity of the data to reveal. If this is true of Dura, then much doubt must be cast on many claims and ideas about such questions based on poorer material elsewhere. There is a need for far more rigorous treatment of the data, and greater circumspection in drawing conclusions from it. In the long run, we may be forced to admit that many of the most interesting questions about Roman armour - such as the degree of unit specificity of weapon types - are tantalisingly forever beyond our reach, because they are inappropriate questions to ask of the data. In the final analysis, conceptual information, especially data as specific as unit names, can only be transmitted by documentary means.

But this is not a council of despair; I believe that soundly-based research can, in the long term, provide a detailed and reliable archaeological picture which will clarify many current mysteries. We must start by assessing what the evidence can tell us, and above all define what it does not and cannot tell us. On that foundation, by careful use of cumulative arguments, perhaps statistically based from many assemblages, a far more reliable picture of ancient Roman and Sassanian armour can be built up.

Even in strict archaeological terms, the Dura collection itself is a paradox; its very uniqueness is also its greatest problem. It is the richest collection of Roman armour in the world, and includes an important group of Sassanian material, yet we cannot fully understand it because it stands in isolation. Due to lack of research and the nature of the archaeology of the Middle East, we do not know the general background of Eastern Roman or Partho-Sassanian military equipment in enough detail even to say that the Dura material is definitely typical. The limited Roman evidence we have (depictions and finds) suggest that in the third century the Eastern armies were equipped in fundamentally the same manner
as European forces, but with some local specialisations showing up at Dura. I would guess that as more evidence appears this picture will be confirmed. However, unless new excavations at Dura provide new textual information of the most inconceivably comprehensive and unambiguous kind, it seems to me that there will always be the suspicion hanging over Dura that its garrison was wholly or partly of European troops, and so, ironically, is not the window onto the archaeology of the Eastern army which it has long appeared to be.

There remains, of course, an immense amount of work to be done, not least specialist work on materials identification, structural analysis and conservation. At the time of writing, the French have been carrying out conservation work on the site itself, which apparently includes further limited excavation, which may conceivably shed new light on the site and its history. But perhaps the most important way forward is the long, slow exploration of the Eastern Roman and Partho-Sassanian archaeological background, the excavation of forts, cities and cemeteries, which will at last put Dura clearly into its proper context. It is a task for several generations of archaeologists to come.
CATALOGUE

NB All measurements are given in SI units (eg metres and millimetres). Dimensions with a plus sign (eg 84mm+) are incomplete, due to damage.
CATALOGUE PART 2.1. HELMETS
(Plates 2.1.A to H)

Provenance Tower 19 Countermine.
No Dura no.

This helmet was briefly described in Rep. VI 194 and fig. 16 (see plate 1.C, top). It has now been fully published, and its affinities and significance assessed (James 1986).

It is quite extensively oxidized, and was crushed when found. It is now at Yale, where it was extensively rebuilt. The helmet had lain on its right side, and the left side had been crushed and shattered when the mine roof caved in (James 1986 fig. 14). It is estimated that 80-90% of the original fabric survives.

The helmet is entirely of iron. The basic skull is composite, constructed in two half-shells, which meet on the longitudinal axis. They are not directly joined to each other; each is independently rivetted to an external strip of iron running over the apex from brow to nape. The last few centimetres of this strip are missing at the back, revealing that the two half-skulls butt but do not overlap. The excavators recorded the presence of a second joining strip, on the inside, but no trace of this is now visible due to the liberal use of plaster in the restoration of the helmet. Confirmation of its existence must await the availability of x-rays.

The preserved dimensions of the skull are: height (rim to apex) 250mm; length c255mm; width 160mm; circumference 660-680mm. The thickness of the plate is hard to measure in its corroded state but may be estimated at c4mm, perhaps a little more at the rim. The external strip was of fairly constant width, about 30mm, and 3-4mm thick as, according to the site-card preserved at Yale, was the inner strip. When found, the helmet weighed 4.15kg.

As restored, the skull is obviously distorted due to the lateral compression which shattered the left side into several fragments and somewhat flattened the right. The result is that the helmet is now longer and narrower than originally. However, it is clear that it was tall, and that its geometry was dominated by the longitudinal junction of its halves. In profile the bowl is roughly parabolic but in front elevation the sides sweep up to meet the crest-strip in a point.

The ridge-strip follows the contours of the junction of the two half-skulls in its section, ie it is nearly flat at front and back, and V-sectioned over the apex. The rivets which held each half to it were carefully paired along its length, at approximately 65mm intervals. They had pronounced heads, now much distorted by corrosion. Perhaps they were hemispherical.

At the apex is fixed a blunt, cylindrical iron projection, apparently solid, rising 51mm above the skull. It is attached by a tab running down each side of the ridge, each pierced by two rivets, one through the strip and one through the skull-half.

Fixed to the joining strip, running from just forward of the 'spike' down towards the brow, is a partially preserved curved iron plate, standing perpendicularly to the helmet. It reaches a maximum preserved
depth of 27mm and was originally up to 5-6mm thick. Apparently it was not attached to the bowl at the time of discovery (plate 1.C, top), but is correctly restored. Its upper end is a flat, teardrop-shaped terminal, which was pieced by a large rivet holding the plate to the crest-strip. How far down the front of the helmet this plate reached is unclear, as the lower part is lost. However, an indentation in the edge of the right half-skull suggests that the lower fixing rivet was immediately above the brow. There is no indication of a similar plate down the back of the bowl, but the possibility cannot be entirely ruled out.

The forehead region is badly damaged. The post-depositional crushing means that here the two halves now meet almost at right-angles where they should butt smoothly, edge-to-edge. Furthermore, the lower front corner of the left half is lost, and with it some important detail. Nevertheless, it is possible to reconstruct the appearance of the brow area with some certainty. Overall, the lower rim of the skull conforms approximately to a horizontal plane. At the front, however, there are two shallow curved cutouts over the wearer’s eyes. Rivetted above these cutouts and conforming to their curvature was a single plate of iron, up to 4mm thick, forming a pair of ‘eyebrows’. The inner half of the left eyebrow was lost with the skull fragment, and the outer half of the right one is covered by the mass of mail fused to the right forehead region and cannot be seen. However, enough of each is visible for a complete reconstruction to be made. Each stretched out about 90mm from the centreline. The left eyebrow is 11mm deep at the tip, flaring to 15mm at its broken end. The right is 23mm deep, c25mm from the centreline. The upper edge of the plate dips steeply in the middle, reinforcing the impression of a pair of eyebrows.

It is clear that the lower edges of the eyebrows swept down into a protective nose-guard, which is now snapped off at the base and lost. While reinforcing the forehead region and serving a secondary decorative function, the main purpose of the eyebrows was the anchoring of this nasal defence. The originally T-shaped plate was attached by four dome-headed rivets, one through each tip and one through the top of each eyebrow c25mm from the centreline.

Adhering to the lower edge of the bowl, all along its back and left side, is a mass of oxidized mail. This provided the cheek and neck protection in the form of a mail screen, or camail, suspended from the helmet rim. It is much folded upon itself, and a large part adheres to the right forehead region where it was trapped beneath the bowl at deposition. In places it is well enough preserved to show rings of about 9mm diameter, but it is not possible to establish the thickness of metal or the joining technique without X-rays. It appears that the uppermost row of links were passed through small holes just above the rim of the bowl. This explains the raggedness of the left side of the rim, as the mail was evidently torn away from it when the helmet was crushed. The mail was almost certainly attached all the way around the rim except, of course, across the eye cutouts.

There is a row of four rivets across the back of the skull, c15mm above the rim. They do not relate to the camail. It is probably no coincidence that they correspond to the four rivets on the front of the bowl, which hold on the eyebrow/nasal plate. It is suggested that these eight rivets also fixed the lining, probably of fabric, which would have been essential to prevent this tall helmet falling over the wearer’s eyes.

There are no very close parallels to this helmet so far known, but it is clearly foreign to the Roman tradition which otherwise prevails at Dura (see nos. 2 to 6). Other, poorly provenanced but supposedly Sassanian helmets are probably much later in date (Grancsay, 1963; Overlaet, 1982 etc). It is significant that the best parallels are the Roman ridge-helmets of the fourth century AD rom sites like Intercis, Berkasovo and Burgh Castle (Klumbach 1973; Johnson 1980 etc). I have reviewed the parallels in detail and assessed the place of the Dura helmet elsewhere (James 1986).
2. Iron cheekpiece of a helmet (Plate 2.1.E and G)
Provenance E8-68
Yale number 1982.28.56
Dura no. H371

This almost complete right cheekpiece was at some stage reassembled from heavily corroded fragments. It is intact except along the top edge. It is made of iron plate apparently c3-4mm thick, although this is partly corrosion layering.

The Dura records suggest that when discovered rather more of the upper front region survived; this now-missing part is approximately indicated in the drawing.

The smoothly curving plate has a narrow throat flange at the bottom, 8mm deep at the front extending to 11mm at the rear. It also has an extension to cover the ear.

An iron tab on the inside upper edge is probably associated with the method of attachment. Most probably it is the rear example of two tabs, folded inwards over the hinge axle, like that seen on a helmet from Heddemheim (Robinson 1975 plate 259).

Three rivets on the inner surface (indicated on the drawing) probably attached a lining, and mark the position of the rear edge of the wearer's ear.

This is a typical cheekpiece from Robinson's so-called auxiliary cavalry type E or F (1975 97-9). The best parallel is the Heddemheim piece, mentioned above.

3. Fragment of an iron helmet (plate 2.1.F and G)
Provenance unknown.
Yale no. 1982.28.55
No Dura no.

Part of an iron helmet, comprising the left temple area of the bowl. Heavily corroded with many traces of organic material in the oxidation products.

Preserved dimensions c120mm by 90mm. It is of iron plate 3-4mm thick. Part of the integral ear-guard, the terminal rivets for attachment of the brow-guard, pieces of the guard itself, and transverse reinforcing bars are preserved, as also is the hinge for the attachment of the cheekpiece. A fragment of the upper edge of the latter survives in situ, showing that it overlapped the edge of the helmet skull to cover the vulnerable hinge. The design of the latter was not recorded. The external rivets attaching the brow- and crest-reinforcements were too corroded to ascertain their form (spherical or teardrop-shaped).

This helmet is of a distinctive type and close parallels are available. The precise form of the integral ear-guard corresponds only to helmets of Robinson's auxiliary cavalry type F, of which two examples are known from Europe. One is from the Rhine at Amerongen and the other is from Kalkar-Hoenepel, both supposedly second century AD (Robinson 1975 98-9 plates 263-8). The ear-guard form is not found on any of Robinson's infantry types, and is only approximated on a few other cavalry types. The use of transverse skull reinforcements also seems to have been confined to types E and F. The identification is further supported by the method used to affix the browguard. It is a broad, horizontal peak in form, found on types E (Heddemheim; Robinson 1975 96 plate 259) and F (Kalkar-Hoenepel, Robinson 1975 98 plates 263-5). The absence of a decorated band following the lower rim of the skull, and the form of the ear-guard clinch the identification as type F. Other examples of this type were of
bronze. Robinson thought that on “stylistic and finishing” grounds two bronze cheekpieces from Königshofen were from type F helmets (1975 92 fig.120). Significantly, these have a ‘tab’ on their upper edge identical to that preserved on the Dura fragment. The similarity of no.2 to its German parallels in even the finest detail is worthy of note.

4. Fragmentary bronze crown reinforcement (Plate 2.1.G)
Provenance unknown
Yale no. 1938.3301
Dura no. unknown
Length 90mm+
Width 28mm
Thickness 2-3 mm

The characteristic shape of this object, its curvature and termination in a flat plate pierced by a large rivet hole make its identification as a helmet crown reinforcement undoubted. Such defences are common on auxiliary cavalry helmets and on one of Robinson’s auxiliary infantry types (type C; Robinson 1975 85 and figs 104-7). The profile of this piece corresponds particularly closely to Robinson’s auxiliary cavalry types E or F (1975 98-9), specifically the front portion of the longitudinal defence. It is particularly close to that on the type F from Kalkar-Hoenepel (Robinson 1975 plates 263-5) which has a flatter profile than those on type E helmets (cf also the type F from Amerongen; Robinson 1975 plates 266-8). Like the Dura example, type F reinforcements have discoid terminals, whereas type E are pointed.

Where it is snapped off there are traces of a drilled hole through the middle of the bar. This would correspond to the method of making a slot for interlocking the longitudinal and transverse reinforcements seen on other examples (Robinson 1975 fig.113-6). The slot seems to have been cut from the bottom. This object may have been associated with no.5.

5. Fragment of possible crown reinforcement (plate 2.1.G)
Provenance unknown
Yale no. 1938.3300
Dura no. unknown
Length 98mm+
Width 25mm
Thickness 2-3 mm

Superficially this appears to be another reinforcement like no.4, with the same section and similar curvature, but the terminal is very thick and lacks a rivet hole. However, it does have a hole drilled at the point where it was broken off, which would be an interlocking slot cut down from the top. This would correspond to the slot in no.4, perhaps suggesting that they come from the same helmet. But their adjacent accession numbers are no evidence that they were found together, and it is not certain that there is any connection between them beyond their superficial similarity.

The function of the second hole drilled through no.5 is as uncertain as that of the rest of this object, whose identification as a helmet fragment must remain tentative in the absence of parallels for its strange unriveted terminal.
6. Bronze brow guard (Plate 2.1.G)
Provenance E8-63
Damascus Museum
Dura no. H326
Length 177m
Width 63mm
Thickness 2mm

Recorded on a site card at Yale, whence the dimensions are taken. Its condition is described as “corroded, and bent in the middle.”

The site sketches show that this was thought to be a downward-pointing visor like that of a peaked cap, but in fact it was originally mounted the other way up, riveted to the helmet at each end and prevented from rotating about the rivets by a central tab which penetrated the helmet skull. The curvature shown on the site sketch does not seem to be reflected in the photograph and is probably exaggerated. The function of this object, like nos.4 and 5, was to spread the force of a blow and to prevent the weapon reaching and penetrating the helmet skull.

Unless the damage was post-depositional, this piece was tested in action, as it has a massive central dent. Clearly it did not fold up, so the skull was not contacted. However, the wearer may well have sustained concussion, and very probably a neck injury.

Both upturned and downturned peaks are known on Roman helmets of supposedly auxiliary types (see fragment 2). However, the orientation of this one is proved by the angle of the rivetted terminals, one of which still contained a hemispherical rivet-head. Parallels are those on the Robinson type E from Friedburg (1975 plate 258) and the type I from Osterburken (1975 plates 124-6).

From the provenance this piece seems to have been found not far from the cheekpiece, no.2. It is possible that they come from the same helmet (bronze browguards are known on iron helmets; eg the Heddemheim example, Robinson 1975 plate 259), but this is not particularly likely.

7. Fragments possibly from a bronze parade helmet (Plate 2.1.H)
Provenance unknown
Yale no. 1938.3688
Dura no. unknown

Twenty-two fragments of an object of thin (under 1mm) bronze sheet with repoussé and engraved decoration. Its identification as armour is tentative, and based on the technique of manufacture and the repertoire of decorative elements. The fragments, which are all fairly small, include no features which can make the identification certain; it is quite possible that this is simply a decorative plaque from an item of furniture or a building. (There is a very similar piece from Hatra, a plaque with a medusa head, possibly part of a chamfron; Fukai 1960 172 plate 34).

The fragments are twisted and torn, apparently deliberately, perhaps as scrap for recycling. The object cannot be reassembled, but it is evident that not all of it survives.

There are three types of surface decoration; an engraved feather pattern; an embossed and engraved pattern of locks of hair; and a strange horse-shoe shaped embossed element, which resembles a croissant and may represent a pair of ram’s horns. The former two styles suggest a relationship with certain Roman “cavalry sports” or “officers’ parade” helmets, suggesting that this, too, may be some kind of ceremonial helmet.
The hair pattern is very common on the "sports" helmets, which often depict elaborate coiffures (eg Robinson 1975 plate 341-3, 359-366, etc; Garbsch 1978 Tafn. 1,2,14,19,20,21 etc). Less common is the feather pattern, which is seen on an unusual helmet from Ostrov, Rumania (Robinson 1975 134), and a bronze cavalry sports helmet of Robinson type F, from Pfondorf (1975 126).

Such helmets are found in the East, eg Homs (Robinson 1975 121 plates 349-351), and a fairly close parallel from Hebron (Weinberg 1979).

The Dura fragments also include what appears to be a fragmentary half-folded eagle's wing, worked out in the round. Repoussé eagles are well represented on parade helmets. The Pfondorf example has one in high relief on the upper forehead. Closer to Dura, such eagles are seen on two helmets from Tell Oum Hauran (Robinson 120,132). However, the closest parallels are on the front of the metal crest of a helmet from the Iron Gates (Robinson 1975 128), and a superb example on the crest of the Theilenhofen parade helmet (Garbsch 1978 Taf.10).

The eagle's wing suggests a Theilenhofen-type metal crest. However, the pieces with the "croissant/ram's horn" design seem to come from a broad neckguard, which had several pairs of "horns" around it with a radial feather pattern as background. However, there is a remarkably close parallel for almost all features of the design (eagle, hair, and "croissants", here seen to be snakes) on a fine helmet from Nawa, also known as Tell Oum Hauran (Helmet B, Abdul Hak 1955, 174-185; Garbsch 1978 60 helmet N2, plates 16,2 to 4, especially plate 3). It is interesting that the best parallel of all should also come from Syria.

A very broad neckguard such as may tentatively be postulated for this piece is not paralleled on any of the helmets discussed above, but something analogous exists on the extraordinary helmet from Autun, a degenerate Etrusco-Corinthian in gilt bronze with an elaborate and massive neck-guard of bronze worked to resemble laurel wreaths (Robinson 1975 137).
MAIL (plates 2.2.A to I)

1. Iron mail shirt (Plates 2.2.A and B).
   Provenance Tower 19 countermine.
   Yale no. 1934.463
   No Dura no.

Currently on loan to the Higgins Armory Museum.

This the mail shirt on the body of the so-called Persian warrior found in the Tower 19 countermine, appeared in Rep. VI 192-4, fig.16 and plate XVIII,3.

It consists of rings c.8mm in diameter and c.1mm thick. These dimensions are approximate, due to the advanced state of oxidation of the iron. For the same reason, in the absence of X-rays it is not possible to establish which technique of mail construction was employed, viz. butted or rivetted rings, with or without intermediate rows of stamped rings.

The front of the shirt is partly destroyed by post-depositional processes including, apparently, collapse of the mine roof. It was folded and rucked up at the moment of deposition. The wearer had perhaps feebly attempted to pull it off before dying (Rep. VI 192) or, equally likely, an assailant may have lifted it to deliver a coup-de-grace. In consequence its exact form is now difficult to ascertain. These problems are exacerbated by the extensive use of modern materials, mainly wood and plaster, currently supporting the object. Most of the skeleton was apparently removed on site.

Nevertheless it is at least clear that the shirt was of the simple "pullover" pattern, and probably reached to the top of the thighs. The well-preserved back, now largely flat from lying on the ground under its own weight, survives to a maximum length of 520mm, but allowing for the several creases caused by it having partly ridden up, its original length will have been 600-700mm.

The shirt had sleeves of a length which is also now uncertain as they, too, are both damaged. Indeed the left sleeve was largely absent on discovery, while the right was partly rucked up and the end badly damaged. Nevertheless enough evidence survived to show that the sleeves reached below the elbow, and may well have been wrist length. The right sleeve has suffered much since excavation, with the distal part, including the elbow, now entirely lost. The surviving part still contains part of the right humerus.

The lower rear edge of the shirt is easily followed, even where it is doubled over, as it is trimmed with three rows of bronze rings, easily distinguishable by colour and superior preservation. This trimming shows that the skirt had a 105mm split up each side. The function of this is, presumably, to allow the wearer to sit astride a horse without pulling the armour up, and incidentally suggests that the shirt was a fairly tight fit.
The neck aperture appears to have been a simple slit in the mail, and was also trimmed with three rows of bronze rings. On the upper chest, just below the neck in the matrix of iron rings is a pattern of bronze rings, in the shape of a trident (plate 2.2.B). A single horizontal row, 80 to 90mm long, forms the base of three verticals, each c.50mm tall and consisting of three rows of rings. The central vertical extends downwards to make the “handle”, and was probably also 50mm long but the end is covered by a fold in the mail. This device, unparalleled on Roman mail, is similar to the “heraldic” devices seen on depictions of early Sassanian warriors (most notably at Firuzabad, on a helmet and horse-barding; see James 1986 fig 11; Ghirshman 1962; Herrmann 1977), and is evidence for the Persian identity of the wearer.

The inside of the shirt contains an unidentified light brown fibrous material, not a woven fabric, which is original and not part of the conservation treatment as it is fused into the oxides. It is tentatively suggested that it constitutes the remains of a felt undershirt.

Due to its relative vulnerability to corrosion, Roman mail is found much more rarely than scale. Nevertheless, a good number of examples have been found. The best general discussion is Robinson 1975 164-73. Rivetted mail was found at Newstead (Curle 1911 161 and plate XXXVIII, fig.10). Third century mail of iron and bronze rings was recovered at Caerleon (Nash Williams 1932 68 Fig 16). Some was of rivetted bronze rings, 9mm in diameter (Nash Williams 1932 94 and fig 41, no.4). Similar mail has recently been published from the Hague (Waasdorp 1989 161 and fig.2). Further rivetted rings are known from from Zugmantel (ORLB Nr 8, 99 Nr 8 and Abb 15). Mainz has also produced rivetted mail, of second century date (Rose 1906 6 and Abb.12).

Recently a remarkable mail shirt of Roman manufacture was found at Bertoldsheim, Austria (Garbsch 1984; information from M. Bishop). Besides having an upper chest plate depicting Mars, the iron mail itself contained an integral check pattern consisting of double rows of bronze rings showing that decorative patterns in mail were not unknown in the Western Roman Empire.

From the Eastern Empire, mail of supposedly Roman date was found at Deir el Medineh in Egypt. It is not clear whether this was a coif or a sleeve (Toronto museum; Kelly 1934 206 and Abb.1). A mail shirt from Hatra, now on Display in Mosul, might well prove an important parallel, but is sadly unpublished (Dr. D. Nicolle, pers. comm). A mail shirt probably of early second century date was found with the Hebron hoard but details are scanty (Weinberg 1979 85 and plate 25,7).

2. Iron mail shirt (plate 2.2.C).
Provenance unknown
Yale no.1930.595
Dura no. unknown
Currently on loan to Higgins Armory Museum.

Published in Rep. III 79 plate XI,1.

A complete mail shirt, evidently discarded rather than worn when deposited. It has been dropped and has collapsed and folded upon itself as a result of its weight and pliability. The upshot is an irregular mass of heavily oxidised iron, c.370x300x40mm in size. The ring rows are largely distinguishable, although they are not well enough preserved to measure their exact dimensions or the method of construction. The rings appear to be about 8-9mm across and 1mm thick, and may be butted, but this is far from certain. X-rays are required. There are no signs of bronze edging rings.

See no.1 for parallels.
3. Sleeve and other fragments from iron mail shirt(s) (plate 2.2.D)
Provenance; Tower 19 countermine?
Yale no. "1934.463"*
No Dura no.

* These, and nos.4-6 are from a box labelled with this number, and a second unnumbered box of mail fragments which, as conjoining pieces are in each box, probably form a single group. The Yale no. is probably misapplied, as it is that of the "Persian" skeleton's armour (no.1).

The sleeve (plate 2.2.D, top) is heavily oxidized but appears to be complete. The sleeve mouth, and the junction with the body shirt seem to be intact. The junction at the shoulder seems to have consisted of three rows of bronze rings. The sleeve itself reached only midway down the upper arm. The junction is c.400mm in circumference, and the opening is an oval c.100 by c.150mm as preserved. The fact that it is open shows that it was still on a body when deposited, which maintained its shape as it corroded, a process no doubt hastened by the decomposition of the corpse.

The size of the rings is hard to measure due to the state of the piece, though the slightly better preserved bronze rings suggest a diameter of c.10mm.

The other fragments of mail in the group, other than nos.4-6 described below, are not informative, but their state of preservation suggests that they come from the same garment as the sleeve. Nos.4-6 have a wholly different surface appearance.

See no.1 for parallels.

4. Fragment of iron mail shirt (plate 2.2.E).
Provenance; Tower 19 countermine?
Yale no. 1982.62.25
No Dura no.

From the same group as no.3. Well oxidized, but the clean state of the surface, with almost every ring visible, indicates corrosion in an air space, providing circumstantial evidence for its provenance among the bodies in the tower 19 countermine (Rep. VI 188-205). Further evidence comes from the items adhering to its outer surface. These include a dome-headed rivet, 13mm across, probably from a shield, and an iron finger ring, with remains of finger bones, all fused to the surface. The whole shows extensive traces of burning, all of which is consistent with a provenance in the mine.

It is a fairly creased fragment of the chest or back of a mail shirt, and now survives to maximum dimensions of c.300x200mm. Part of what appears to be the lower edge of the garment is preserved. It was not edged in bronze rings. The ring size could not be measured accurately but was c.7-10mm. An interesting detail is a botched repair, with a ring on an anomalous orientation presumably to bridge a small tear (2.2.E, bottom).

See no.1 for parallels.

5. Sleeve of an iron mail shirt (Plate 2.2.F).
Provenance tower 19 countermine?
Yale no."1934.463"*
No Dura no.
** Probably incorrect. See no.3.

From the same group as nos. 3 and 4, this also is almost certainly from the mine at tower 19. Its surface condition indicates that it oxidized in an air pocket. It contains the bones of the arm of the wearer, and adhering to its surface are two objects. The first is a fragment of the bowl of a bronze shield-boss (c.60x30mm). The second is part of the blade of a *spatha*. The fragment, 145mm long, is of lenticular section, 40mm wide and 12mm thick. This piece, too, is therefore very probably part of the mass of remains from the mine described in *Rep.* VI 188-205.

The preserved length of the sleeve is c.320mm, with a maximum width of c.150mm and maximum thickness of c.100mm. The shaft of the humerus within projects from one end, and the broken ends of the radius and ulna from the other. The angle between the bones shows that the arm was flexed at about ninety degrees at deposition. Expert examination will confirm which arm it is, but the position of fragments apparently from the body shirt now adhering to it suggest that it is the right.

The sleeve appears to have been stretched to almost its full length at deposition. From the position of the elbow joint it seems to have reached about halfway down the forearm, and probably did not reach the wrist.

The distal end of the sleeve is well preserved, and is c.280-320mm in circumference. The rings of the last row are seen to be c.8-9mm in diameter. Local thickening of the rings may suggest rivetting, but corrosion makes certainty impossible in the absence of x-rays.

See no.1 for parallels.

6. Fragments of an iron mail shirt (Plate 2.2.G, top)
Provenance unknown
Yale number unknown
Dura number unknown

Four fragments of iron mail, well preserved in form although heavily oxidised. It appears that these corroded in an air-space, and so the shape and surface form has not been obscured by adhesion of soil particles. The ring details are particularly clear. The rings are 8mm in diameter, many with traces of copper corrosion products perhaps from copper rivets.

One tiny fragment of c.6 rings supports this; it is an edge, with the last row bound to only two other rings each. These three bottom rings are 10mm across, and c.1-1.25mm thick. The second row have the same dimensions, but each ring has a copper stain presumably from a rivet. The absence of these stains from the edge rings might suggest alternative rows of riveted and stamped rings.

See no.1 for parallels.

7. Fragments of an iron mail shirt (Plate 2.2.G, bottom).
Provenance: E8-80
Yale no. 1938.5956.
Dura no. H403

The site card at Yale preserves the following notes;
"Mail corselet found w[ith] skeleton. Found in folded + crumpled mass of fragment[s]. Partly iron, partly bronze mail. Whole rusted together by iron... [illegible] almost completely oxidized. From bronze scales [? sic] appears that composed of rows of interlocking rings sewn on leather or stuff. As far as can tell, no cross linking between rows of rings. Bronze and [iron ?] rings not rivetted or twisted together but apparently simply lengths of heavy bronze wire fashioned into links and... [illegible] while heated. No indication of what parts bronze, what iron".

Examination of the heavily oxidized fragments shows much of this analysis to be incorrect. The shirt was of standard mail construction, where visible. Most fragments are now amorphous chunks of oxide, but some preserve the ring structure, especially the fragment edged with bronze rings in apparently four rows (plate 2.2.G, bottom). These rings were 7-8mm across, and a little over 1mm thick, of bronze wire of circular section. They were apparently all butted, though of course this weak structure need not have applied to the iron rings.

See no.1 for parallels.

8. Fragments of iron mail shirt (plate 2.2.H, top).
Provenance; "G3-H5"
Yale no. 1930.595c?
Dura no. J171?

Four fragments of iron mail, with traces of bronze edging rings. One fragment bears the number quoted, which is the same as no.2; However the latter is certainly complete, so these fragments come from a different shirt or shirts. In fact the Dura number and Yale number are mutually contradictory, implying that the item was accessioned at Yale some years before it was excavated! Clearly one or both are wrong.

The rings are c.9mm across, but details of their thickness and construction are obscured by corrosion.

See no.1 for parallels.

9. Fragment of iron mail (plate 2.2.H, bottom).
Provenance unknown
Yale no.1982.62.81
No Dura no.

10. Fragment of iron mail (plate 2.2.I, top).
Provenance unknown
Yale no. 1982.62.83
No Dura no.

11. Fragment of iron mail (plate 2.2.I, bottom).
Provenance unknown
No Yale no.
No Dura no.
12. Fragment of iron mail shirt (not illust.).
Provenance “G5.7 D31”
Yale no. 1935.557
Dura no. unknown

Folded mail fragment, 220mm across, of iron rings 8-9mm in diameter. There are traces of rows of bronze rings, and the impression of fabric in the corrosion products.

13. Fragment of iron mail (not illust.).
Provenance; Tower 19 counter mine?
Yale no. 1933.714
Dura no. F1329

A fragment of oxidized iron mail which had been deposited in an air space. This, combined with its discovery in the sixth season indicates that it came from the tower 19 mine complex. The rings were c.9mm in diameter. No bronze rings were visible.

14. Bronze edging from iron mail (not illust.).
Provenance; Tower 19
Yale no. 1938.3727
No Dura no.

A few butted rings of bronze wire, 7.5mm in diameter. A fragment of an iron ring adheres to one, confirming the identification.

Isolated rows of bronze trimming rings from iron mail which has completely corroded away are known from a variety of sites, eg Caerleon (Nash-Williams 1932 94 and fig.41, no.4), Theilenhofen (ORLB 71a, 13, Nr.6 and Taf.IV, Nr.41) and Carnuntum (RLO XXXI Taf.18). See also Alfs, 1941, 78, for a piece from the Danube.

15. Bronze edging from iron mail (not illust.).
Provenance unknown
Yale no. 11938.3728
No Dura no.

Apparently four rows of bronze rings, 7.25mm in diameter and 1.25mm thick, with traces of the first row of iron rings still adhering. See no.14 for parallels.

16. Bronze edging from iron mail (not illust.).
Provenance unknown
Yale no. 1938.3729
No Dura no.

Apparently four rows of rings c.6mm across, 0.6mm thick. They are butted. Traces of iron rings are visible on them. See no.14 for parallels.
17. Bronze edging from iron mail (not illust.).
Provenance unknown
Yale no. 1938.3730
No Dura no.

Three rows of bronze rings, fragments of iron rings adhering. See no.14 for parallels.

18. Bronze edging from iron mail (not illust.).
Provenance unknown
Yale no. 1938.3731
No Dura no.

Three rows of bronze rings, with iron fragments adhering. See no.14 for parallels.

19. Bronze edging from iron mail (not illust.).
Provenance unknown
Yale no. 1938.37.32
No Dura no.

Three rows of bronze rings, 8mm in diameter, 1.2mm thick. See no.14 for parallels.

20. Bronze edging from iron mail (not illust.).
Provenance L7-W
Yale no. 1938.3658
Dura no. F1155

Five links of bronze wire, all butted. Four are 8mm in diameter and 1.5mm thick. The fifth is 7mm by 1mm. See no.14 for parallels.

21. Bronze edging from iron mail (not illust.).
Provenance M8-W2
Yale no. 1938.3653
Dura no. F777

Too corroded to measure rings.

22. Bronze edging from iron mail (not illust.).
Provenance L7-W23
Yale no. 1938.3654
Dura no. F1541

Two types of bronze ring, butted ones 8.5mm across and 1.5mm thick, and stamped links 7.5mm across and 1mm thick. Some fragmentary iron rings survive. See no.14 for parallels.
23. Bronze edging from iron mail (not illust.).
Provenance unknown
Yale no. 1938.3656
Dura no. 1406

Published in Rep. IX part III 63. There are two types of ring, butted (diameter 8mm, thickness 1.3mm) and stamped (6-7mm by 0.5-1mm). Five rows survive. See no.14 for parallels.

The following fragments of mail are recorded in the Dura archive, but were not located at Yale.

24. Fragment of iron mail (not illust.).
Provenance J3/5, Temple of Bel
No Yale no.
Dura no. K424

No further details

25. Fragment of iron mail (not illust.).
Provenance G5-D1
No Yale no.
No Dura no.

A file card at Yale records a “large piece [of] chain mail, very badly rusted, several thicknesses together; with it, 15 fragment[s].” This may well refer to items catalogued under separate headings, but identifications are impossible.

26. Bronze edging from iron mail (not illust.).
Provenance M8
Yale no. 1932.1516A
Dura no. E1043

A similar piece of edging to nos.14-23, with iron rings adhering.

27. Bronze edging from iron mail (not illust.).
Provenance B3-30
Yale no. 1938.3655
Dura no. G1664 (?)

No further details.

28. Bronze edging from iron mail (not illust.).
Provenance L7-W
29. Bronze edging from iron mail (not illust.).
Provenance J7-W1
No Yale no.
Dura no. G1786
No further details.

30. Bronze edging from iron mail (not illust.).
Provenance L7-W2
No Yale no.
Dura no. G1977
No further details.

The following fragments are at the Royal Ontario Museum, but cannot be linked back to the Yale records, even though they came from the Yale collection. The following details kindly supplied by Dr J. Hayes, ROM.

31. Fragment of iron mail (not illust.).
Provenance unknown
ROM number 933.25.22 (old no. G5732)
Dura number unknown

A small fragment, 47mm across, heavily corroded, of 8mm diameter rings.

32. Fragment of iron mail (not illust.).
Provenance unknown
ROM number 933.25.23 (old no. G5733)
Dura number unknown

A fragment, 54mm across, probably from the same garment as 31.

33. Fragment of iron mail (not illust.).
Provenance unknown
ROM number 933.25.24 (old no. G5734)
Dura number unknown
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Completely oxidised, 65mm across. Possibly from the same garment as 31.

34. Fragment of iron mail (not illust.).
Provenance unknown
ROM number 933.25.25 (old no. G5735)
Dura number unknown

A fragment, 35mm across, of oxidised mail with rings about 8mm across.

35. Fragment of iron mail (not illust.).
Provenance unknown
ROM number 933.25.26 (old no. G5736)
Dura number unknown

A double thickness of mail, with a fold down one edge. Now entirely corroded. Rings about 9mm. Fragment 35mm across.

SCALE ARMOUR (Plates 2.2.J to AH)

Scale cuirasses (Plates 2.2.J to N)

1. Fragment of a bronze scale cuirasse (Plate no.2.2.J and K).
Provenance L8-W104
Yale no. 1935.31
Dura no. G25


Described as "Bronze plaque repoussé", this is the upper right chest plate of a scale cuirasse of the so-called cavalry sport type. It is a bronze plate, 118mm high, 88mm wide, and under 1mm thick. It is badly corroded. Yale possesses a drawing and photographs.

The design is a perfectly standard Minerva head over an eagle resting with wings folded (not understood in the drawing), all within a cabled border in repoussé work. It has two rectangular apertures for twist-key fastenings, 18mm by 6mm. There are two of the original four rivets surviving on the other edge. On the back these pass through the plate, then one or two scales (now fragmentary), then 4mm of fabric and a bronze washer or load-spreader which stops the rivet pulling through the cloth. The point of the rivet was hammered over.

This piece is well within the range of variation shown by the several near-identical pieces from Western sites (eg Hrusica, Garbsch 1978 79 and Taf.35.2; Frankfurt, Garbsch 1978 77 and Taf.36.3;
Pfünz, Garbsch, 1978, 79 and Taf.36,6). See, for example, the Minerva plate from Buciumi on the Danube frontier (Gudea 1972 Taf LXXXIV and LXXXV). A similar piece, showing Minerva full face, has turned up at the temple site at Masjid-i-Solaiman in Iran, surely a piece of booty from the Roman frontier (Ghirshman 1971 174, plate Ilia).

2. Fragments of a bronze scale cuirasse (Plate no.2.2.J).
Provenance M8-W10
Yale no. 1982.28.98
Dura no. H109

A badly corroded chest-plate from a scale cuirasse, shattered and beyond restoration, with some loose scales. The Yale records preserve a site card with a sketch which shows that when found this was in one piece, and was the upper part of the left chest plate, and had a cabled border surrounding a bird, presumably an eagle, in repoussé work. This is presumably to be identified with a find mentioned in Rep. VI 305; “part of a lorica squamata, with fragments of powdery cloth still adhering to the scales, and a small fragment of a shoulder piece with a goose design”. The site card also records that the top of a helmet crest, surely of a bust of Minerva, was visible on the broken lower edge.

Only part survives, with some attached scales. The plate was attached to the scale shirt by rivets with heads decorated with concentric circles. These pierced a layer of leather, the scales and fabric backing, and were hammered over a diamond-shaped washer, 14mm by 21mm.

This is again a perfectly standard “cavalry” cuirasse. See no.1 for parallels.

The scales are fine, about 0.5mm thick, and nearly square, c.13 by 13mm, with rounded lower corners. They are linked by bronze staples about two-thirds of the way down the sides, and attached to the cloth backing by a centrally placed vertical pair at the top by 1mm thick thread. Very similar scales are to be seen on the Buciumi example (Gudea 1972 69 and plate LXVIII,2).

3. Plate probably from a bronze scale cuirasse (Plate 2.2.J)
Provenance H2*
Damascus Museum
Dura no. K600

*The record card at Yale says “Temple of Atargatis, cistern”.

A rectangular plaque, 84mm high, 62mm wide and 0.5mm thick, of bronze repoussé work. It is clearly closely related to no.1, again depicting Minerva in the same style, facing right. This differs from the standard cuirasse plates in being rectangular, with a rivet hole at each corner. It is closely paralleled by a piece from Brigetio (Garbsch 1978 78 Taf. 36,2).

4. Plate probably from a bronze scale cuirasse (Plate 2.2.J)
Provenance J3 St B
Damascus Museum
Dura no. H536

A bronze repoussé plaque, almost certainly the left chest-plate from a scale cuirasse. When found it
was 127mm tall, 79mm wide and about 1mm thick but heavily corroded. Before it was photographed, the upper part was lost. However, earlier sketches and the existing pictures show that its decoration was apparently borderless, and consisted of a male figure in tunic, breeches, cloak and probably knee-boots, facing left, with his left arm resting on his hip or perhaps sword hilt, and possibly a banner or spear over his right shoulder. The figure is not easy to identify, but could be Mithras or perhaps one of his acolytes, Cautes or Cautopates. Whoever it is, no close parallel is known to me, although there may be a connection with the figure on shield 3, thought possibly to depict the god Iarhibol.

The fixings also differ from the standard. Down the right hand edge their are some small holes, a pair near the bottom corner and a group of three about 50mm above, perhaps to staple the plate directly to a scale shirt. For similar examples see Garbsch, 1978, Taf. 34,3 (from Adana), Taf.8,1 (Manching) and 9,13 (Pfünz).

On the left edge is a ring of metal wire, which is probably for fixing this plate to its neighbour. This may have worked quite simply, if the ring was held on by a split pin which allowed it to be raised from the surface and swivelled into the vertical plane, to allow it to pass through an upright slot in the opposite plate. It could then be twisted back through ninety degrees and allowed to drop to the position seen in the photograph, locking the two together. No parallel is known to me.

5. Fragments of a bronze scale cuirasse (Plate no.2.2.J).
Provenance unknown
Yale no. 1938.4110
Dura no. unknown

A fragment of a bronze breastplate and some scales, all very corroded. The scales, 28mm by 16mm, have a pair of holes at the bottom as well as the top and sides.

The breastplate fragment preserves a rivet and square load-spreader, which show that, unusually, the cloth and scales overlapped the front of the piece.

6. Twist-fastener from a bronze scale cuirasse (Plate 2.2.J)
Provenance N8 W Dump
Yale no. 1938.2502
Dura no. K240
Length 30mm

This and the following similar objects are fasteners from bronze scale cuirasses of the so-called cavalry sports type. They are identified by the existence of a pair still attached to a pair of cuirasse plates at Manching in Bavaria (Robinson 1975 161 and plate 454; Klumbach, 1962, 187-193; Garbsch 1978 Taf.8,1). These fasteners, which could swivel in the plate to which they were attached, could be turned to pass through rectangular apertures in its neighbour, like those on no.1. They could then be twisted to lock the plates together, and a pin inserted through the central holes in each fastener would stop them undoing accidentally.

These thick bronze castings are much more resistant to corrosion than the thin scales and plates of the rest of the garment. Each of these probably represents all that is left of an entire scale shirt.
7. Twist-fastener from a bronze scale cuirasse (Plate 2.2.J)
Provenance unknown
Yale no. 1938.2499
Dura no. unknown
Length 33mm.

For parallels, see no.6

8. Twist-fastener from a bronze scale cuirasse (Plate 2.2.J)
Provenance unknown
Yale no. 1937.3332
Dura no. unknown
Length 29mm.

For parallels see no.6

9. Twist-fastener from a bronze scale cuirasse (Plate 2.2.J)
Provenance unknown
Yale no. 1938.2497
Dura no. unknown
Length 32mm.

For parallels see no.6

10. Twist-fastener from a bronze scale cuirasse (Plate 2.2.J)
Provenance unknown
Yale no. 1932.1606
Dura no. unknown
Length 29mm.

For parallels see no.6

11. Twist-fastener from a bronze scale cuirasse (Plate 2.2.J)
Provenance L7 W10
Yale no. 1938.2489
Dura no. F1538
Length 36mm.

For parallels see no.6

12. Twist-fastener from a bronze scale cuirasse (Plate 2.2.J)
Provenance unknown
Yale no. 1932.1607
13. Twist-fastener from a bronze scale cuirasse (Plate 2.2.J)
Provenance G3 W1
Yale no. 1938.2501
Dura no. K181
Length 26mm.
For parallels see no.6

14. Twist-fastener from a bronze scale cuirasse (Plate 2.2.J)
Provenance unknown
Yale no. 1932.1608
Dura no. unknown
Length 24mm.
For parallels see no.6

15. Twist-fastener from a bronze scale cuirasse (Plate 2.2.J)
Provenance unknown
Yale no. 1938.2500
Dura no. unknown
Length 23mm.
For parallels see no.6

16. Twist-fastener from a bronze scale cuirasse (Plate 2.2.J)
Provenance unknown
Yale no. 1937.3514
Dura no. unknown
Length 34mm.
For parallels see no.6

17. Fragments of a bronze scale cuirasse (Plates 2.2.L and M).
Provenance M8-W10
Yale no. 1938.4134
Dura no. H108
A quantity of scales identical to those seen on no.2, whose adjacent Dura number and common
provenance may indicate they are indeed from the same cuirasse. There are also very fragile and powdery fragments of backing fabric. Further constructional details are provided by these pieces. The scales are slightly domed at the bottom for additional strength. There was also a 1.5mm thick cord running across the face of the scale rows, through the loops of thread holding the scales to the backing. The purpose of this, beyond general strengthening, is not clear, but essentially the same structure is seen on the fragment of scale armour recovered from Carpow (a piece brought to my attention by Prof. J. J. Wilkes; Wild 1981).

18. Fragment of bronze scale cuirasse (Plate 2.2.L)
Provenance G1-36
Yale no. 1932.1403 (part of)
Dura no. E565

Some rows and loose scales from armour of the same type as those seen on no.2. There are also fragments of backing fabric. A sketch on the Yale record card shows exactly the same method of attachment as no.17.

19. Fragment of a bronze scale cuirasse (Plate 2.2.L)
Provenance unknown
Yale no. 1981.62.50
Dura no. unknown

A heavily corroded fragment of a cuirasse of scales exactly like no.2.

20. Bronze scales (Plate 2.2.L)
Provenance unknown
Yale no. 1938.4137 (part of)
Dura no. unknown

A few scales of the same type as no.2, although slightly wider.

21. Bronze scales (Plate 2.2.L)
Provenance unknown
Yale no. 1982.28.104
Dura no. unknown

A few scales of the same type as no.2.

22. Fragments of a very fine bronze scale shirt (Plate 2.2.N, top)
Provenance unknown
Yale no. 1934.464
Dura no. unknown
Substantial portions of a garment of extremely fine scales, now heavily oxidised and fused together. These are 6-7mm high by 5-6mm wide, and only c.0.25mm thick. They have pointed ends, and are held on by six holes, in three vertical pairs or two rows of three, at the top. Despite the tiny size, the scales were linked by the conventional wire staples, and presumably the rows were affixed to the backing with thread via the central pair of holes in each scale. However, the piece is now too corroded to show this detail.

One of the fragments preserves the backing fabric and traces of an upper edge. Above the top row of scales is a row of holes for the leather edging strip.

The intricacy of the work was enormously labour intensive and skilled. It must have been very expensive, and was probably therefore a rather showy shirt. Its strength and effectiveness in battle may be doubted.

Virtually identical scale armour is known from Carnuntum (*RLO* XXXI Taf.18) and Vindobona (*RLO* XXIII Taf.XXXV.1).

23. Fragment of a very fine bronze scale shirt (Plate 2.2.N, bottom)
Provenance unknown
Yale no. unknown
Dura no. unknown

A fragment, c.200mm by 70mm, of a garment of identical construction to no.22, and possibly part of it. It is folded double, inside out. The flexibility of such fine armour is well seen in this piece, which took a 180 degree fold with a diameter of about 20mm. See no.22 for parallels.

24. Fragments of very fine bronze scale armour (Plate 2.2.L)
Provenance unknown
Yale no. 1934.467b
Dura no. unknown

A small quantity of loose scales, identical to no.22.

25. Fragments of very fine bronze scale armour (Not illust.)
Provenance J1-103
Yale no. 1938.4135
Dura no. K502

A small quantity of loose scales, identical to no.22.
Limb armour (Plates 2.2.O to W)

1. Leather lamellar cuisse (Plate 2.2.O and P)
   Provenance Tower 19
   Yale No. 1981.62.27
   Dura No. unknown.

   Published in Rep. VI 450 no.1 and plate XXIII, left; and Robinson 1975 162 and Plate 457.

   Found with a second cuisse or thigh defence (no.2, below) between the collapsed floors of Tower 19. The identification of these as thigh guards is based on their size and shape and seems secure. Both had provision for laces to hold them around the thigh of the wearer, and they are of the appropriate size to cover the wearer from waist to below the knee. Such defences are appropriate to cavalrymen, affording protection to the vulnerable exposed area between mail shirt and, if worn, greaves.

   The two are mirror images in shape, but it is not easy to decide which was right and which left; however, they do not constitute a pair, as they differ in size, colour and construction. To add to the confusion, examination of the pieces reveals that both publications have got them back-to-front; the published photographs show the rear side only. The front of each has a dramatically different appearance with almost all of the complex lacing hidden and the lamellae overlapping downwards, not upwards as published (Plate 2.2.O). On balance I think that this piece is for the right leg, in which case the exposed edge of the overlapping scales would be downwards and backwards when mounted on horseback, affording maximum protection from a downward blow.

   Lamellar armour differs from scale in structure in that the small plates of which it consists are not dependent on attachment to a cloth backing, but are attached directly to each other. Usually the complex lacing is visible on the front of lamellar defences, and the individual plates usually overlap upwards, again in contrast to the practice with scale armour. The Dura pieces are unusual in both these respects, for the lacing is almost entirely covered by the lamellae, which overlap downwards. The result is armour with a strong superficial resemblance to Roman scale armour. This is especially intriguing, as if this armour were common across the Empire, it would be almost undetectable. Its organic construction would militate against its survival in the archaeological record, while its construction makes it almost indistinguishable from scale in any depiction. Lamellar has scales in vertical rows but this is not necessary with scale armour.

   No. 1 is 740mm long and 570mm wide, and is made of 13 rows of rectangular lamellae c.65-70mm by c.40-45mm, plus an extra row of larger scales c.80-90mm by 40-50mm) at the bottom. Below this is a single extra-large lamella, 90 by 60mm, which probably formed a basic shin-guard. The scales vary in thickness from 3 to 5mm. The defence is clearly effectively complete, as most of the leather edging survives.

   The original report describes the scales as cuir bouilli, while Robinson, who, so far as I can establish, never inspected them, says they are rawhide. Both these identifications may be doubted. The scales do not have the texture or appearance of rawhide, which was widely used for stitching on scale armour at Dura. They do look to have undergone some kind of curing process, but I doubt that the technique used was cuir bouilli, which involves soaking in water or, better, hot wax to harden the hide (Blair 1958 19). Perhaps chemical analysis will identify the technique used.

   Robinson also described the piece as lacquered red. No trace of this was seen by me, although the vertical lacing and leather edging is reddish.
The lamellae are connected together in horizontal rows by a lather lace, squarish in section, c.3mm thick, which runs along the front of the rows. It passes through three holes on either side of the upper part of the scale (Plate 2.2.P). Some of the rows have a second lace midway down (see below). The rows are linked vertically by red leather strips, c.7-10mm wide and 1-2mm thick, running down the back of the garment. Each strip passes to the front of a lamella through a small rectangular slot, loops around the horizontal lace and passes back through the aperture and moves on to the next row (Plate 2.2.P). Unlike the lamellae, which have the skin side outwards, the laces have the smooth surface inwards, probably to reduce chafing.

The bottom row has a different transverse lacing system. The longer scales are joined at both top and bottom, like more conventional lamellar armour, but the lace passes through only two holes on each side. The vertical laces attach the row to the rest by the same method of looping through the lamellae and over the upper lace; however, in this row there is a second slot below the first on each lamella. The vertical laces pass once more to the front through these, and each is secured by a knot. The upper ends of the vertical lacing strips pass over the upper edge of the topmost row of lamellae, where they are caught by the lacing of the edge-strip. About 200mm of each lace was left to hang over the front of the defence.

The scale rows overlap vertically so that c.35-40mm of the scale below is exposed. It is noticeable that all the primary structural lacing is covered, as is ordinary scale garments and unlike other lamellar armour.

The cuisse is edged with red leather strip, in two lengths, around all but the straight vertical edge. This trimming, 20-30mm wide and 1.5mm thick is held on by lacing. The untrimmed straight edge seems to have had a different arrangement, consisting of a 10mm by 1mm leather lace running down the back, squeezed through a pair of 3mm round holes in the edge of each terminal lamella.

On its outer face the edge of the garment has a continuous line of holes for fine stitching, presumably for thread, but this is now lost. The purpose of this is obscure. It is possible that the front of the garment was covered with fine cloth to reflect the heat of the sun and protect the leather.

There are signs of repair. Part of the edging is held on by hemp string rather than leather lacing, presumably a secondary feature. Also, certain lamellae have redundant holes, possibly indicating reuse of parts to replace damaged ones.

The only evidence for the method of attachment to the leg is a leather lace, 1mm thick and 6mm wide, expanding to 10mm at its free end, attached to the second scale in from the curved edge, on the twelfth row. Secured by a simple knot at the front, it passes through the lamella and c.150mm hangs free at the back. The square-cut end does not appear to be broken. Perhaps it was designed to tie with another around the back of the leg, but no evidence of a matching lace appears at the other end of the row.

It does appear that this piece was of some age when deposited, and incomplete, most notably in the general absence of fixing laces. This accords well with the idea that this, and other items in Tower 19 at the time of the siege were there in store or awaiting repair (Rep. VI 439).

There are no close parallels for this piece known to me either from the Roman Empire or beyond. Cuisses are known from elsewhere, made of metal strips (eg Newstead, Curle 1911 156 and plate XXIII).

Lamellar armour is not thought to be widespread in the Roman world, although metal examples are known from North Britain (Robinson 1975 162 fig 174). It seems to have been much more popular in the East during the classical period. There are depictions of such armour at Palmyra, for example (Robinson 1975 plate 456).
Actual examples of ancient leather lamellae were recovered from various Asian sites by Sir Aurel Stein, although these seem mostly to belong to the eighth or ninth centuries AD (eg, the Tibetan fort of Miran, Stein 1921 459 MI.0068 to 0071 481MI ix 002 to 004, 482 MI xiv 0074, 483 xxiv 0040).

Below is a summary of the lamellar structure (rows numbered from top to bottom):

<table>
<thead>
<tr>
<th>Row</th>
<th>No. of lamellae</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>3</td>
<td>17</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
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<td>7</td>
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<td>8</td>
<td>15*</td>
</tr>
<tr>
<td>9</td>
<td>13</td>
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<tr>
<td>10</td>
<td>13*</td>
</tr>
<tr>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>12</td>
<td>12*</td>
</tr>
<tr>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>Extra row</td>
<td>11*</td>
</tr>
<tr>
<td>Shin-guard</td>
<td>1</td>
</tr>
</tbody>
</table>

* These rows each have a second transverse lace linking them together.

2. Leather lamellar cuisse (Plate 2.2.Q and R)
Provenance Tower 19
No Yale No.
No Dura No.
Published in Rep. VI 450-1 and plate XXIII, right, and Robinson 1975 162 and plate 458.

See the discussion of no. 1, with which this was found, for general comments and parallels. Like the other cuisse, it was not complete when deposited; a number of lamellae were missing.

This is probably a cuisse for the left leg, because of the way the scales overlap. It does not constitute a pair with no.1, as it is of differing size, colour and construction. Its shape is also different, being more rectilinear, an inverted "L" rather than a "leg-of-mutton" shape. It is 660mm high by 450mm wide. The defence consists of 12 rows of roughly uniform scales, and it lacks the arrangement of larger scales seen at the bottom of no.1. The lamellae are 55-60mm by 40-45mm, of black leather, possibly dyed or lacquered. They are now very curled up. The degree of vertical overlap of the rows is much less than on no.1, only c.10mm, leaving the lacing exposed.

Like no.1 the whole is held together by thin, horizontal laces on the front and wider vertical laces down the back. However, no.2 differs in significant details (Plate 2.2.R). The lamellae are joined into horizontal rows by a single lace which passes through a pair of holes just above the middle of each vertical edge of each scale. The laces, which run obliquely across the front of each lamella, are red leather thongs, 3-8mm wide. The rows are joined vertically by laces of the same dimensions as the equivalents on no.1, which again loop through rectangular apertures in the upper part of each lamella, over and around a horizontal lace on the front of the row. However, unlike no.1, this is not the main transverse connecting lace, but a second thong, which is not attached to the scales at all; it
simply runs across the face of the scales, over the slots and through the loops of the vertical laces. The advantage of this system is that an entire row of scales can easily be removed by pulling out this second lace, facilitating replacement of damaged lamellae without complete disassembly of the cuisse. This cannot be achieved with no.1.

The vertical laces are fixed at the top in the same manner as no.1. At the bottom they are stitched through by the edging thong.

The edging, now fragmentary, is a thin strip of red leather, only 20mm wide and 1mm thick, held on by a lace running down the back, looping through the scales and back through itself (plate 2.2.R).

Five attachment laces survive, one at each end of the bottom row, 100mm and 300mm long, presumed to be for tying behind the knee. There is one on row 6, attached to the third scale from the right, 400mm long. There is another on row 3, third scale from the right, again 400mm in length, and one on the top row, third (surviving) scale from the left, 310mm long.

Lamellae are missing from all but the bottommost rows. However, the laces survive, allowing the following layout to be reconstructed with some confidence. The rows are numbered from top to bottom. Numbers of surviving lamellae are given, along with the original numbers (in brackets).

<table>
<thead>
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<tr>
<td>11</td>
<td>9 (9)</td>
</tr>
<tr>
<td>12</td>
<td>9 (9)</td>
</tr>
</tbody>
</table>

See no.1 for parallels for this item.

3 and 4. Fragmentary bronze scale armour, probably a pair of cuisses (Plates 2.2.S and T).
Provenance Tower 19
Yale number 1938.4106, 4111
Dura no. unknown

This group of fragments corresponds to the published description of the “accessory” to armoured horse barding III (Rep. VI 443);

“Fragments of an accessory to housing III, or to another housing which may have perished, include:

“1. A hundred or more scales, separate, or linked in strips of from two to ten, of small format. They average 0.03m long and 0.015m wide, have the lower corners bevelled off, and are pierced with six holes each, two on either side and two at the top.
There are two large fragments of cloth backing, with some rows of scales adhering, and traces of leather edging strip bound with rawhide laces. There are also a number of fragmentary rows of scales.

The scales, which precisely match the published description, are held on by two threads running separately through the two central holes in each one. While one thread enters the outside of the upper hole, the other is emerging from the lower hole and runs to the top hole of the next scale, where the first emerges through the lower aperture; in other words, the two threads form a "double helix", and if either breaks the scale is still secured by the other (plate 2.2.1, below).

One of the fragments preserves the obtuse upper corner described above in 2. Both the upper and side edges are bound with leather edging strip (two pieces) held on by a running rawhide lace which passes through the strip, cloth, and special large holes in the side- and top-edge scales.

There is also a box with the same number, containing mostly loose rows of scales. Three rows are linked by edging; these have 11,10 and 1 scale from top to bottom. There is a row of 25, with the left-hand 5 having a single large hole at the top for edging. The other rows have the following numbers of scales: 28, 17, 16, 14, 13, 12, 7, 7, 5, 4, 4, 3, 3, 3. However, there may be no particular significance in these numbers as we cannot be sure these rows are complete.

It is difficult to be sure of the purpose of this item of armour, but it is unlikely to be part of a horse armour. Unlike the fragmentary armour associated with housings 1 and 2, this differs from its supposedly associated trapper, housing III, in construction, notably in the form of its scales. In addition, the upper edge is finished with leather binding strip and rawhide lacing, but no sign of a median strip to hang it over a horse's back or neck. The cloth backing is now highly fragmentary, but it may well represent an inverted "L"-shape, similar in size and form to leather cuisse no.2. On balance I think that this item is a scale cuisse.

The scales are identical to a fragment labelled 1938.4111, which I believe to be part of a second scale cuisse. This fragment consists of seven fragmentary rows of scales, held together by rawhide edging-lacing. The fabric backing, and presumed leather edging, is lost. However, the lacing preserves part of the edge shape of this piece which reveals a right-angled re-entrant, again consistent with the shape of a cuisse like number 2. The scales are identical to those of cuisse 3, so I propose that these fragments represent not an accessory to a horse armour, but a pair of cuisses. The provenance of 1938.4111, given as L8W, is consistent with the two possibly being found together.

Box H
This box at Yale contains loose rows of scales identical to those on the fragments discussed and probably also come from these garments (Yale accession nos, followed by numbers of scales in brackets);

<table>
<thead>
<tr>
<th>1938.4053</th>
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<td>(2)</td>
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<td>4062</td>
<td>4076</td>
</tr>
<tr>
<td>(4)</td>
<td>(2)</td>
</tr>
</tbody>
</table>
There are some scales apparently from the same group of fragments now at the Royal Ontario Museum (identified from information provided by Dr. J. Hayes);

933.58.1  
933.58.2  
933.58.3  
933.58.4

5. Possible cuisse of iron scales (plate 2.2.U)
Provenance unknown  
Dura number unknown  
Yale number unknown

A fragment of an item of scale armour with leather and rawhide edging. It bears the identification XX/359.39 which relates to the leather conservation.

The iron scales are large, of the same size and form as those on armoured horse trapping number 2, and so this appears at first sight to be from a horse armour. However, it is apparent that this is an upper corner, and like cuisse 3 there are no signs of means of attachment to a strip of fabric or leather along the top edge to allow this to hang down the flank or neck of a horse. Again the best parallels for the shape seem to be leather cuisses 1 and 2, so this piece is considered to be probably from a cuisse as well.

This armour would have been no heavier or more cumbersome than cuisse no.6.

6. Fragment of cuisse of iron laminated armour (Plate 2.2.V)
Provenance Tomb 28 “in earth fill, not in loculus”*  
No Yale no.  
Dura no. 1282

*According to a site record card, but this object is not mentioned in Rep. IX, part 2. This evidence means that it is not possible to be sure whether the object was part of a disturbed grave group, or an accidental inclusion as rubbish in the grave fill. The latter is more likely, but either origin would mean that the item predates the siege, perhaps by a considerable period. It is the only piece of laminated armour identified at Dura.

When found, the fragment consisted of three slightly curving iron plates, the upper of which is now lost. The surviving fragment is 125mm wide and 85mm tall. The iron, moderately corroded, is now c.2mm thick. The (wearer’s) left hand corner is broken, but it is clear that the defence tapered gently to a somewhat rounded lower end.

The iron plates overlap upwards, and this, together with the breadth and relative flatness of the plates, makes it fairly certain that this is the lower end of a cuisse, rather than an arm-defence or any form of segmentate body armour.
The surface is quite heavily corroded, but a difference in the texture of the oxidation products betrays the use of (presumably) leather edging, running continuously down the sides of the cuisse, held on by a running lace through the edges of the plates, holes for which survive. The edging will have served to reduce chafing, and may have been the primary way of holding the plates together. It will certainly have allowed the cuisse to flex, but would severely limit the freedom of the individual plates to slide over each other; however, this is little disadvantage in a cuisse. Nevertheless the main longitudinal connection between plates may have been a leather strap or straps, running down the back of the cuisse and rivetted to each plate. Evidence for the use of this method, which seems to be standard on Roman *Lorica segmentata* (Robinson 1975, especially figs 108-181; Allason Jones and Bishop, 1988) and other laminated defences (see the Newstead cuisse, below) may be seen in the two surviving rivets on the back of the plates.

Fixing of the lower end of the cuisse to the leg, presumably just above the knee, was probably by straps, either attached to the rivets or through the larger lacing holes in the centre of the bottom edge.

A quite close parallel for this cuisse, albeit in bronze, was found in fragments at Newstead (Curle 1911 156 and plate XXIII). A reconstruction was made by Robinson (1975 plates 503-4). The latter shows the system of articulating straps on the back.

It is clearly akin to the more massive limb-defences used by heavy cavalry from Hellenistic times if not earlier, from Central Asia to the Mediterranean (eg the Hellenistic cataphract armour from Ai Khanoum, Bernard et al 1980 60-63 and plate XXXVI,a).

Its apparent context means that this piece predates the siege, but nothing further can be deduced about its exact dating and affiliations.

7. Fragments of a bronze greave (Plate 2.2.W)
Provenance unknown
Yale no. 1938.3695A-D
Dura No. unknown
Recorded as "Br[onze] shield Fragm[ents]" at Yale, the object is evidently a plain bronze greave of known Roman type.

Four fragments survive, and these conjoin into two larger pieces, preserving parts of both edges. The fragment of the (wearer’s) right edge preserves the change from the convex curve around the calf to the concave line down towards the ankle. The surface is of smooth yellow bronze, embellishment being limited to two shallow ridges parallel to each edge, one right on the edge, the other c15mm in from it. These would have served to stiffen the piece.

In section the greave appears to have been an open "V", with a slight median carination, to improve resistance to blows.

Roman greaves did not spring around the calf like Greek examples, but were strapped on. Signs of such attachments may be seen in the small holes, between the edge ridges, which suggest straps just below the calf muscle. Other straps may be assumed above it.

European forts have produced both infantry and cavalry greaves from third century contexts. Presumed cavalry types are much more common, being distinguished from probable infantry patterns by inclusion of knee-guards and ankle protectors; the supposed infantry types are just shin-guards,
presumably lack these additional features for the sake of agility, and because the knee was protected by the large body-shield.

Fragments of at least two similar plain greaves, albeit in iron, were found in the Hebron hoard which probably belongs to the earlier second century AD (Weinberg 1979 85 and plate 25,6). Most cavalry examples are highly decorated (eg Robinson 1975 plates 505-6; Garbsch 1978 Taf.3) while the rarer "infantry" ones tend to be plain like the example under discussion (eg Künzing, Robinson 1975 plate 150). However, plain cavalry ones are also known, as may be seen in an example in Regensburg museum (Robinson 1975 plate 511).

On balance, it is more likely that these fragments represent a cavalry type.

8. Fabric liner for a greave (not illustrated)
Provenance unknown
Yale no. 1933.481
Dura no. unknown
Height 442mm
Width 270mm

This piece was described in the Final Report on the textiles (Pfister and Bellinger 1945 59 number 292 and plate XXX; XXXII and XXXIII D1), where it is described as a;

"shinguard of very stout linen (.5cm thick) bound by leather sewed on by undyed linen; three pairs of leather ties originally dyed red sewed on by undyed linen. Binding 1.3cm wide. The surface has felted slightly through wear... Two cuts penetrating the thick fabric may be the evidence of actual combat".

Having examined the piece I am convinced that it is a greave liner rather than a defence in its own right; even 5mm of linen would not have been very effective. It makes far better sense as shock-absorber and anti-chafing device between the shin and a metal greave like no.7. This explanation also accords well with the observed pattern of wear.

Given its considerable height, and the curved top edge, it is clear that it covered the knee and so was designed for use with a bronze or iron greave of the "cavalry" pattern discussed under no.7.

There are no parallels known to me, although these were probably routinely employed with metal greaves.
Horse armour (Plates 2.2.X to AG)

1. Armoured horse trapper of bronze scales (Plate 2.2.X to AB)
Provenience Tower 19
Damascus no. unknown
Dura no. unknown; possibly none given

Referred to in the publications as housing 1 (Rep. VI 440-2). This armour is now in Damascus (Abdul-Hak and Abdul-Hak 1951 17 no.40 and plate VI2), and was therefore not available to me for study. The following is the published description:

"The housing of bronze scale armor is in exceptional preservation, the scales very little patinated, the cloth and leather almost intact. It consists of two side pieces fastened together by a strip of leather down the center, and a tail-piece attached at one end of the same strip. When laid flat it is almost perfectly rectangular, 1.22m long and 1.69m wide. In the middle of the forward end it is cut slightly back over a width of 0.70m where it passed over the horse’s withers. Back 0.12 from this edge is an ovoid hole 0.37m long and 0.68m wide, its long axis perpendicular to the median line, exposing the shabrack. Each half, except where it is interrupted by this hole, consists of thirty or thirty-one strips of thin bronze scales sewn on a doubled backing of coarse linen cloth. The scales, averaging 0.035m long by 0.025m wide with rounded lower corners, are pierced with eight holes each, two on either side and four, disposed in a square, at the top. They are linked together horizontally, each overlapping the next by loops of bronze wire passed through the side holes. The strips are sewn to the backing by a cross stitch of heavy linen thread through the upper holes in such a way that each strip overlaps the one beneath it and covers the stitching. Each of the scales of the top strip on either side is punched with a large hole through which pass the rawhide thongs which lace it to the central stripping. This stripping, the front segment 0.22m wide, the rear 0.14m, consists of a double thickness of red-dyed leather. The end of the ensemble and the circumference of the saddle hole are finished off with a leather edging consisting of a strip of red-dyed leather 0.04-0.05m wide folded over the edge scales and laced with rawhide thongs through holes punched in the scales. The bottom edges were originally finished with a band of red leather skirting 0.085m wide sewn to the cloth backing with the same sort of thread as was used for the scales. The ends of the skirting were finished by a continuation of the end edging. Two considerable fragments remain of this skirting at the rear corners, a smaller fragment at the right front corner. At the left front corner, the continuation of the edging remains, though the skirting which it bound has disappeared.

"The garde-queue is roughly triangular in shape, 0.26m long and 0.20m at its widest point. It is composed of eleven rows of scales linked horizontally and sewn on the same cloth backing as the rest of the housing. Its edges are bound with the same sort of leather edging. It is attached to the body by a loop of leather 0.055m wide passed through a slit in its own edging and laced to that of the body with a rawhide thong.

"At 0.16m and 0.09m respectively from the front edge and 0.27m from the bottom on either side, are two red leather laces, the right one 0.27m long, the left 0.145m. Neither is preserved to its full length. They are simply thrust through the cloth backing and held fast by a knot at the end. One of an identical pair of laces remains left 0.035m from the rear edge and 0.335m from the bottom on the side. It is 0.135m long. No trace remains of its mate on the right."
"At the centre of the rear edge of the shabrack hole a length of rawhide lace is looped through the central leather strip. Its ends are braided together by being passed through slits in each other for about 0.03m above the loop, and they continue free for 0.14-0.18m more. In the loop is threaded a flat brass ring 0.033m in diameter.

"On either side of the loop and ring, 0.28m along the edge of the saddle-hole, is a larger loop of rawhide 0.12-0.13m in diameter braided in the same fashion. The ends are tied through holes punched in the adjacent scales.

"Through the central leather strip 0.22m from the rear edge is looped another length of rawhide lace. The two ends, each originally 0.32m long, are first threaded through a hole in the center of a round wooden button, 0.057m in diameter, and then through two slits in a second transverse length of rawhide, originally 0.70m long.

"Fragments of accessories (IA) to Housing I include:

1. Several hundred scales, separate, or linked in strips of from two to eighteen, of the same format as those of the housing (average 0.025m X 0.035m).

2. Fragments of top and side edging of red leather laced to adjacent scales with rawhide laces.

3. Fragment of red leather skirting with part of cloth backing adhering. The edge of the skirting is indented in a series of triangular points [sic].

4. An important fragment of scales and backing showing an angle of about 30 degrees made by the horizontal scale strips."

Of particular interest are the two loops attached to the rear edge of the saddle hole mentioned, but not explained, in the above description (and see plates 2.2.X and Y). It is almost certain that these were actually intended to be hooked over the rear pommels of a standard Romano-Celtic four-pommel saddle, of the type brilliantly elucidated by Connolly (1987), and which is now shown to have been the usual type employed in the Partho-Sassanian world as well (Herrmann 1989). Here the loops will have stopped the armour sagging and stretching below the saddle. It is useful to have this indirect archaeological evidence for the type of saddle used at Dura, as no actual remains have been identified.

Accessories

It appears that some at least of the fragments of accessory IA are at Yale. These include a substantial fragment of a scale garment in an excellent state of preservation, complete with stitching and cloth backing, c280mm by 250mm (1934.467a; no Dura number but provenance given as N8-W9).

There are two layers of off-white fabric, the outer coarser than the inner. Some rows of bronze scales are still attached, by thread passing through both thicknesses of fabric.

The bronze scales are 35-7mm by 24-6mm, c.0.25mm thick. The lower corners are cut off and apparently filed to eliminate sharp edges. The lower part of each scale is slightly domed to resist bending. Rows of scales overlap so that (to the wearer) right side overlaps left. Scales are attached to their lateral neighbours by a single twist of rectangular or circular-sectioned wire, passing through matching pairs of apparently drilled holes, 2.25mm in diameter, and hammered flat.

Preassembled rows were sewn onto the backing fabrics via a cross-stitched pattern of doubled thread passing through a group of four holes at the top of each scale. It is difficult to be sure due to the absence
of some rows, but it appears that the rows were slightly staggered, so that each row is placed about one-third of a scale width to the (wearer's) left of the row below. Each row covers about 13mm of the scales below, which protected the stitching but not the staples.

The piece shows evidence of repair, eg one scale overlaps both its neighbours, and some have crudely punched holes. Some scales have an extra-large hole, possibly for attaching laces. Alternatively they may represent reuse of scales from the edge of a garment.

A second fragment from this garment preserves part of the lateral edging. It consists of two pairs of scales linked by leather edging with rawhide stitching. The fabric backing has perished. These scales constitute the ends of rows; there is one row missing between. The edging is a 40mm wide strip of leather, wrapped around the edge of the scales, and held on by two running laces of rawhide, which pass through the strip, a large hole in each scale, and back through each other.

A third fragment (1934.465) represents the lower edge of the garment. It is the bottom row of scales, which all have a central large hole, in which survives a rawhide lace for binding the edging. With this is a piece of leather, a strip c.100mm wide, with a serrated lower edge, sewing holes for attachment to the fabric backing at 15mm intervals 4mm from the top edge, and holes for the laces 20mm from the top edge. This appears to equate to fragment 3.

Box E1
A box at Yale marked “E1” contains hundreds of scales of the same format, mainly in short rows, which can be identified as those mentioned under the list of Accessory 1A fragments, item 1. These include the following numbered scales and rows (number of scales in brackets. All Yale nos. 1938.**** except where indicated);

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Box E2
This also contains scales of the same type, although three of these (1931.599 (part of); 1938.4114 and 4118) have provenances other than Tower 19, showing that this type of scale was used in other garments elsewhere. However, it remains likely that the following belong to the garment under discussion;

<table>
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<td>2</td>
</tr>
<tr>
<td>4052</td>
<td>2</td>
</tr>
</tbody>
</table>

162
Others now physically separated from the group but probably belonging to it include 1938.4007 (6), 1982.28.99 and 1982.28.100.

There are in addition some 60 loose, unnumbered scales. There are also a handful of scales of a slightly larger format (42mm by 30mm), perhaps a repair to this garment, but possibly intrusive, having been thrown into the box at some later date on grounds of similarity. These include 1938.4014 and four unnumbered scales.

There are also rows of scales of the same type and condition as part of a group numbered 1938.4111. It seems likely that they are also from this armour. They include long rows with angled leather and rawhide edging, and may equate to fragments 2 and 4 listed above.

Some scales of this type are now at the Royal Ontario Museum. Information provided by Dr. J. Hayes allows the following tentatively to be assigned to the accessory (ROM numbers);

933.25.10
933.25.11
933.25.12
933.25.13
933.25.14

From the confusion of the records it is clear that it will never be possible to establish a definitive list of scales belonging to this piece.

It seems likely from the published description and study of the fragments that they are parts of a neck-defence.

There are no known Roman archaeological parallels for this form of armour outside Dura, although documentary evidence makes it clear that it was widely used in the Roman army from the third century onwards, and that body-armour for horses of various types was commonly used across Asia from the Hellenistic period if not earlier (see discussion, part 2.2.6). An interesting example of what appears to be a chest-protector for a horse was found in a Hellenistic context at Ai Khanoum in Afghanistan (Bernard et al 1980 61 and plate XXXVIII,b).

2. Armoured trapper of Iron scales (Plate 2.2.Y and AC to AE)
Provenance Tower 19
Yale No. 1933.680
Dura no. unknown

This piece is referred to in the published report as housing II (Rep. VI 442-3), and is apparently the trapper pictured by Hopkins shortly after excavation (1979 189). It is now displayed in the Higgins Armory Museum, but it was not possible to open the case during my visit. The following is the published description:

"The housing of iron scale armour is somewhat less well preserved than I, but nearly intact. It is made all in one piece, strengthened by a strip of leather down the center, from which the strips of scales overlap downward on either side. Laid out, it is very nearly rectangular, 1.48m long and 1.10m wide. At the two front corners, however, it is produced [sic] 0.30m in two curving extensions 0.16m wide designed to meet across the horse's breast. The rear edge is rounded off so that the rear corners are 0.18m back of the center. The ovoid shabrack-hole, 0.28m from the front edge, is 0.61m long and 0.38m wide, with its long axis in the median
line of the housing. The scales, averaging 0.06m long by 0.045m wide by 0.004m thick, are rounded at the bottom and pierced with eight holes each, two small ones at either side and four larger ones in a square at the top. They are linked together by staples of bronze wire through the side holes, and sewn in nineteen overlapping rows on each side of the center strip, to a single thickness of coarse cloth resembling burlap. The sewing is done with fine rawhide laces with a regular over-one-under-one stitch.

"The center stripping, each segment of it 0.15m wide, is of heavy, untanned, uncolored leather. It is laced to the adjacent scales on either side with rawhide laces. As in I, both ends of the housing and the shabrack-hole are finished with fine red leather edgings folded over the edges of the scales and laced to them. The same laces along the rear edged attach two triangular flaps of the same untanned leather as the center strip, 0.18m wide at their ends, which take up the rounding off of the rear edge. The bottom edges have a skirting of red leather, similar to that of Housing I, 0.05m wide, sewn with coarse thread to the cloth backing.

"The triangular garde-queue, 0.215m on a side, is crudely made of four unevenly overlapping rows of scales laced to a backing of untanned leather with rawhide laces. This backing itself was first bound with a red leather edging; then backing and scales were rebound with one of untanned leather, which passed under the edges of the two bottom rows of scales.

"The remnant of a tie-lace remains thrust through the pierced top corner scale of the right front extension.

"Fragments of accessories (IIA) to housing II, include:

1. One hundred or more scales, separate, or linked in strips of from two to eight of the same format as those of the housing (average 0.06m X 0.045m).

2. Fragments of two lower outside comers, scales on backing, red leather side edging, and indented bottom skirting.

*** The scales and staples are technically analyzed by John W. Higgins of the Worcester Pressed Steel Co., Worcester, Mass., as follows: The iron plates are hammered uniformly thin, annealed soft with a slight blue scale and no indication of burning, work-hardening, brittleness, or bad lamination. The marks are still on the plates, as though they were polished yesterday, and scarcely any rust. The wire staples are sheared or forged, not die drawn."

The fabric backing was described in the textiles report as a coarse-fibre linen "twill" (Pfister and Bellinger, 1945 64).

My own scrutiny of this piece adds some more details. The direction of overlap of some of the scales is incorrect, suggesting rough repairs, apparently in antiquity. Generally, on each side the scales overlap their neighbour to the rear, as would be expected, to repel projectiles coming from the front. However, half of one row overlaps the other way, which must surely be a repair. The overlaps are particularly chaotic at the top of the garment, in front of the saddle hole. There also seems to be a fairly random scatter of scales with additional unused lacing holes, which also probably represent repairs with scales taken from edge positions on other trappers. Each row is sewn above and slightly to the rear of the one below.

The published drawing (plate 2.2.Y, right) shows that there are projecting leather strips along the rear edge of the trapper, but incorrectly shows their shape; strangely, they were cropped from the published photograph (plate 2.2.AC). However, an unpublished photograph (number unknown) on the Yale record card shows that this trapper, like no.1, was put on the back of a pony, which whatever the
JAMES: THE ARMS AND ARMOUR FROM DURA-EUROPOS

demerits for conservation was a useful exercise as it shows how these leather flaps closed around the
tail of the horse, providing all-round protection. It also makes it clear that, as might be expected,
the armour was just deep enough to cover the body of the animal without interfering with the
movement of the legs.

Some items at Yale may be equated with the fragmentary "accessory", perhaps including a row
of eight iron scales numbered 1981.62.26. There is also an edging fragment (1933.713), probably a
neck defence. It is a lower edge, and indented. A corner survives, as does part of the fabric backing.
The leather bears impressions of the bottom row of large, presumably iron, scales (plate 2.2.AE).

3. Fragments of an armoured trapper of bronze scales (Plate 2.2.AF)
Provenance Tower 19
Yale Nos. below
Dura No. unknown
Referred to in the publications as housing III (Rep. VI 443), this had completely dissolved into
fragments due to the loss of all organic parts, probably because it was on the top of the pile of debris
(Rep. VI 439) and so was most vulnerable to rain and insect attack.

The following is the published description;

"Housing III consists of scales whose backing and leather work have wholly disintegrated. They average 0.04m long and 0.025m wide, rounded at the bottom, and are linked with bronze wire in strips of from two to forty. All have the normal two holes on either side, but the majority have a single large hole at the top and were evidently laced to their backing with rawhide. A few have four holes arranged in a square at the top for thread stitching.

"All that can be determined from the position in which the scales lay when excavated was that they originally made up a housing similar to I and II. At a rough estimate there were two thousand or more individual scales.

"Fragments of an accessory to housing III, or to another housing which may have perished, include:

"1. A hundred or more scales, separate, or linked in strips of from two to ten, of small format. They average 0.03m long and 0.015m wide, have the lower corners bevelled off, and are pierced with six holes each, two on either side and two at the top.

"2. Two large fragments of an upper edge, with scales, backing, and red leather edging laced on with rawhide like the edging of the other housings and accessories. One of the fragments shows an obtuse upper corner of about 45 degrees."

Horse Armour 3 had apparently been struck by a catapult bolt, but the circumstances are unclear.

There are at Yale a number of boxes containing hundreds of scales, loose and in rows, in excellent
condition and which fully match the description of those found in Tower 19 and assigned to the
disintegrated Housing III. The scales are c40mm by c25mm, with the lateral staple holes and for the
most part a large single hole at the top which must indeed suggest that the rows were largely held on by rawhide laces. The top corners are also sometimes clipped off, presumably to reduce chafing on the laces. Rows overlap in both directions. The yellow bronze scales tend to be slightly domed at the bottom.
The following lists draw on my own scrutiny of the objects, and also on the listings made by Donald Wright, who does not appear to have made the identification with Trapper III. They are certainly not complete, as some numbers listed in the Yale archives seem to be missing from Wright's lists. This may be partly explained by the appearance of some pieces at, for instance the Royal Ontario Museum (identified from information provided by Dr. J. Hayes; there is no record of this transfer in the Yale Dura archive). Wright also recorded seeing a case full of complete scale rows at the Higgins Museum (unpub 24) but I did not see these myself. I suspect others may have been lost or went to other, unrecorded destinations.

Most of the scales are in labelled boxes as follows;

Yale box “A”
1938.3935 (6 scales)
- 3983 (4), Dura no. F1007, from L7-W
- 3863 (1)
- 3823 (1)
- 3875 (1)
- 3986 (1), Dura no. F1119, from L7-W24

Both the provenanced scales are from the vicinity of Tower 19.

Yale box “A1”
A box of a total of 63 loose, unmarked scales.

Yale box “A2”
Wright lists Yale accession nos. as follows (nos. of scales added from Yale records);

1938.3774 (8)  3797 (11)
- 3775 (15)  3801 (9)
- 3777 (9)  3806 (9)
- 3784 (7)  3807 (8)
- 3787 (7)  3820 (9)
- 3789 (9)  3827 (10)
- 3790 (9)  3851 (10)
- 3793 (10)  3858 (10)
- 3794 (8)  3861 (10)
- 3795 (10)  3878 (9)
- 3796 (9)  3924 (9)

Yale box “A3”
Accession numbers as listed by Wright, here resorted into numerical order (across the page);

1938.3775a (8)  3856 (14)  3943 (2)
- 3776 (13)  3862 (12)  3948 (2)
- 3780 (12)  3866 (2)  3953 (2)
- 3781 (2)  3867 (3)  3955 (3)
- 3782 (12)  3868 (2)  3956 (3)
- 3783 (14)  3869 (2)  3958 (2)
- 391 (3)  3871 (3)  3959 (2)
- 392 (5)  3873 (2)  3960 (2)
- 398 (11)  3876 (2)  3961 (2)
- 3800 (12)  3877 (3)  3962 (2)
<table>
<thead>
<tr>
<th>Yale box “A4”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yale nos. listed by Wright, here resorted into numerical order (numbers of scales added from Yale records);</td>
</tr>
<tr>
<td>1938 3778 (5)</td>
</tr>
<tr>
<td>3779 (5)</td>
</tr>
<tr>
<td>3785 (7)</td>
</tr>
<tr>
<td>3786 (6)</td>
</tr>
<tr>
<td>3799 (6)</td>
</tr>
<tr>
<td>3802 (6)</td>
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<tr>
<td>3803 (4)</td>
</tr>
<tr>
<td>3805 (3)</td>
</tr>
<tr>
<td>3808 (8)</td>
</tr>
<tr>
<td>3809 (5)</td>
</tr>
<tr>
<td>3811 (4)</td>
</tr>
<tr>
<td>3812 (5)</td>
</tr>
<tr>
<td>3813 (4)</td>
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<tr>
<td>3814 (4)</td>
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<tr>
<td>3815 (8)</td>
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<td>3816 (4)</td>
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<td>3818 (4)</td>
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<td>3819 (5)</td>
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<tr>
<td>3821 (5)</td>
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<tr>
<td>3825 (8)</td>
</tr>
<tr>
<td>3826 (4)</td>
</tr>
<tr>
<td>3830 (8)</td>
</tr>
<tr>
<td>3831 (8)</td>
</tr>
<tr>
<td>3833 (7)</td>
</tr>
<tr>
<td>3834 (8)</td>
</tr>
<tr>
<td>3835 (6)</td>
</tr>
</tbody>
</table>
Yale Box “A5”
Longer rows of the same scales.

1938.3744 (34)  
3746 (25)  
3747 (26)  
3748 (31)  
3749 (21)  
3750 (24)  
3751 (23)  
3752 (18)

Yale Box “A6”
More of the same, listed by Wright and here rearranged into numerical order;

1938.3745 (15)  3900 (19)  
3845 (6)  3909 (5)  
3864 (6)  3933 (3)  
3880 (9)  3934 (2)  
3886 (4)  3937 (3)  
3887 (9)  3938 (4)  
3888 (9)  3939 (3)  
3889 (11)  3940 (2)  
3890 (8)  3941 (10)  
3891 (6)  3942 (6)  
3892 (2)

It is probable that the following boxes of scales also belong to this garment;

Yale box “B”
Identical to the above scale types, except that in some cases the top corners are not cut off.

1938.3768 (20)  
3769 (23)  
3770 (5)  
3771 (3)  
3772 (1)  
3985 (1)

Yale box “Mix, A&B, A&E”
This includes two rows of scales with either a single, large upper hole or four small holes at the top edge, in the same row.

1938.3898 (3)  
3982 (6)  
3989 (10)
Yale box "C and D"

Some of the contents of this box also appear to be part of the same garment, with standard scales with a large upper hole but with two or three additional apertures.

- 1938.3754 (21)
- 3755 (4)
- 3757 (6)
- 3758 (6)
- 3760 (4)
- 3761 (5)
- 3990 (7)

Pieces at the Royal Ontario Museum

Information about items at the ROM kindly provided by Dr. Hayes strongly suggests that they are also part of this armour, although there is no record of their Dura or Yale numbers (if any). The following are their current ROM numbers;

- 933.25.15
- 933.25.16
- 933.25.17
- 933.25.18
- 933.25.19

A group of fragments bearing the Yale no. 1938.4106 correspond to the description of the "accessory" to housing III. Close inspection and a parallel piece suggest that these represent a cuisse or pair of cuisses rather than horse armour. They are fully discussed as cuisses 3 and 4.

4. Fragment of iron scale horse armour (Plate 2.2.AG)

Provenance unknown
Yale no. 1929.771*
Dura no. unknown

*This also bears the designation xx/369.46, which relates to the conservation of its leather part.

A lower corner of a scale garment, of large iron scales on a fabric backing, with leather edging. It appears that this cannot be part of the hoard of material found in Tower 19, as it was already at Yale by that time.

Only two heavily corroded scales survive, with fragments of a third and fourth. The best preserved scale measures 72mm by 52mm. The bottom is roughly semicircular. The scales are linked by bronze wire of circular section, 1.5mm thick, via two holes in each edge.

Attachment to the backing appears to be via a group of four holes in a square at the top of the scale. One of the surviving scales has extra holes for lacing the edge-strip. The overlap of the scale rows covers the top stitching, but not the lateral staples.

The fabric backing is a doubled thickness of coarse cloth, folded back on itself to the side. The stitching thread is 2.5mm thick.

The lateral edge is bound with a strip of leather 55-60mm wide and about 1mm thick, held in place
by leather laces which pass right through all layers. The edging strip extends about 40mm below the edge of the scales and cloth, and is cut into 7 strips or tassels about 8mm wide, apparently for decoration.

The lower edge of the garment is a strip of leather about 110mm deep and 1mm thick. It was sewn to the front of the cloth by coarse thread, but under the scales. About 75mm of the depth of the strip is visible. Its lower edge is cut into a saw-tooth pattern, about 17mm deep and 11-20mm from peak to peak. 35mm above the bottom edge are two parallel tooling lines on the surface of the leather, which is now almost black although this is probably a result of conservation.

The size of the scales, and the vertical edge and serrated lower edge suggest that this is a fragment of an armoured trapper like that from Tower 19, or more likely part of a horse’s neck armour.

Miscellaneous scale armour (Plates 2.2.AH to AQ)

1. Fragment of lamellar-like bronze scale garment (Plate 2.2.AH and AJ)
Provenance unknown
Yale no. 1938.4091
Dura no. unknown

Small scales, 8-9mm wide by 18mm long with a paraboloid lower edge, which apparently were held together entirely by metal staples without an attached fabric backing. Rows are held together by the usual vertical pairs of holes on the sides, while the rows are attached to each other by similar vertical pairs of holes in both the top and bottom of each scale. The scales are linked by bronze wire of circular section. To the wearer the left side of the scales overlap.

This garment is relatively stiff due to the attachment of scale rows vertically as well as horizontally, which also increases the protective value of the garment. In this, and the lack of backing, it is like conventional lamellar armour.

A widely distributed, if not enormously common type of armour, known from Northern Britain (Corbridge; Robinson 1975 162 fig 174) to the Danube (Hrusica, Yugoslavia, Garbsch 1978 79 No. P18, Taf 35,2; Dacia Inferior, Vladescu 1975 fig.27).

2. Fragment of lamellar-like bronze scale garment (Plate 2.2.AH)
Provenance unknown
Yale no. 1938.4115
Dura no. unknown

Scales of similar shape to no.1, but 21-22mm by 7mm. The bronze staples are in broad loops, perhaps partly to allow more flexibility but perhaps also for looping over horizontal threads as attachment to a fabric backing.

There is a good parallel from Razgrad, Bulgaria (Alfs 1941 Abb.27).
3. Fragments of lamellar-like bronze scale garment (Plate 2.2.AH and AJ)
Provenance D1-13
Yale no. 1938.4138
Dura no. H734

The scales, 18mm by 25mm with a paraboloid lower edge, are fastened to each other with very wide staples, probably to allow a backing to be threaded onto them. The scales are now corroded together.

See no.1 for general parallels, especially from Hrusica.

4. Fragment of lamellar-like bronze scale garment (Plate 2.2.AH and AK)
Provenance unknown
Yale no. 1932.1403 (part)
Dura no. unknown

A small fragment of about half a dozen angular scales, each with the lower corners cut off. The scales are c.30 by 15mm.

5. Fragment of lamellar-like bronze scale garment (Plate 2.2.AH and AL)
Provenance N7-W2
Yale no. 1938.4131
Dura no. H287

A row of three scales with rounded lower ends. About 10mm by 28mm.

6. Fragment of lamellar-like bronze scale garment (Plate 2.2.AH and AP)
Provenance unknown
Yale no. 1938.4136 (part)
Dura no. unknown

Six scales in two rows of three. Each scale is 8mm by 13mm.

7. Fragment of lamellar-like bronze scale garment (Plate 2.2.AH and AL)
Provenance "Ramp. SW corner"
Yale no. 1938.4105
Dura no. I219

A fragment with nineteen scales, each 17mm by 28mm, in excellent condition, although any backing that there may have been is now lost. The scales have a roughly semicircular lower edge. The staples are of fairly broad bronze strip and allow a considerable degree of flexibility.

8. Fragment of lamellar-like bronze scale garment (Plate 2.2.AH)
Provenance unknown
A fragment with four broken scales, each 20mm by 27mm, from the upper edge of a garment. The upper row is stapled at the bottom, but has single large holes at the top almost certainly for a laced leather edging.

9. Fragment of lamellar-like bronze scale garment (Plate 2.2.AK)
Provenance X7-5
Yale no. 1938.4110
Dura no. 1741

A fragment with about a dozen scales, each 15mm by 28mm, corroded together. The lower corners of the scales are clipped off.

10. Fragment of lamellar-like bronze scale garment (Plate 2.2.AH and AM)
Provenance unknown
Yale no. 1982.28.110
Dura no. unknown

A fragment with about seven scales, each 9mm by 22mm, corroded together. The lower edge of the scales is a long parabola.

11. Fragment of lamellar-like bronze scale garment (Plate 2.2.AH and AM)
Provenance unknown
Yale no. 1982.28.111
Dura no. unknown

A fragment with about a dozen broken scales, each 7mm by 25mm, corroded together. These scales are particularly slender, with a paraboloid lower edge.

12. Fragment of lamellar-like bronze scale garment (Plate 2.2.AH and AM)
Provenance unknown
Yale no. 1982.28.112
Dura no. unknown

A fragment with four or five broken scales, each originally 10mm by 20mm, corroded together.

13. Fragment of lamellar-like bronze scale garment (Plate 2.2.AH and AM)
Provenance unknown
Yale no. 1982.28.113
Dura no. unknown

A fragment with about eight broken scales, each 10mm by 27mm, corroded together. The scales have paraboloid lower edges.
14. Bronze scale from a lamellar-like garment (Plate 2.2.AH and AM)
Provenance F3-6
Yale no. 1938.4126
Dura no. F845

A scale, 14mm by 25mm, with a paraboloid lower edge.

15. Bronze scale from a lamellar-like garment (Plate 2.2.AH and AM)
Provenance J7-D1
Yale no. 1938.4133
Dura no. F1228(8)

A scale, 10mm by 27mm, with a paraboloid lower edge.

16. Double-stapled scales (Plate 2.2.AH and AM)
Provenances unknown.
Dura nos. unknown.

A number of quite large, roughly square scales (32-34mm tall by 29mm wide), with four stitching holes at the top and two staples instead of the usual one on each edge, are at Yale, under a variety of numbers (below). The upper stitching holes are in two quite widely spaced pairs. The lower corners of each scale are clipped.

These scales seem to be in the same, very good state of preservation and may well have been found together, but their provenance is lost.

Given their relatively large size and sturdy lateral fixings, perhaps these are from horse-armours. Virtually identical scales are known from Dacia Inferior (Vladascu 1975 figs 26 and 27).

Yale numbers (with number of scales);
- 1938.4092 (1)
- 4093 (1)
- 4095 (2)
- 4096 (2)
- 4097 (1)
- 4098 (1)
- 4099 (1)
- 4100 (1)
- 4101 (1)
- 4102 (1)
- 4104 (1)

17. Double-stapled scale (not illustrated)
Provenance B2-A1-A2
Yale number 1938.4121
Dura no. F114
A single scale of the same type as 16. Height 35mm; width 29mm.

18. Double-stapled scale (not illustrated)
Provenance L7-W1
Yale number 1938.4122
Dura no. F444

A single scale of the same type as 16. Height 32mm; width 29mm.

19. Double-stapled scale (not illustrated)
Provenance B2 A4
Yale number 1938.4123
Dura no. F137

A single scale of the same type as 16. Height 33mm; width 28mm.

20. Double-stapled scale (Plate 2.2.AH and AM)
Provenance E4-20-24
Yale number 1938.4116
Dura no. F324

A particularly wide example of the type of scale represented by 16. Height 32mm; width 35mm.

21. Double-stapled scale (Plate 2.2.AH)
Provenance unknown
Yale number 1982.28.103
Dura no. unknown

An incomplete scale, with attached fragment of a second, of the same type as 16.

22. Row of iron scales (plate 2.2.AH)
Provenance unknown
Yale number 1981.62.26
Dura number unknown

A row of 8 iron scales, 65-80mm high by 45-50mm wide, with lateral bronze wire staples and four holes near the upper edge. Probably from horse armour.

23. Large iron scale (Plate 2.2.AH)
Provenance unknown
Yale number unknown
Dura Number unknown
Height 64mm
Width 47mm

At the Higgins, no. Q173. A fairly standard large scale with lateral staple holes and a square of lacing holes at the top. There are also two larger holes probably to take lacing for an edge binding. Probably from horse armour.

24. A row of large iron scales (Plate 2.2.AH and AN)
Provenance unknown
Yale number 1930.594
Dura Number unknown
Height 59mm
Width 45mm

Similar to the above, a row of three attached with bronze staples and a singleton with holes probably for edge trimming. These cannot be part of the Tower 19 complex due to their accession date.

25. A row of large iron scales (Plate 2.2.AH)
Provenance unknown
Yale number unknown
Dura Number unknown
Height 57-59mm
Width 43-45mm

At the Higgins, no. Q172. A row of four scales with bronze staples, like no.24.

26. A row of large iron scales (Plate 2.2.AH)
Provenance unknown
Yale number unknown
Dura Number unknown
Height 47-48mm
Width 33-37mm

At the Higgins, no. Q117. Similar to no.24.

27. A row of large iron scales (plate 2.2.AN)
Provenance unknown
Yale number 1981.62.48
Dura number unknown
Height not measured
Width not measured

A row of 7 scales with the standard bronze staples and four stitching holes. The right-hand end scale has a lacing hole. Probably horse armour.
28. A row of large iron scales (plate 2.2.AN)
Provenance unknown
Yale number 1981.62.49
Dura number unknown
Height not measured
Width not measured

A row of 9 scales with the standard bronze staples and four stitching holes, quite heavily corroded. Probably horse armour.

29. A large iron scale (Plate 2.2.AH and AO)
Provenance unknown
Yale number unknown
Dura Number unknown
Height 80mm
Width 41mm

A rather long thin scale, with three staple holes on one side, and a larger lace hole.

30. Two rows of large iron scales (Plate 2.2.AH and AO)
Provenance unknown
Yale number 1933.712
Dura Number unknown
Height 70mm
Width 45-50mm

Fused into two rows, one of three and one of five scales. These scales are unusual in having only a vertical pair of lace-holes at the top rather than the usual square of four.

31. A row of large iron scales (plate 2.2.AH)
Provenance unknown
Yale number unknown
Dura number unknown
Height 48-53mm
Width 35mm

At the Higgins, no. Q178. A row of four scales, with bronze staples, two having only a vertical pair of lace-holes at the top, the other two having a single large hole probably for an edging. This is probably from the upper edge of a defence, most likely a horse armour.

32. Two rows of iron scales (plate 2.2.1)
Provenance unknown
Yale number "possibly 1930.594"
Dura number unknown
Height 40mm

176
Width 25mm

Scales with the common side staples (except the staples are also iron) and a square of stitching holes at the top.

33. Iron scales (plate 2.2.AI and AP)
Provenance unknown
Yale number 1982.28.118
Dura number unknown
Height 40mm
Width 26mm

A group of scales, some heavily oxidized and fused. One has a larger aperture for an edging lace.

34. A row of iron scales (plate 2.2.AI and AP)
Provenance unknown
Yale number 1982.28.119
Dura number unknown
Height 51mm
Width 25mm

A row of 7 whole and fragmentary scales unusual in that the single pair of stitching holes at the top is horizontal.

35. A pair of iron scales (plate 2.2.AP)
Provenance unknown
Yale number 1982.28.120
Dura number unknown
Height not measured
Width not measured

A pair of scales similar to 34.

36. A pair of iron scales (plate 2.2.AI and AP)
Provenance unknown
Yale number 1982.28.121
Dura number unknown
Height 48mm
Width 27mm

A pair of scales similar to 34 except that there is only a single large lacing aperture at the top.

37. A group of bronze scales (plate 2.2.AI and AQ).
Provenance unknown
A group of fragments of heavily oxidised scales of three different sizes, mostly with standard side staples and a vertical pair of stitching holes, although some have a single upper lace hole. This is a very important piece as at least one of the fragments includes two sizes of scale (both 16-18mm wide, but some 23-30mm tall, others 36mm tall), suggesting that garments did not necessarily consist of scales of uniform size. Those with a single lace-hole are the smallest size, at c.20mm tall, and are probably from the upper edge, suggesting perhaps that the scales were shortest in the upper rows, longest in the lower. Possibly part of a shirt like cuirasse 1.

38. Bronze scale (plate 2.2.AI and AM)
Provenance J7-D1
Yale number 1938.4127
Dura number F1228
Height 26mm
Width 12mm

A scale with a long parabolic lower edge, standard side staple holes and a single upper lacing hole.

39. Bronze scales (plate 2.2.AI and AM)
Provenance G1-36
Yale number 1932.1403
Dura number E565
Height 29mm
Width 15mm

Two corroded rows of scales with standard staple holes and single upper lacing apertures. The box also contains unattached cloth fragments.

Similar in form to scales found at Newstead (Curle 1911).

40. Two bronze scales (plate 2.2.AI)
Provenance unknown
Yale number 1938.4124
Dura number F379
Height 27mm
Width 20mm

A pair of scales similar in form to 38.

41. Bronze scale (plate 2.2.AI and AM)
Provenance unknown
Yale number 1938.3981
Dura number unknown
Height 40mm
Width 25mm

A scale similar in basic form to 38. but the left edge is angled, perhaps to accommodate an angle edge to the armour.

42. Bronze scales (plate 2.2.AI)
Provenance unknown
Yale numbers below
Dura number unknown
Height 30mm
Width 17mm

The contents of "box I" at Yale, these scales are in size and shape identical to those of cuisses 3 and 4, differing only in having single lace-holes at the top instead of the vertical pair of stitching holes. These do not appear to belong to the cuisses, because despite the survival of substantial parts of the garments, including a lot of edging, no scales of this type are present. Yale numbers are as follows (with numbers of scales in each row in brackets):

| 1938.4082 (1) | 4087 (2) |
| 4083 (1) | 4088 (1) |
| 4084 (2) | 4089 (1) |
| 4085 (2) | 4090 (3) |

43. Bronze scale (plate 2.2.AI and AM)
Provenance unknown
Yale number 1982.28.105
Dura number unknown
Height 18mm
Width 12mm

A single scale with a single upper lace hole.

44. Three bronze scales (plate 2.2.AI and AM)
Provenance unknown
Yale number 1938.4119
Dura number unknown
Height 24-27mm
Width 18-19mm

A row of three squarish scales similar to 40.

45. Bronze scale (plate 2.2.AI)
Provenance unknown
Yale number 1938.4137 (part of)
Dura number unknown
Height 26mm
Width 20mm

A single scale with a vertical pair of stitching holes at the top.

46. Bronze scale (plate 2.2.AI)
Provenance unknown
Yale number 1938.4086
Dura number unknown
Height 28mm
Width 14mm

A single scale with a vertical pair of stitching holes at the top.

47. Group of bronze scales (plate 2.2.AI)
Provenance unknown
Yale numbers 1938.4056 (3 scales), 1982.28.106 (1) and .107 (2)
Dura number unknown
Height 28mm
Width 14mm

Scales with a vertical pair of stitching holes at the top.

48. Bronze scale (plate 2.2.AI)
Provenance unknown
Yale number 1938.3773
Dura number unknown
Height 38mm
Width 23mm

A single scale with a horizontal pair of stitching holes at the top, damaged by a larger lace hole.

49. Two bronze scales (plate 2.2.AI)
Provenance unknown
Yale number 1938.4094
Dura number unknown
Height 42mm
Width 32mm

Scales with a horizontal pair of stitching holes at the top and larger lace holes in the centre.

50. Bronze scale (plate 2.2.AI)
Provenance unknown
Yale number 1938.4103
Dura number unknown
Height 42mm
Width 28mm

A single scale with a horizontal pair of stitching holes at the top. Scales of this form have been found at Lauriacum (RLO XIV fig.30, no.2).

51. Bronze scale (plate 2.2.AI)
Provenance unknown
Yale number 1933.363
Dura number unknown
Height 34mm
Width 23mm

A single scale with a square of four stitching holes at the top, one of the holes enlarged to take a lace.

52. Bronze scales (plate 2.2.AI)
Provenance unknown
Yale number 1982.28.101 and 102
Dura number unknown
Height 38mm
Width 20mm

A single scale, and a pair corroded together, with standard side staple holes and a group of four stitching holes at the top. The singleton has an additional lace hole.

53. Bronze scales (plate 2.2.AI)
Provenance unknown
Yale numbers below
Dura number unknown
Height 41mm
Width 25mm

A group of scales all apparently from the same garment, including (with numbers of scales in brackets);
1938.3994 (3)
  4028 (12)
  4029 (10)
  4035 (2, plus 3 loose ones)

The following in "box C and D" also appear to belong;
1938.3753
  3756
  3762
  3764
  4113
54. *Bronze scale (plate 2.2.AI)*
Provenance unknown
Yale number 1938.4042
Dura number unknown
Height 36mm
Width 20mm

A single scale of similar pattern to 54.

55. *Bronze scales (plate 2.2.AI and AP)*
Provenance unknown
Yale number 1938.4139
Dura number unknown
Height 29mm
Width 20mm

Two small groups of scales, corroded together, mostly with four holes at the top but one with a single large lace hole.

56. *Bronze plate, probably from scale armour (plate 2.2.AI and AM)*
Provenance unknown
Yale number 1938.4125
Dura number unknown
Length 68mm+
Width 16.5mm

A thin bronze plate with three double apertures two of which still contain twisted wire staples, whose general form appears to be related to scale armour.

The piece is not complete, but appears to have been torn across two further staple holes suggesting that the other end was a mirror image of the intact end, i.e. with a total of six staples. The purpose of the piece is not clear, but an obvious possibility is that it is a shoulder plate from a scale shirt. It has never been clear what happened to scale shirts around the shoulder and this may be one answer; however, this piece appears to be without parallel, and if these were standard scale fittings many more should be known, so its identification remains highly doubtful.

57. *Bronze scales (not illust.)*
Provenance unknown
Yale number 1931.599 (part of)
Dura number unknown

Five scales like those used in the accessory to Horse Armour 1, but found in an earlier season.
58. Bronze scales (not illust.)
Provenance J7 C2
Yale number 1938.4114
Dura number F1253

Two scales of the same type as those used in the accessory to Horse Armour I, but found elsewhere.

59. Bronze scales (not illust.)
Provenance M8 W3
Yale number 1938.4118
Dura number F930

Two scales of the same type as those used in the accessory to Horse Armour I, but found elsewhere.
Blades (Plates 2.3.A to F).

1. Iron longsword with chape (plate 2.3.A).
Provenance F3-2
Damascus museum
Dimensions:
Overall length 790mm
Blade length 645mm
Blade width 55mm flaring to 58mm at the shoulders
Thickness 10mm
Tang length 145mm
Tang width 22mm tapering to 11mm

Published in Rep. VI 82-3 and plate XXVI,2, according to Yale records this object is now in Damascus Museum. The following is based on the published account and the site record card in the Yale archives.

The blade is complete except for the tip of the tang and possibly a small piece near the point. It was broken into five pieces when found. A two-edged weapon of lenticular section, whose cutting edges are roughly parallel. They flare slightly towards the shoulders of the blade, while towards the tip the profile tapers gently before sweeping in to the point which at the time of discovery was still inserted into a bone chape. The latter is discussed separately (chape 12). One photograph of this blade (Damascus neg. N128) shows what appear to be grooves running the length of the blade. These are probably fullers, but could be caused by differential corrosion of the alloys in a so-called pattern-welded sword. However in the absence of x-rays it is pointless to speculate on the structure of the blade. The Yale record card mentions “remnants of wooden sheets” from the scabbard, but these traces are not mentioned in either the description written on site or the published account. The tang is described as being of round section, but from the photographs appears to be so split by corrosion that this cannot be regarded as certain. It is in any case unlikely; Roman tangs are usually rectangular in section, a shape easier to forge and which prevents the grip rotating. No trace of the hilt assembly or scabbard slide survived.

This is a heavy long-sword of a well known Roman type, usually identified as the spatha of literary sources. It is similar in size to the two second century AD examples recently discovered in Canterbury (655mm x 59mm and 690mm x 56mm), resembling especially the longer of the two which has the same shaped point and the slight expansion in width up to the shoulders of the blade (Webster 1982 185 and fig.99). The latter weapon is pattern-welded, while the shorter blade is also of composite construction with two fullers on one side only. Both Canterbury examples are of lenticular section.

The Dura example is not especially long for a Roman spatha; one from Straubing has a blade of 797mm and a tang of 143mm (Keim and Klumbach 1951 37 no.43 and Taf.42). One from Wroxeter reaches 725mm (Atkinson 1942 218), while an example from Carnuntum has a blade as long as 840mm, 50-55mm wide (RLO V 75 fig.33 no.1). Two earlier spathae from Newstead had blades of 610mm and 635mm (Curle 1911 183 and plate XXXIV nos.6 and 7), while the late third or early fourth century
spatha from Cologne is 890mm (Behren 1919 1 and Taf.1).

The shape of this blade is typical of second and third century weapons, especially in the lenticular cross-section rather than the earlier diamond, the form of the point and the flared shoulders. Other similar blades come from Carnuntum (RLO II Taf.XXI no.9), Kastell Buch (ORLB Nr.67 14 no.2), and Pfünz (ORLB Nr.73 40 no.6 and Taf.XV no.64). There is a fine spatha from Lyon which probably dates to the very end of the second century (Wuilleumier 1950).

There is a quantity of comparable material from the Eastern empire, but details are sadly few. It would be particularly interesting to compare Dura blade 1 with the remarkable Khisfine sword from Syria, but the blade of the latter is hidden in the ivory scabbard (Trousdale 1975 236 no.S1 and plate 19a and b). There is also a blade from Jerusalem, (Qadmoniot V, nos 3-4, 1972, 105), and a spatha was found in a grave at Nawa (Tell Oum Hauran) in Syria (Abdul-Hak 1955 187), but no precise description of either is available.

For other examples of Roman pattern-welded swords, see Rosenqvist 1971.

2. Complete longsword blade (plate 2.3.B and D).
Provenance uncertain, possibly Tower 19 countermine*
Yale no. uncertain*
Dura no. unknown
Dimensions;
Overall length...855mm
Blade length....695mm
Blade width...48mm flaring to 60mm at the shoulders
Blade thickness.9-11mm
Tang length.....160mm
Tang section....24mm x 11mm tapering to 10mm x 6mm

* There is confusion over the identity and provenance of this blade which is currently on loan to the Higgins Armory Museum. It is given the number 1933.693 in the Yale card catalogue. Its Dura number and provenance are given as "F1333?" and "B2 D12?" with "Tower 19?" pencilled below. The notes say "with glass pommel [sic; this is the rock crystal pommel, hilt fitting no.8] -Yale Gallery card gives field no.F877 to this, but that is another sword, now in Damascus." In fact this sword cannot be either F877 or F1333. The former is certainly blade 1, and F1333/1933.693 is also certainly the fragmentary sword 3 which bears labels with these numbers. Sword 2 lacks labels and cannot be certainly identified or provenanced. It could well come from the Tower 19 countermine, where the crystal pommel was found with a "large sword" to which it supposedly belonged (Rep. VI 195 and 204). Whether the current association between blade 2 and the crystal pommel proves that this is the blade referred to is debatable. What is certain is that the pommel does not belong to this sword. The pommel has a cylindrical aperture, while the tang of the sword is of rectangular section, too large to fit the hole, and in any case shows unequivocal evidence of a wooden pommel.

The blade, now in six pieces, is of the same type as no.1, of lenticular section with slightly tapering edges flaring at the shoulders and sweeping gracefully into the point. There are no signs of fullers. It is rather longer than no.1. The metal of the blade is not too deeply oxidized, but there is a layer of corrosion over much of the surface which has preserved very well the grain of the wooden scabbard, and the hilt assembly which was likewise entirely of wood. The species remain unidentified.

It has been observed that the fact that the sword was sheathed may cast doubt on a provenance in the tower 19 countermine on the grounds that the men buried there were apparently involved in fighting
and so are likely to have had weapons drawn (Mark Hassall, pers. comm.); however, it may be that short thrusting spears were used instead, as there was little room in the mine to wield slashing swords. Certainly a couple of bodkin points were found in the mine, where they are perhaps not explicable as artillery bolts but might be from perhaps special makeshift mine-fighting weapons (see part 2.5). Consequently, the sheathing of this sword is not an objection to a countermine provenance.

The hilt was of three pieces of wood; guard, grip and pommel. The grain of the first and last runs towards the observer when the blade is viewed face-on, while that of the grip runs parallel with the tang, and passes under the sword guard. The grip was therefore rebated into the guard. This is clearly a wooden version of the characteristic tripartite hilt assembly widely known on Roman swords, especially in bone or ivory (cf Oldenstein 1976, 89-95 Taf. 10 and 11 and refs). Other wooden examples are known, from Vindonissa (Fellmann 1966), Rheingonheim (Ulbert, 1969a 44 Taf. 32 1-4) Pflunz (ORLB Nr. 73 25 no. 13 Taf. 15 no. 65) and Canterbury (Watson et al 1982 188). The Canterbury spathae had hilts and scabbards of poplar and willow. One had a guard of maple (Watson et al 1982 189).

An unusually large amount of detail relating to the scabbard survives, although its fittings (chape and slide) are missing. It is likely that they too were wood, and are completely lost because unlike hilt and scabbard they were not in direct contact with the blade and so were not preserved by mineralisation.

The scabbard was made of two thin (c. 3mm) sheets of knotty wood, sandwiching the blade. Traces of textile adhere to the surface of the wood. These are consistently orientated at a slight angle to the axis of the scabbard. It is possible that the fabric has nothing to do with the structure of the scabbard; for example, the sword may have been wrapped in a cloak or garment at burial. However, it may have been made in the following manner. The two wooden slats were placed against the greased surfaces of the blade. The whole was then wound tightly with a spiral strip of glue-soaked cloth. The fabric would contract on drying, forming a lightweight, perfectly fitting sheath to which the slide and chape could be added. This reconstruction is shown in plate 2.3.B. At least one other Roman sword with a fabric covering is known, although in that case it was held on by leather cross-straps (Berciu 1981 236 plate 62). A further structural parallel is provided by the probably sixth century Sutton Hoo sword, which had a wooden scabbard at least partly wrapped in linen tape (Bruce Mitford 1978 284).

For general parallels, see no. 1.

3. Fragmentary longsword blade (plates 2.3.C and E).
Provenance B2-D12
Yale no. 1933.693 and 694a and c*
Dura no. F1333, F1321 and F1355a*
Dimensions;
Overall length.. c 830mm (estimated)
Blade length.. c 650mm (estimated)
Blade width...... 40mm flaring to 47mm at the shoulders
Blade thickness.. 14mm
Tang length..... c 180mm (estimated)
Tang width...... 25mm tapering to 10mm

* Two large pieces of a spatha labelled 1933.693/F1333. One is the near end of the blade including the base of the tang. The other does not join, but is clearly part of the same blade as dimensions and corrosion patterns match. These fragments preserve at least 470mm of blade and 31mm of tang. A separate iron tang labelled 1933.694/F1321 also seems to be from this weapon. Again there is no direct join but dimensions and surface indications make the match fairly certain. In the site register, F1321/1933.694 is described as “coin, needle” and the provenance as B2-D11. Clearly there is an
error here. Several other fragments of swords are labelled 1933.694, so for convenience and clarity the tang is here called 1933.694c.

Rather clearer is the association of the blade tip, F1355a/1933.694 (called 1933.694a here). The provenance in the site register is B2-D12 (identical to the major fragments 1933.693) and the description is "fragments of iron sword". Found in the same room, this tip almost certainly comes from the same sword.

Obviously, the original length of the weapon is unknown, but the estimated length shown in the drawing (830mm overall and 650mm of blade) is unlikely to be far out. Like nos. 1 and 2, the blade flares slightly towards the shoulders, and curves gently to a tip of parabolic outline. Overall, the blade is rather slenderer in appearance than nos. 1 and 2, but its thickness makes it a formidable weapon.

It was sheathed when buried. Traces of the grain of the longitudinal wooden slats of the scabbard are fused into the corrosion products. No scabbard fittings are associated, but the hilt has evidence of an all-wood hilt assembly clear enough to allow a detailed reconstruction (plate 2.3.C). The species of wood has not been identified. The sword guard was 40mm deep. The grain runs horizontally across the flat face of the rectangular-sectioned tang. The grip itself will have been effectively a tube of wood, the grain running along the tang. The pommel was approximately 48mm deep. Again transverse grain adheres to the front and back of the tang. The mortise through the pommel would have been cut through the plane of the grain for maximum resistance to splitting. Grain of a different orientation runs down the sides of the last few centimetres of tang. As with the grip itself, this runs along the tang, but does not meet the grain of the grip; the grain of the pommel interrupts it. The explanation for this is that the swordsmith used tightening wedges to secure the hilt assembly. The last few centimetres of the tang are tapered, so that once the three elements of the hilt had been dropped on, wedges could be slipped into the top of the pommel mortise, on either side if the tang, and tapped down until the whole hilt was firmly fixed. The tops of the wedges were then cut off and sanded flush with the surface of the pommel, and the projecting length of the tang hammered over to fix the whole assembly permanently.

As with sword 2, the appearance of the hilt assembly is uncertain but the grip would have been roughly tubular, with the pommel and guard well rounded but somewhat flattened by this date, as the metal guard-plates show (hilt fittings 1-4). The grip was probably embellished with some simple pattern such as facets or a "candy-twist".

For parallels, see no. 1.

4. Longsword fragment (plates 2.3.C and F).
Yale no. 1982.28.53
Dura no. unknown
Dimensions;
Length....383mm+
Width.....58-61mm
Thickness 11mm

* This provenance, on a label attached to the blade, is obscure.

A fragment of a broad-bladed sword of lenticular section. Both ends are lost. Corrosion and fissuring are extensive. The form of the weapon is of course uncertain, but it is almost certainly a spatha. Traces of wood grain on its surface show that it was sheathed at burial. See no. 1 for parallels.
5. Sword tang (plate 2.3.C).
Provenance unknown
Yale no. 1982.28.52
Dura no. unknown
Dimensions;
Length 92mm+
Width 20mm tapering to 10mm

A heavily corroded and fissured tang, of roughly rectangular section, probably from a spatha. See no.1 for parallels.

6. Fragment of sword blade (plates 2.3.C and F).
Provenance “B2-NStr1”
Yale no. 1933.694 (part of)
Dura no. F1353
Dimensions;
Length...113mm+
Width...50mm
Thickness..15mm

A length of heavy sword blade of lenticular section. Both ends are lost. Extensive traces of wood grain on its surface show that it was sheathed at deposition. Probably from a spatha. See no.1 for parallels.

7. Fragment of sword blade (not illustrated).
Provenance B2-D12
Yale no. 1933.694d*
Dura no. F1321
Dimensions;
Length.....156mm

*One of a number of sword fragments labelled 1933.694, this one here called “d” for identification.

This might be part of sword 3, but does not obviously belong to it and there is clearly an error of numbering in the registers, so certainty is not possible. No complete cross-section is preserved.

8. Fragment of sword blade (not illustrated).
Provenance B2-D12
Yale no. 1933.694 (part of)
Dura no. F1355b
Dimensions;
Length 112mm

Like no.7 also possibly part of sword 3 but no joins were found. No complete section preserved.
Provenance unknown
Yale no. 1982.28.54
Dura no. unknown
Dimensions;
Length 106mm+

Revealed as a fragment of a sword blade by the camber of its surface. It preserves no complete section so its original width and thickness are not known.

10. Fragment of a dagger (plate 2.3.C).
Provenance unknown
Yale no. 1982.28.59
Dura no. unknown
Dimensions;
Length 125mm+

A fragment of a broad flat blade. Neither edge is preserved, and only one surface. However, its flatness and characteristic midrib leave little doubt that this is part of a standard Roman military dagger or pugio.

Third century pugiones are less common than first century ones, but a large hoard found at Kunzing (Hermann 1969 Abb.3 and Schonberger and Herrmann 1968) shows that they were still available, although probably becoming obsolete; there is no evidence to suggest that they continued in use into the fourth century. For a gazetteer, see Scott 1985.

11. Fragment of sword (plates 2.3.C and F).
Provenance unknown
Yale no. 1930.596a-d*
Dura no. unknown
Dimensions;
Length......285mm+
Width......85mm
Thickness..16mm

*This object may be that described as a large spearhead in Rep. III 79, although the latter is referring to 1930.591a-d. The dimensions are very similar, the time of discovery the same and the numbers differ by a single digit. I think they are probably one and the same, and that there are some small errors in the published report.

Four joining fragments of a single-edged, backed asymmetric blade. Heavily corroded and fissured. The very characteristic asymmetric profile and single edge of this weapon immediately identifies it as an example of a common sword type in use right across the Mediterranean and the Hellenistic world in the last centuries BC. In Spain the local variant was called the falcata, in the Eastern Mediterranean it was known as the kopis or machaira. Its appearance at Dura is something of a surprise, as it is commonly supposed that this type had been obsolete for centuries by the time the city was besieged. A number of explanations may be proposed, including the possibility that it represents a local survival of this style of weapon. It might also have been in the city armoury for a very long period, or perhaps was an heirloom of one of the Durene families of Macedonian origin who jealously preserved their identity down to the Roman period. It is also quite possible that it was actually excavated from a
Hellenistic context not recognised or recorded as such, or that it was a residual find from a Roman context.

Hilt Fittings (plates 2.3.G and H).

1. Bronze guard plate (plate 2.3.G).
   Provenance unknown
   Yale no. 1938.2242
   Dura no. unknown
   Dimensions;
   Length..69mm
   Width...29mm+

   About three quarters of the object survives, in a lightly corroded condition. It is identified as the metal plate protecting the vulnerable underside of the hilt guard of a Roman sword. Such guards were often of wood (see blades 2 and 3; Fellmann 1966 etc.), roughly hemispherical but later were often somewhat flattened to an oval section, as here. From an early date the undersides of wooden guards were often reinforced with a bronze plate, presumably to improve resistance when parrying blows (eg Colchester, Hawkes and Hull 1947 340 nos.4-6 and plate CIV; Crummy 1983 138 no.4244 and fig 159. See also Neeb 1918 175 Abb.6). By the end of the second century AD these plates had acquired a rim, so that they enclosed the lower part of the guard (eg the plate in situ on the Lyons spatha, Wuilleumier 1950 fig.l). This example from Dura has remains of pierced ornament on its broken side, apertures drilled and filed through the side wall of the guard to leave a delicate tracery of bronze. This feature is better preserved on nos.2-4. The lower, exposed face of the guard plate has grooves running off the tang aperture to allow a snug fit to the shoulders of the blade. Very similar examples, with pierced decoration on one side only, are known from Germany, from the Saalburg (Jacobi 1897 485 Taf.56,1) and Zugmantel (SJb. 3 1912 48 Taf.13,3).

2. Bronze guard plate (plate 2.3.G).
   Provenance L7-W
   Yale no. 1938.2316
   Dura no. F446
   Dimensions;
   Length...72mm
   Width....29mm

   A largely intact plate like no.1. The decoration, which again is on one side only, is interrupted by a rivet hole for fixing to the wooden part of the guard. See no.1 for parallels.
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Provenance K1-W
Damascus museum
Dura no. H527
Dimensions;
Length...65mm
Width....30mm

Apparently sent to Damascus, although photographs, drawings and a description are preserved on a record card at Yale. It is a virtually complete example of the type represented by nos. 1 and 2. See no.1 for parallels.

Provenance G1-2?
Damascus museum
Dura no. E433
Dimensions;
Length...76mm
Width....33mm

Details from Yale records. Similar to nos.1-3. See no.1 for parallels.

5. Bone hilt guard (plate 2.3.G).
Provenance unknown
Yale no. 1938.707
Dura no. unknown
Dimensions;
Length....68mm
Thickness 15mm

A complete hilt guard of roughly circular cross section, slightly curved along its length. This is unlike "standard" Roman sword guards which were usually bulbous sub-hemispheres. Considering that the object is in bone, its small size would make it of little protective value. However, the seating for the shoulders of the blade cut into the underside was for a two edged blade c48mm wide but only 5mm thick. This is much thinner than any sword found at Dura but would accord well with a broad dagger, perhaps a form related to or derived from the pugio (see blade 10). A very similar guard in bone has been found at Kastell Oberstimm (Schonberger 1975 286 and Taf.112, no.F8), and another from the Hague (late second to early third century; Waasdorp 1989 163 and fig 4,b).

Provenance G6-A7
Damascus museum
Dura no. E1352
Dimensions;
Length 80mm

A description and photograph of this object are preserved on a record card at Yale. There is no scale
drawing. It is evidently a hilt guard from a bladed weapon but is quite unlike any known Roman form. Its curved lower edge runs outwards and backwards, flowing into swept quillons which end in spherical knobs. The centre sweeps smoothly up into the grip, which is snapped off. The Card records that the “width of aperture for blade” is 60mm. The first impression imparted by this object is that it belongs to a weapon akin to the later Turkish scimitar, but the records do not specify the thickness of the blade so it is not even clear whether it is from a sword rather than a dagger. Beyond noting its generally “oriental” appearance little may be said regarding its affinities. No representations of such hilts are known to me, and archaeological parallels are not forthcoming.

Provenance uncertain *
Yale no. 1933.404a or 1934.524a
Dura no. unknown
Dimensions:
Length.... 105mm
Thickness 24mm

* Confusion surrounds the identity of this object. It is marked 1933.404a but the file card also bears a second Yale number, 1934.524a and two provenances, “C3” and “L7-W”. The latter could mean that the object came from the Tower 19 countermine.

It is clearly a grip for a sword blade. It is hollowed to accommodate a substantial tang of the size seen on Roman swords. It is of the size one expects for gladius or spatha grips, which are often of bone. The surface is embellished with a pattern of diamond or teardrop shaped bumps. This resembles the stylised representations of the club of Hercules seen on glassware and jewellery (Mark Hassall, pers. comm.), highly appropriate for a sword. This zone of decoration is defined at each end by a plain raised band. The last 20mm of the narrower end is left plain.

Early grips from gladii and spathae had a characteristic pattern of finger-grips, and were polygonal in section (Ulbert 1969 Tafn.31,2; 32,1-4; 31,2), unlike this which is sub-square in section. Those from the Upper German limes forts, which are presumably to be dated to the mid-second to mid-third century AD, show a much wider variety than the earlier ones. Most are fairly smooth cylinders, perhaps with bands or a “candy-twist” pattern around them (Oldenstein 1976 Tafn.10-11). The Dura example is quite at home in this group, and there is a fairly good parallel to it from Köln-Bickersdorf, found in a well. It has a similar diamond-like decoration on its surface (SJb. X 1951 78 Abb.4 no.7).

8. Rock crystal sword pommel (plate 2.3.G and H).
Provenance Tower 19 countermine
Yale no. unknown
Dura no. unknown
Dimensions:
Height....26mm
Diameter...53mm

Currently on loan to the Higgins Armory Museum, bearing the number Q390. In the Yale records it is associated with blade 2, but this is not possible (see blade 2 catalogue entry for discussion). It certainly came from the countermine, where it was found with (but apparently not on) a large sword (Rep. VI 195 and 204).
The pommel is circular in plan, and overall is roughly onion-shaped with flat upper and lower surfaces. The tang aperture is cylindrical, 15mm in diameter. The sides have eight equidistantly spaced shallow vertical grooves and are highly polished. The flat-ground facets at top and bottom are only roughly finished, suggesting that the crystal was only part of the pommel assembly and had some form of cap, perhaps in bronze, at each end. Such metal caps have been found, some with radial lines (e.g. Pfünz, ORLB Nr.73 38 no.50 and Taf.13, nos.14 and 39). Its bulbous form certainly suggests that it comes from a Roman sword, but no parallels for stone pommels from Roman sites are known to me. This may well be from a sword of Roman type made to reflect oriental taste. Stone pommels on oriental swords are well attested (see no.9).

Provenance Tower 19 countermine
Damascus Museum
Dura no. unknown
Dimensions;
Height: 17mm
Diameter: 54mm

Details of this object, together with a photograph and drawings are in the Yale archives. It was found in the mine close to the "Persian" helmet with "...a large sword which at the time of discovery was represented only by a few fragments of badly oxidised iron...the stone appears to come from Chinese Turkestan." (Rep. VI 194)

Of highly polished stone, it is discoid with convex faces. It has a tapering axial aperture for the sword tang, from 6mm to 9mm across. The stone is described as "hard, polished, pale yellowish-grey... (jade acc. Rostovtzeff)" on the site record card.

Flat disc pommels like this are quite alien to Roman sword types. If the identification as jade is correct, then clearly the stone, and probably the sword, is of oriental origin. It was found in association with the "Persian" helmet and the supposedly Sassanian soldier killed in the mine. This suggests that it may have been a Sassanian weapon. Discoid pommels are known from finds and representations from South Russia to China (e.g. Povrosk, USSR, Trousdale 1975 243 no.V1, figs 91-2; China, fig 38).

Scabbard Slides (plates 2.3.I to M).

1. Bronze slide (plate 2.3.I, J 4th from left and K right).
Provenance unknown
Yale no. 1934.702a
Dura no. unknown
Dimensions;
Length 105mm+

Cast in a single piece in a yellow alloy which is a tin bronze with some zinc (Lillios unpub, sample 3061). The upper end is shaped into a characteristic half-round moulding with a flat rear face originally
in contact with the scabbard. The bridge is of flat section and is not embellished beyond the bevelling of its edges. It tapers towards the bottom. The elongated lower end terminates in a heart-shaped plate, now slightly damaged. The original form of this may have resembled no.11. It is simply embellished with two knife cuts.

The rear face has two drilled holes, one at each end just clear of the bridge. These contain traces of iron, and had originally held iron pins for fixing the slide to the scabbard (Plate 2.3.K right).

A number of very similar slides have been found in Europe, from Britain to Roumania, eg Stockstadt (ORLB Nr.33 51 no.34 and Taf.8.3 which is broken in the same place); Colchester (Webster 1958 no.74); Southwark (Dennis 1978 390 no.125 and fig.177); South Shields (Allason and Miket 1984 195, 197-8 nos. 3.644 and 3.645); Buciumi (Gudea 1972 92 Taf.XCIX,1) and several other Rumanian sites (Petculescu 1983 457-8 and fig. 1 nos. 3-6). The closest parallels are a group of three from Caerleon (Nash-Williams 1932 fig.36 nos.4,5 and 7) and another found with a spatha blade and chape at Lyons (Wuilleumier 1950 147 fig.1). These examples reflect the Dura slide in all details down to the knife cuts on the lower terminal. See Oldenstein 1976 95-8 and 241, nrs 38 to 49, Tafn 12-14 (esp. nr.44) for similar slides from the Upper German limes.

2. Bronze slide (plate 2.3.I and J 2nd from right).
Provenance unknown
Yale no. 1938.2270
Dura no. unknown
Length 95mm+

As no.1 except that the lower terminal is lost. See no.1 for parallels.

3. Bronze slide (plate 2.3.I, J far right and K left).
Provenance unknown
Yale no. 1938.2273
Dura no. unknown
Length 92mm+

As no.1 except that the lower terminal is lost. It is also bent, as if the top had been wrenched away from the scabbard. This might account for the loss of the lower terminal.

The alloy is a tin bronze, with a high proportion of lead perhaps to aid casting (Lillios unpub, 24 sample 3060).

See no.1 for parallels.

4. Bronze slide (plate 2.3.I and L 3rd from right).
Provenance unknown
Yale no. 1938.2272
Dura no. unknown
Length 75mm+

As no.1 but snapped off at the lower end of the bridge. See no.1 for parallels.
5. Bronze slide (plate 2.3.I and L 3rd from left).
Provenance unknown
Yale no. 1938.2274
Dura no. unknown
Length 66mm+

As no.1 but snapped off at the lower end of the bridge. See no.1 for parallels.

6. Bronze slide (plate 2.3.I and L 2nd from left).
Provenance "G3-Room NE"
Yale no. 1938.2269
Dura no. K8
Length 71mm+

As no.1 but snapped off at the lower end of the bridge. There is a heavily corroded iron locating pin on the rear side. See no.1 for parallels.

7. Bronze slide (plate 2.3.I and L 4th from left).
Provenance unknown
Yale no. 1938.2279
Dura no. unknown
Length 47mm+

Basically the same type as no.1, snapped off halfway along the bridge. However, it differs from no.1 in that the locating pins are of bronze, apparently cast in one piece with the rest of the slide. This is unique among the slides from Dura, but it more common than inserted iron pins in Europe. Around the junction of the moulded upper terminal and the bridge is a deposit of iron oxide, suggesting that iron wire was bound around the slide at that point, presumably as a reinforcement to the locating pins holding it to the scabbard.

See no.1 for general parallels.

8. Bronze slide (plate 2.3.I and L 2nd from right).
Provenance unknown
Yale no. 1938.2271
Dura no. unknown
Length 64mm+

As no.1 but snapped off near the bottom of the bridge and the tip of the upper terminal is lost. See no.1 for parallels.

9. Bronze slide (plate 2.3.I and L far right).
Provenance unknown
Yale no. 1938.2444
Dura no. unknown
Length 46mm+

Probably as no.1, but snapped off about half-way down the bridge. Most of the upper terminal is also lost. See no.1 for parallels.

10. Bronze slide (plate 2.3.1 and L far left).
Provenance unknown
Yale no. 1982.28.61
Dura no. unknown
Length 68mm+

Probably as no.1 except that the bridge is of curved rather than flat cross section. It is snapped off at the lower end of the bridge and the tip of the upper terminal is lost. The piece is too corroded to tell whether it ever had fixing pins inserted in its rear face.

See no.1 for parallels.

11. Bronze slide (plate 2.3.1).
Provenance “G2-Main St.”
Damascus Museum
Dura no. K245
Length 95mm+

Known only from a record card and photograph in the Yale archive. The picture bears a Damascus negative number (Neg.142), so it may be assumed that the slide is now in Damascus.

It is clearly of the same type as nos.1-10, and is almost complete. It is hard to tell from the photograph, but it probably had the same moulded upper terminal common to the above example. The lower end has a heart-shaped terminal with a pair of wings which may once have been present on no.1’s terminal as well.

No. 11’s terminal is paralleled on a piece from Pfünz (ORLB Nr.73 23 no.18 and Taf.15, 28) and rather less closely on a number of other examples (eg Saalburg; Jacobi 1897 487 Abb.78,2). The closest is a slide from Jagsthausen (ORLB Nr.41 38 no.5, Taf.3,10), but this slide is of a different type. The drawings make it clear that no.11 had iron fixing pins like no.1 etc., and the lower of these was apparently in a hole drilled right through the bronze, something otherwise known only on two slides from Niederbieber (Oldenstein 1976 Nr.45 241 and Taf.12; Nr.55 242 and Taf.13).

12. Bronze slide (plate 2.3.1).
Provenance unknown
Yale no. 1938.3160
Dura no. unknown
Length 47mm+

Lower terminal of a cast bronze slide of basically the same form as nos.1-11, but of a more ornate design. Broken off some way below the bridge, its shaft is of ovoid section, much thicker than the flat plates nos.1-3 and 11. This has cast mouldings on its outer surface. The terminal is an elaborated heart
form, with a pair of lower lobes, and is pierced by three pairs of holes. The basic casting has been cleaned up with a file. A slide from Zugmantel (SJb. 5 1924 58 Taf.7,4) closely parallels the mouldings on the shaft, the shape of the shaft and the six apertures. It is also close to one from Niederbieber (Oldenstein 1976 Nr.50 242 and Taf 13) which is effectively complete. The rest of this German example is as nos.1-11, suggesting that the same was true for no.12.

13. Bronze slide (plate 2.3.1 and J far left).
Provenance “G3-a2”
Yale no. 1932.1583
Dura no. E688
Length 78mm

An apparently complete cast slide, with a bridge of the same form as no.1 etc., and added iron fixing pins. However it lacks the extended lower end and also the upper moulded terminal. Instead it ends in thin flat bronze tongues. No close parallels are known to the writer. It is suggested that this was originally of the same type as no.1, but its terminals have been filed down into tabs to make it functionally similar to no.16.

14. Bronze slide (plate 2.3.1).
Provenance unknown
Yale no. 1938.3168
Dura no. unknown
Length 65mm+

The lower end of a slide of a type quite different from no.1 etc., made to resemble a serpentine creature. Parallels suggest a stylised dolphin. The closest is from Jagsthausen (ORLB Nr.41 38 no.5 Taf.3,10). There are others from Cannstatt (Fundber. aus Schwaben NF 18 18/2 1967 120 no.13h, Taf.184 1a and 1b and Taf.185,1), Zugmantel (ORLB Nr.8 64 no.17 Taf.11,22) and Caerleon (Collingwood and Richmond 1969 fig.108b). There are also examples from South Shields (Allason and Miket 1984 197 and 201, no. 3.648) and two from Rumania (Petculescu 1983 458 fig.2 nos.8 and 9).

15. Bronze slide (plate 2.3.1 and J 3rd from left).
Provenance unknown
Yale no. 1938.2275
Dura no. unknown
Length 133mm

A complete slide made by bending a strip of metal rather than by casting. Like no.1 etc., the top of the bridge is wider than the bottom to spread the load of the baldric which exerts most stress at this point. The direction of the thrust of the strap, i.e. up the slide, is represented by the distortion of the bridge in that direction. There were no securing pins on the inner face. Instead the slide must have been held on at the top by the extended bronze tongue which was either thrust into the structure of the scabbard (i.e. under a leather covering) or was held by binding around it. It must be assumed that the lower end was also held by such binding, between the end of the bridge and the coiled tip which acted as a secure anchor.

The alloy is somewhat heterogeneous in structure, varying from copper to high-zinc brass (Lillios
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unpub, sample 3059).

There seem to be no close parallels for this simple bronze form, although it is close to an iron example from the Saalburg (SJb. 18, 1960 Abb.1,7). The coiled end is also best paralleled on an iron example from the same site (SJb. 18 1960 Abb.2,1). Such coiled or cylindrical terminals are commonplace on iron slides (eg an example from the Saalburg, Oldenstein 1976 241 nr.77 and Taf.16).

16. Bronze slide (plate 2.3.I and J 2nd from left).
Provenance unknown
Yale no. 1938.2276
Dura no. unknown
Length 106mm+

A nearly complete cast bronze slide, distinctly waisted across the middle of the bridge. Unlike the above examples it is longitudinally symmetrical and so has no obvious upper end. Each end terminates in a thin triangular bronze tongue, which in the absence of fixing pins were the only means of attachment to the scabbard.

This slide is so far unparalleled in bronze, though a number of bone versions are known. See no.17 for references.

17. Polished bone slide (plate 2.3.I and M centre).
Provenance unknown
Yale no. 1938.701
Dura no. unknown
Length 81mm

Complete, but broken in two when found. As no.16, it is waisted centrally, over the bridge. Embellishment is limited to the chamfered edges and the moulded central ridge. Each end has a short thin tongue as part of the method of fixing. Locating pins are lacking, but transverse holes are bored above and below the bridge cutout. These apertures presumably took cords or wires to reinforce the fixing provided by the tongues. The inside of the bridge shows knife marks from manufacturing, and also evidence of polishing from wear caused by the chafing of the baldric where it passed through the slide. This wear shows which end was the top, and it is noteworthy that the slide broke at the point of maximum stress.

It is a type well represented in the West; at South Shields (Allason and Miket 1984 40-1 no. 2.34), Niederbieber (Oldenstein 1976 242 no.64 and Taf.14), Mainz (Behrens 1912 108 Abb.20,5), two from Hedderheim (Oldenstein 1976 101 fn.259), Micia in Rumania (Petculescu 1983 459 and fig 2 no.18) and Vimose in Denmark (Trousdale 1975 222 no.E5 and plate 15a). A further example, almost indistinguishable from no.17, was recently found during excavations in the City of London (F.Grew, pers. comm.).

18. Polished bone slide (plate 2.3.I and M right).
Provenance “F3-16”
Yale no. 1933.430
Dura no. F1229

198
Length 71mm

A thicker and more crudely made slide than no. 17, slightly damaged at the back. Basically rectangular in plan, it lacks the waisting of no. 17 and also the characteristic terminal tongues of the type. However, it does have the same transverse holes for binding cords. It also has a longitudinal groove running up the back which presumably accommodated a spine along the centreline of the scabbard. Embellishment is confined to two shallow grooves down its outer face.

No close parallels are known to me, but it is clearly related to the type represented by no. 17.

19. Polished bone slide (plate 2.3.I and M).
Provenance unknown
Yale no. 1938.702
Dura no. unknown
Length 72mm+

The upper terminal and bridge of a well-known slide type, which resembles the no. 17 type in having tongues at each end and a cord hole each side of the strap aperture. However, this type differs in being much deeper and in having a fully enclosed aperture to accommodate the baldric rather than the simple cutout in the back seen on nos. 1-18. More complete examples of this type found elsewhere have an elongated lower end which has a cylindrical knob, probably meant to be a volute, just above the terminal tab. For examples from London and South Shields see Chapman 1977 and Allason and Miket 1984 300-1 no. 6.1. Others have been found at Vimoise in Denmark (Trousdale 1975 221 no. E2 and plate 14C), in Bulgaria (Trousdale 1975 229 no. E35 plate 17B), Rumania (Peteculescu 1983 459-60 and fig. 2 no. 20) and two from Syria itself, from the cemetery at Khisfine (Trousdale 1975 236-7 nos. S1 and S2 and plates 18C and D and 19A and B).

Scabbard Chapes (Plates 2.3.N to S).

1. Bronze chape (plate 2.3.N and Q top right).
Provenance "redoubt"
Yale no. 1938.2243
Dura no. G2004
Dimensions;
Length 53mm
Width 52mm

A complete cast bronze chape, of rounded outline, with approximately semicircular projections from the middle of the edges of the mouth. The front face is elevated above the surrounding edges by a step in the metal. Both front and rear faces contain two perforations of peltate outline. A raised spine runs down the front face only. The upper edge of the front projection is crudely embellished with knife cuts. In overall appearance this type resembles a pelta with developed terminals, and so is the type here labelled "peltate".
This is the only completely intact example of the commonest form of chape found at Dura, a type readily paralleled on Roman military sites throughout Europe, e.g. Osterburken (ORLB Nr. 40 35 no. 12 and Taf. 7.45), Zugmantel (SJb. V 58 and Taf. 7.2), and from Britain (one now in the Fremington Hagg hoard, possibly added in Victorian times, Webster 1971 no. 6) and Roumania (Buciumi; Gudea 1972 Taf. CXV no. 22). The unusual knife cut decoration on no. 1 links it particularly with another from Osterburken which has analogous, albeit cast decoration (ORLB Nr. 40 35 no. 12 and Taf. 7.52). For general parallels from Germany, see Oldenstein 1976, especially nos. 122-127 and the related nos. 101 and 112-120.

2. Bronze chape (plate 2.3.N and Q bottom right).
Provenance unknown
Yale no. 1932.1523
Dura no. unknown
Dimensions;
Length 55mm
Width 60mm

Largely intact bronze casting. The upper central part of the rear face is missing. Its overall form is as no. 1, but it is rather wider and flatter. The peltate cutouts are rather more crisply defined. The semicircular upper-edge projection is plain. See no. 1 for parallels.

Provenance unknown
Yale no. 1938.3509
Dura no. unknown
Dimensions;
Length 52mm
Width 59mm

Largely complete, but extensively corroded and crushed. Its form is clearly as nos. 1 and 2, and almost certainly had the same semicircular upper-edge projections. See no. 1 for parallels.

Provenance unknown
Yale no. 1932.707
Dura no. unknown
Dimensions;
Length 44mm
Width 51mm

Largely complete, except that the upper central portion of the front and back plates have broken across the peltate cutouts. See no. 1 for parallels.

5. Bronze chape (plate 2.3.N).
Provenance unknown

200
Yale no. 1938.2241  
Dura no. unknown  
Dimensions;  
Length 53mm+  
Width 58mm

Most of the top and upper right side is lost, and the remainder is split and distorted by heat. See no.1 for parallels.

Provenance unknown  
Yale no. 1938.3401  
Dura no. unknown  
Dimensions;  
Length 49mm+  
Width 51mm+

About half of this piece survives, below a diagonal line from top right to bottom left. It has a raised face, midrib and peltate apertures. See no.1 for parallels.

Provenance Tower of the Archers  
Whereabouts unknown  
Dimensions;  
Length 45mm  
Thickness 6mm

A meagre description and rough drawing were published in Cumont 1926 261 and plate XCVII,4. This ovoid chape, apparently of bronze, had the raised face, midrib and (originally) peltate apertures as seen on no.1 etc, and is clearly of the same type. The upper central part of the front face is broken away as in no.4. This piece is peculiar in having a triangle engraved either side if the midrib, something unparalleled elsewhere. See no.1 for general parallels.

Provenance unknown  
Yale no. 1938.3449  
Dura no. unknown  
Dimensions;  
Length 46mm+  
Width 59mm

This appears to be of the same general type as no.1 etc. However, the (?) front plate has been entirely torn away, so that although it certainly had peltate cutouts it is not known whether it had a raised front face or an unelevated one as seen on the slight variant, no.9.
Provenance Palmyrene Gate
Yale no. 1938.2240
Dura no. K129
Dimensions:
Length 63mm
Width 63mm

A rather crushed chape, from which the upper part of the back plate has been torn across the peltate cutouts. When found, the upper part of the front plate was still attached and appears on a site photograph (number unknown) and a scale drawing. Now lost, this part is shown in outline on the drawing. Clearly very closely related to the type exemplified by no.1 etc., it differs only in lacking the raised front face defined by a characteristic step.

It is well paralleled at Niederbieber (Oldenstein 1976 243 no.117 Taf.19) and Zugmantel (SJbV 1924 58 and Taf.21,1).

Provenance “L7-W”*
Whereabouts unknown
Dura no. unknown
Dimensions:
Length 66mm
Width 61mm

* This provenance means that this object may be from the Tower 19 countermine.

A chape known only from a site record card preserved at Yale. The object itself was not located in the collection. However, the sketch is detailed enough to show that it was the same type as no.9, although the tab on the upper edge is squarer. It also apparently had some kind of stud or plate on the bottom, but the sketch is inadequate to decide what function this served.

Provenance G5-29
Whereabouts unknown
Dura no. unknown
Dimensions:
Length 55mm
Width 60mm

Known only from a site record card preserved at Yale. The piece itself was not located in the collection. the sketch on the card is too crude to say more than that this object had the same ovoid outline and peltate cutouts as nos.1-10. Whether it had the central rib, or whether the upper edges were really straight as shown, is uncertain.

Provenance B3-2
Damascus Museum
Dura no. F877 (part of)
Dimensions:
Length 61mm+
Width 70mm

Still attached to a sword when found. The weapon, F877, is now in Damascus. It has been published (Rep. VI 82-3 and plate XXVI,2). No detailed photographs are available, but a scale drawing indicates that this is a bone analogue of the bronze nos. 1 and 2, ovoid with a raised face and perforations towards the top. However, the medial ridge seems to be absent. The upper central portion has apparently broken away. Niederbieber has produced a similar chape (Oldenstein 1976 245 no.178 and Taf.28).

Provenance unknown
Yale no. 1930.714
Dura no. unknown
Dimensions:
Length 46mm

A small fragment of the front face of a bone chape, with a median ridge and traces of a perforation on each side. By analogy with other Dura chapes, this is from a bone version of no.2 or no.9, depending on whether it possessed or lacked a raised face. A similar chape was found at South Shields (Allason and Miket 1984 47 and 49, no.2.81).

Provenance unknown
Yale no. "1932.1718 (probably)"
Dura no. E1289
Dimensions:
Diameter 78-80mm
Thickness 23mm

* This object, currently at the Higgins Armory Museum, is so labelled but the Yale card catalogue does not include it.

A circular iron chape, a shallow cylinder or pill shape. It is considerably wider than the scabbard, as is shown by the width of the aperture for insertion of the tip of the sheath.

Although apparently largely of iron, there are hints of bronze around its edge. It is not clear whether this is from a bronze internal structure (as no.17) or whether it is decoration of the edge with bronze strip as seen on the front face.

It is quite heavily corroded overall. The front face bears extensive remains of inlaid bronze decoration. This is now heavily damaged and can only be reconstructed in broad outline. The decorative design seems to have consisted of a six-pointed star or engrailed hexagon, surrounding two concentric rings, all in thin bronze sheet or foil. Other traces survive, but these are very fragmentary and some parts seem to have been displaced before being fused into the iron oxide. Further information about the design might well result from X-rays.
The centre of the front face is drawn up into a cone of iron, c5mm high and 10mm across. At the apex of this is the head of a bronze rivet which presumably anchored the chape to the scabbard by transfixing the bottom of the sheath thrust through the upper aperture.

This is related to a class of disc-shaped iron chapes well known in the West, some of which are plain (e.g., Heddermheim, SJb14, 1955 Abb.1,1). Most have faces inlaid with intricate geometric decoration in copper alloy. These have been studied by Hundt (1953) and Kellner (1966), and seem to have a rather localised distribution (Oldenstein 1976 116). The apparent six-fold symmetry of no.14 differs from known European examples which exhibit two, four or eight-fold symmetry. A bronze chape with decoration in six-fold symmetry is known from Nydam (Englehardt 1865 plate IX no.45).

15. Iron chape (plate 2.3.O).
Provenance unknown
Yale no. 1933.700B
Dura no. unknown
Dimensions;
Diameter 76-78mm

A plain iron disc chape, quite heavily corroded and split around the seam between the flat face-plates and sides. A dome-headed bronze rivet pierces the centre of the faces to hold the end of the scabbard in position. This object also contains traces of leather (?), presumably from the scabbard binding. See no.14 for parallels.

Provenance unknown
Yale no. 1933.700A
Dura no. unknown
Dimensions;
Diameter 72mm

A plain disc-chape, somewhat damaged along its upper edge. Very similar to no.15, but lacks the central rivet. See no.14 for parallels.

17. Iron chape (plate 2.3.O).
Provenance unknown
Yale no. 1982.28.62
Dura no. G187
Dimensions;
Diameter 75mm

A much corroded but apparently plain iron disc chape of unusual construction, in that it seems to have an inner structure of bronze covered in iron plate. The reason for this is obscure. It also lacks the central rivet seen in no.15. See no.14 for parallels.
18. Bronze chape (plate 2.3.0 and S top centre).
Provenance unknown
Yale no. 1938.2239
Dura no. unknown
Dimensions;
Diameter 64mm

A fine disc chape of bronze, in excellent condition. The only parallels known to me is from Nydam (Englehardt 1865 plate IX nos.45-47). Hundt thought these to be German imitations of Roman iron disc chapes (1960 66), but the simple decoration of inscribed rings, such as appear on bronze shield-bosses, suggests that they are indeed of Roman manufacture.

19. Bone chape (plate 2.3.0 and Q top left).
Provenance "L7-W"*
Yale no. 1938.708
Dura no. F1801
Dimensions;
Diameter 86mm

* Possibly from the Tower 19 countermine.

A well-preserved bone disc-chape, with a flat rear face but the centre of the front face domed, with a raised lip around the edge. The marks of the drill and subsequent knife work to make the mouth are still visible. There is a central hole for an anchoring rivet, as on no.15.

A similar chape is known from Niederbieber (Oldenstein 1976 245 no.185 and Taf.28). A comparable example, of ivory held to an ivory scabbard by a central golden rivet, was found at Khisfine in Syria (Trousdale 1975 236 no.51 and plates 18D, 19A and B).

20. Ivory chape (plate 2.3.0 and R top left).
Provenance N8-W1
Yale no. 1934.529
Dura no. G679 (?)*
Dimensions;
Diameter 58mm

* Struck out on catalogue card.

About half of a chape of hard white material, which because of its laminated state is almost certainly ivory. Too much has been lost for certainty, but it was probably a plain disc chape. Found with no.21.

21. Bone chape (plate 2.3.0).
Provenance N8-W1
Whereabouts unknown
Dura no. unknown
Dimensions;
Diameter 65mm

205
22. Bone chape (plate 2.3.0 and R top right).
Provenance G2-24
Yale no. 1938.709
Dura no. E918
Dimensions;
Height 53mm
Width 62mm

A sort of small disc chape, but with the upper edge cut straight across. Below the centre of the rear edge is a small rivet hole, which probably corresponded with another on the upper front face (now lost). The doming of the faces gives it a strongly lenticular appearance. The best parallel is an iron example from Niederbieber (Oldenstein 1976 44 no.137 and Taf.21).

23. Bronze chape (plate 2.3.P).
Provenance E7-W12
Whereabouts unknown
Dura no. E1235
Dimensions;
Height 74mm
Width 52mm

Published in Rep. V, plate XXIII no.2, but not located at Yale. The original drawing survives at Yale and gave the above dimensions. The lower edge is a parabolic curve, while the centre part of the front upper edge sweeps up into a form of "fleur-de-lys". A narrow median ridge up the front face formed the only surface embellishment. Both upper central portions of the face-plates had been broken away, but the front one had been found with the object and so was restored to its correct position in the drawing.

This is a type common throughout Roman Europe. There are good examples at Zugmantel (ORLB Nr.8 63 no.13 Taf.11.5; Jb. V 1924 58 Taf.21.2), Lyons (Wuilleumier 1950 fig.1), Vindolanda (Birley 1977 plate 25), Caerleon (Nash-Williams 1932 fig.36 nos. 16-22) and South Shields (Allason and Miket 1984 160-1 nos. 3.397 and 3.398). However, these Western examples do not have such well defined fleurs-de-lys.

24. Bronze chape (plate 2.3.P and S top left).
Provenance E7-W
Yale no. 1932.1522
Dura no. E1226
Dimensions;
Height 56mm+
Width 55mm

Identical to no.23, except that the fleurs-de-lys are both lost. See no.23 for parallels.
25. Bronze chape (plate 2.3.P).
Provenance G2-40
Yale no. 1932.1524
Dura no. E1127
Dimensions;
Height 55mm
Width 48mm+

Of the same type as no.23, but most of the front face and the uppermost part of the backplate are torn away. The backplate preserves a rivet hole just below the upper edge projection. See no.23 for parallels.

Provenance B2-B5
Yale no. 1938.2287
Dura no. F1997
Dimensions;
Height 68mm
Width 57mm

Largely intact chape, from which corrosion products have been removed. The bottom left side is holed in two places and the top of the left aperture is missing. The cleaning process has made it difficult to tell if the upper rear edge is intact or damaged.

This relatively ornate piece seems to be a hybrid, having the peltate apertures and upper edge projection of nos.1-10, but being closer to nos.23 and 24 in its outline. It lacks the median ridge seen on both these types. The elegant curves and facets of the upper edge projection suggests to the eye a pair of diving dolphins "kissing" at the base. It is possible that fine inscribed surface detail may have been lost to corrosion and overenthusiastic modern cleaning. Alternatively, the piece may be unfinished, or a degenerate copy of a more detailed piece. No close parallels to this individualistic object are known to me.

27. Bronze chape (plates 2.3.P and S top right)
Provenance B2-B14
Yale no. 1938.2321
Dura no. F1294
Dimensions;
Height 46mm
Width c.48mm

A fairly simple bronze chape with two peltate apertures and a rivet hole slightly above the outer face. The only surface embellishment consists of the two rounded and very shallow protruberances on the front of the piece. These are also found on a very similar piece from Zugmantel (Oldenstein 1976 243 nr.119 Taf. 19) and another rather more ornate chape from Stockstadt (Oldenstein 1976 243 nr. 115, Taf. 19).
Provenance C3-D1
Whereabouts unknown
Dura no. F2154
Dimensions;
Height 57mm+*

* Measured from a site sketch which seems to have been traced around the object.

Known from a site sketch preserved in the card catalogue at Yale, and apparently published in Frisch and Toll 1949 32, pierced bronze no.89, and plate VI. In that publication a large piece of the right side had been lost since the site sketch was made. The latter is not particularly well executed, but reveals some interesting details which show that the object was a chape of unusual and quite ornate form. Its outline was almost parabolic, perhaps tending towards a point at the bottom, relating it to nos.23-5. However, the upper edge sweeps into volutes, with a central projection rising between them. The form of the latter is uncertain; it appears to have been broken off. Up the central axis ran either one broad ridge or more probably a pair of narrow ridges, a feature seen on no other chapes at Dura, but paralleled elsewhere (eg Niederbieber; Oldenstein 1976 244 no.155 and Taf.25). On either side of this were two narrow lunate apertures. Most unusual of all, however, is the decoration running along the sides, made by drilling and filing a series of apertures to leave a tracery of bronze.

Overall this piece is highly unusual, incorporating features of a number of other common types. It is quite closely paralleled by an unprovenanced chape on display in the British Museum (No.GR.1975.5-18.2). The pierced decoration is particularly noteworthy, and relates it stylistically to the sword guards and other fittings embellished in the same way (eg hilt fittings 1-4).

29. Iron and bronze chape (plate 2.3.P and S bottom).
Provenance unknown
Yale no. 1934.459
Dura no. unknown
Dimensions;
Height 60mm
Width 49mm

A curious chape of composite bronze and iron construction; the side walls and bottom are of the former, the front and back plates of the latter. Exact details of construction are obscure in the absence of X-rays, as the object is heavily corroded.

This chape is unique at Dura in being rectangular. It flares slightly towards the base, which appears to have had three bronze projections, perhaps beads or spheres, one on each corner and one centrally. However, certainty is not possible due to the severity of the corrosion.

Most Roman chapes of this general form are in bone, but one or two iron or bronze ones are known. Perhaps the closest to no.29 is one from the Saalburg (SJb III 20 and Taf.2,2). Another from the same site is a piece in bronze which has beads on the bottom edge, as suggested for no.29 (Jacobi 1897 486 fig.78 no.8). A similar chape was found at Lauriacum (RLO XI fig.14 no.10).
30. Bronze chape (plate 2.3.P).
Provenance unknown
Yale no. 1938.3115
Dura no. unknown
Dimensions;
Height 51mm
Width 23mm

A simple bronze chape, shaped like a flattened cone with a rounded tip, quite plain. Probably from a dagger. See no.31 for discussion.

Provenance unknown
Yale no. 1938.3116
Dura no. unknown
Dimensions;
Height 41mm
Width 22mm

Similar to no.30, a small bronze chape, but this example has a bulbous tip. Probably from a dagger, on the basis of its size. They may be from the sheaths of a late form of pugio, but equally need not be strictly "military" at all. Good parallels are known from various sites in Europe, eg Saalburg (Jacobi 1897 486 fig.78 nos.9 and 10; ORLB Nr.8 64 nos.19 and 20, Taf XI) and Holzhausen (ORLB Nr.6, Taf.VII fig.22)
CATALOGUE PART 2.4. SHIELDS
(Plates 2.4.A TO 2.4.AS).

Shield Bosses (Umbones) (Plates 2.4.A to 2.4.R).

   Provenance L7-W*
   Yale no. 1938.3647
   Dura no. F1149
   Dimensions;
   Overall diameter 197mm
   Bowl diameter...c115mm
   Bowl height......c62mm
   Plate thickness..2-3mm

   * Probably from the countermine at Tower 19, where a number of bosses were recovered (Rep. VI 204, and fig.18).

   A bronze boss with a hemispherical bowl and an annular flange which is very slightly downturned. It is complete and in excellent condition. It is probably from the Tower 19 countermine.

   There are four empty fixing holes through the flange, made from the front. These are not spaced equidistantly around the circumference, probably to increase the clearance between them and the line of the grip assembly (see boss 2).

   At the apex of the bowl is an indentation, perhaps from a lathe if this circular boss was made by spinning. The boss is decorated with inscribed rings, probably made while still on the lathe. From the centre outwards, there is a single ring and two closely spaced pairs on the bowl, and two single rings on the flange.

   This is the best preserved of all the Dura shield bosses, hardly damaged at all beyond superficial corrosion pitting. The boss has a polish, presumably acquired since excavation. The colour of the metal is not clear but appears to be a yellow bronze, presumably a high zinc alloy.

   Parallels for this boss are quite common (James unpub. for gazetteer of bosses known to 1979). Good examples include a second century AD boss from Zwammerdam (Haalebos and Bogaers 1970 and 1971), an unprovenanced boss from Pannonia (Thomas 1971 38 and Taf.LVI-LVIII). There are a number of very fine examples with ornate surface embellishment from Mainz (Klumbach 1966) and from Pannonia (Thomas 1971 31-33 and Taf. XXXIX-XLV).

2. Circular bronze boss (plates 2.4.A bottom and B, right).
   Provenance unknown
   Yale no. 1938.3648
   Dura no. unknown
Dimensions;
Overall diameter...206mm
Bowl diameter......117mm
Height..............67mm
Plate thickness....1-2mm
Grip length........189mm
Grip section (mid) 16x6mm
Grip section (end) 26x6mm

Dimensions of grip exclude corrosion products. Measured from the metallic core at fractures.

The bowl is approximately hemispherical (tending towards conical), and has an annular flange. Attached to the back of the boss was an iron grip, complete but now broken into four pieces.

There are four empty fixing holes through the flange. These had been made from the front. Each was rectangular when made, 7x4mm, but had had round-shanked rivets, 5mm thick, forced through them. The holes are equidistantly spaced around the perimeter. Two further rivet holes exist, on opposite sides of the boss and midway between the adjacent rectangular holes. They are circular, about 5mm across and contain corroded iron rivets. The latter, which have heads 19mm in diameter, attached the short iron grip bar to the back of the flange.

The surface of the boss has a light and fairly even patination. At the centre of the bowl is an indentation, 2mm across and 1mm deep. It is the result either of manufacture by spinning on a lathe, or of the use of compasses to inscribe the concentric ring decoration. The edge of the flange is embellished with a series of knife-cuts or nicks, about every 5mm, an unusual technique on bosses only otherwise attested on an example from London (James 1980). It does not appear to bear any inscribed rings.

The iron grip piece, held to the back of the boss by the two preserved iron rivets, is complete apart from some minor chipping. Significantly, there is no space between the boss and the grip for the shield board. Clearly the iron bar was attached to the boss and this assembly was rivetted to the front of the board. Its thinness suggests that it is only part of the grip assembly, as it is insufficient on its own. This conclusion is supported by the structure of the shield boards and reinforcement/grip bars preserved in the collection (see part 2.4.5).

See no.1 for general parallels and James 1980 for the unusual edge decoration paralleled in London. A boss from Lauriacum was found with a similar grip attached (RLO XV 195 and fig.59, no.6), while holes on a couple of bosses from other sites are best interpreted as fixing points for the same thing (eg Mainz C, Klumbach 1966 172 and Taf.LV; Butzbach, Simon 1968 193 and Abb.1-5).

3. Oval bronze boss (plates 2.4.C top, D left and R).
Provenance L7-W*
Yale no. 1938.3676
Dura no. F1224
Dimensions;
Overall dimensions; an oval 187mm x 180mm restored minimum.
Bowl dimensions; an oval 111mm x 180mm.
Bowl height c50mm.

* Probably from the countermine at Tower 19.

Basically similar to no.1 in form, but distinctly ovoid. It is complete, except for some chipping of the
edge of the flange. There is considerable corrosion pitting on the outer face.

Four fixing points exist around the flange, all empty. These are roughly circular and about 5mm across. They are not equidistantly spaced, but regularly positioned between the axes of the ovoid flange. Two have been recut, in slightly different positions, indicating that this boss was used on two different shield boards, or perhaps had to be refixed onto the same board following a repair; the new hole positions could be explained by damage caused to the original nail-holes requiring new ones to be made in intact wood.

A lathe or compass mark is to be seen at the apex of the bowl. There are three concentric inscribed rings around it on the bowl, and a fourth, botched due to the acircularity of the piece, about 10-15mm above the junction of bowl and flange (plate 2.4.R, top).

The metal used was a red copper alloy, which is unusual, as is its ovoid form. The latter is best paralleled on an iron boss from London (James 1980). Its acircularity presumably precludes manufacture by spinning on a lathe, although it is apparently possible for a particularly skilled craftsman to produce objects of ovoid section using this technique (J.Paddock, pers. comm.). In fact there are clear hammer marks on the inside of the bowl, suggesting that it was made by sinking into a former (plate 2.4.R, bottom).

There are two associated dents on the object, one on the bowl and one on the flange, probably as a result of a single blow. It is not possible to tell if this was due to a blow from a weapon, or accident, or if it was a result of deposition (e.g., the caving-in of the countermine, if that is indeed its provenance).

See no. 1 for general parallels.

4. Circular bronze boss (plates 2.4.C bottom and D right).
Provenance unknown
Yale no. 1938.3677, 3689 and 3691-4
Dura no. unknown
Dimensions:
Overall diameter...220mm
Bowl diameter.....120mm
Bowl height.......58mm
Plate thickness...1-2mm

Largely complete, but broken into six fragments. About a quarter of the flange and a small part of the bowl is lost. The bowl consists of a slightly tapering drum surmounted by a flattish dome, joined with a distinct carination. The flange is annular, relatively wide and is slightly downturned. Corrosion is fairly light.

Only two fixing points survive, diametrically opposite each other and relatively near the edge of the flange. Both are empty, and of irregular outline. There were almost certainly originally four, the other two in the portions now lost. One may have been associated with the strange semi-circular “bite” taken out of one side of the flange, perhaps caused by its being torn from the shield board.

The bowl is embellished with three concentric pairs of inscribed rings, but there are none on the flange. A broad dent in the bowl, with the mark of a sharp straight edge in the centre could be from a weapon blow.

See no. 1 for parallels.
5. Circular bronze boss (plates 2.4.E top and F left).
Provenance L7-W*
Yale no. 1938.3680
Dura no. F1154
Dimensions;
Overall diameter..175-180mm
Bowl diameter.....c115mm
Bowl height......55-60mm
Plate thickness...under 1mm (up to 2.5mm at edge)

*Probably from the Tower 19 countermine.

The bowl is a short drum which curves smoothly into a subconical dome. The flange is annular and relatively narrow. Less than half the bowl and only a quarter of the flange survive, as two fragments. However, the metal appears to be in perfect condition, with no traces of corrosion.

Only one fixing hole through the flange survives, although there are traces of a possible second one along one of the fractured edges. If the identification is correct the boss originally had the standard complement of four, spaced equidistantly about the flange.

Embellishment is via concentric groups of inscribed rings, two groups of three on the upper bowl, two pairs around the sides of the drum and two groups of four around the flange.

See no.1 for parallels.

6. Circular bronze boss (plates 2.4.E bottom and F right).
Provenance unknown
Yale no. 1938.3678
Dura no. unknown
Dimensions;
Overall diameter..207mm
Bowl diameter.....115-120mm*
Bowl height......55-55mm*
Plate thickness...1-2mm

* Estimated, due to distortion.

Approximately hemispherical bowl and annular flange. About half of the bowl and flange survive, in a single piece. The bowl is distorted, being pushed over to one side, and bears a small dent which may result from a blow from a weapon. The surface is quite extensively corroded.

Two of the original four flange apertures survive. They are 5-7mm across, and both contain much-corroded iron rivet shanks. The heads of the latter are absent.

Embellishment is by means of concentric pairs of inscribed rings, three on the upper part of the bowl, and a single pair on the flange.

See no.1 for parallels.
7. Circular bronze boss (plates 2.4.G top and H right).
Provenance L7-W*
Yale no. 1938.3700
Dimensions;
Overall diameter.. 190mm
Bowl diameter.... 110-115mm
Bowl height...... 60mm
Plate thickness... under 1mm, rising to 2mm at rim

*Probably from the countermine at tower 19.

Approximately hemispherical bowl, with annular flange. Three dome-headed rivets are still attached. The flange is almost complete, but about half the bowl is lost, probably as a result of the extensive corrosion seen on this object eating through the relatively thin metal of the central part.

The approximately planar flange retains the original total of six apertures, spaced in a roughly equidistant manner around the bowl. The three rivets which survive in situ have domed bronze heads 25mm across. These are interpreted as three of the four rivets used for attaching the boss to the shield-board. The fourth head is lost, but part of an iron shank is still to be seen in the aperture. It is not clear whether this means that all the dome-headed rivets had iron shanks, or whether this one is a replacement. To my knowledge, these rivets are unparalleled outside Dura. Western shield rivets are flat headed.

The two remaining holes are now empty, but had probably been used for attaching a short iron grip bar directly to the back of the boss as on no.2.

Embellishment is again confined to concentric inscribed rings. These are difficult to trace due to the degree of corrosion, but at least one pair was detected on the upper part of the bowl and two further pairs may be seen on the flange.

See no.1 for parallels.

8. Circular bronze boss (plates 2.4.G bottom and H right).
Provenance L7-W*
Yale no. 1938.3441 and 3685
Dura no. F1152
Original dimensions not measurable
Maximum preserved diameter... 195mm
Plate thickness........... 1-2mm (measured at fracture)

*Probably from the countermine at tower 19.

The bowl is hemispherical, with an annular flange. Part of an iron grip survives in position. Approximately half the boss is missing, and what remains is severely distorted and cracked, and possesses a heavy corrosion layer.

Only one of the original four rivet-holes for attachment to the shield board has survived. It contains a dome-headed rivet similar to those on no.7, 25mm across.

Traces of at least one pair of inscribed rings are visible.

The iron grip seem essentially the same as that on no.2, except that it was attached with a bronze rivet.
This object is too badly damaged to provide much further data. Adhering to its surface are two fragments of iron, one of which may be from another boss. This is consistent with the object being found in the tangled mass of bodies and equipment in the mine.

See nos. 1 and 2 for parallels.

9. Circular bronze boss (plates 2.4.1 and J).
Provenance unknown
Yale no. 1938.3687 to 3690
Dura no. unknown.
Dimensions;
Overall diameter..c210mm
Plate thickness... 1.5 to 3mm at edge
Other dimensions not measurable

Bowl hemispherical with annular flange and fragmentary iron grip. Only about half the flange survives, and a small part of the bowl. It is badly bent and heavily corroded, with indications of burning.

Three fixing points in the flange survive. Two of these contain iron rivets for fixing a short iron grip bar to the back of the plate, as in no.2. Oxides from the heads of these rivets cover substantial areas of the flange. The remaining aperture is empty. Its position suggests that there may only have been four apertures in all, including those for the grip bar. This would be unusual, as bosses with an integral grip more commonly had six rivet holes. The iron rivets holding the grip on this example may well have served a double function, transfixing not only the grip but also the shield board with its iron grip/reinforcing bar.

The surface is too badly damaged to reveal inscribed rings or any other superficial decoration.

See nos. 1 and 2 for parallels.

Provenance unknown
Yale no. 1982.28.41
Dura no. unknown
Maximum preserved length 147mm
Plate thickness ..........4-5mm

Fragment of a circular boss with hemispherical bowl. A single, heavily corroded bronze rivet is preserved. Its head is flat, 18-22mm in diameter.

For general parallels, see no. 1. Iron bosses of the same general form are known from a number of sites including Newstead (Curle 1911 182 and plate XXXIV), Kastell Echzell (Baatz 1964 48 and Abb.13, no.15), Arnsburg (ORLB II, Nr.16, 22 and Taf.6, nos.11 and 12), Pfünz (ORLB VII Nr.73, 25 no.19 and Taf.XV no.14 and 16) and one from Dacia Inferior, (Vlădescu 1975 51 and Fig 30). Further finds have been made recently at Doncaster (Buckland 1978 249 and figs.346 and plate XVI) and Vindolanda (Jackson 1985 130 and fig.47, no.1).
Provenance “L8-W (T.19 sap)”*
Yale no. 1982.28.37
Dura no. unknown
Dimensions;
Overall diameter...154mm+
Bowl diameter......120-125mm
Bowl height.......c54mm
Plate thickness...3-3.5mm

* Identified with a sketch on a site record card at Yale, which gives this provenance.

A circular boss with annular flange, now shattered into several fragments. The flange is slightly downturned. See nos.1 and 10 for parallels.

12. Fragment of circular (?) iron boss (plate 2.4.K).
Provenance unknown
Yale no. 1982.28.43
Dura no. unknown
Dimensions;
Maximum preserved length 118mm
Plate thickness........4mm

Part of an iron boss with a hemispherical bowl and a particularly broad flange of uncertain outline. This is quite possibly a rectangular boss from a scutum, but this cannot be proved. It is equally likely that the boss was circular in outline.

See nos.1 and 10 for parallels.

Provenance unknown
Yale no. 1982.28.40
Dura no. unknown
Dimensions;
Maximum preserved length 105mm
Plate thickness up to 6mm

A large part of a circular boss with hemispherical bowl.

See nos.1 and 10 for parallels.

Provenance unknown
Yale no. 1982.28.42
Dimensions;
Bowl height..............50-55mm
Plate thickness...........5-8mm
Part of a circular boss with hemispherical bowl. See nos.1 and 10 for parallels.

15. Star-shaped bronze boss (plates 2.4.M top and and N left).
Provenance L7-W*
Yale no. 1938.3679
Dura no. F1146
Dimensions;
Overall diameter: 219mm
Bowl diameter: 135mm
Bowl height: 52mm+
Plate thickness...0.5-1mm

*Probably from the countermine at Tower 19. Star-shaped bosses are visible in the published drawings of the deposits in the mine; Rep. VI fig.18).

The bowl is slightly ballooned, i.e., it expands from its junction with the flange, reaching its maximum width at about 26mm above it. The profile then sweeps in, to form a flattened dome. In outline, the flange is an eight-pointed star. About 60% of the flange survives, but almost all of the centre of the bowl is lost. Corrosion is limited to a light, even patination.

Three of the original four fixing holes survive, spaced equidistantly about the flange in the narrow stretches between two points. Two have parts of (bronze) rivet shanks still in situ. Traces of the missing rivet heads are to be seen in the surface corrosion products. They were round, and about 18mm across.

The only embellishment, apart from the star-shaped outline, is a group of three concentric inscribed rings around the flange. These are unusually broad (c.1.5mm) and shallow.

The sides of the bowl and flange bear concentric scratches which are signs of manufacture, or at least finishing, on a lathe. It is not clear how the star outline was produced. Traces of the use of metal shears or files were not observed.

There are no good parallels for this boss. See no.1 for general parallels. The closest are an octagonal boss from Kastell Zugmantel (ORLB II Nr.8 Taf.XI) and a four-point star from Carnuntum (RLO II 118 and Taf.XX no.14).

Provenance unknown
Yale no. 1938.3496 and 3686
Dura no. unknown
Dimensions;
Overall diameter: 238mm
Bowl diameter: 125mm
Bowl height: c.55mm
Plate thickness: c.1mm

The bowl is ballooned like no.15. The flange is an eight-pointed star in outline. About 40% of the flange and part of the bowl are missing. The flange is slightly bent. The surface exhibits considerable corrosion.
Each of the points on the star-shaped flange bears a small raised boss, made by pushing the plate out from behind. Each is about 8mm across and 2mm high.

Two certain rivet positions are known, located diametrically opposite each other. They are on the narrow parts of the flange, between two star-points. Both have traces of iron rivet shanks in them. Traces of a possible third aperture are visible at one of the fractures, but this is in an anomalous position and is in any case uncertain.

Two pairs of concentric rings are visible on the flange, but none on the bowl.

See no. 15 for the rather unsatisfactory known parallels.

17. Fragment of a star-shaped bronze boss (plate 2.4.P).
Provenance L7-W*
Yale no. unknown
Dura no. unknown
Dimensions unknown

*Probably from the Tower 19 countermine.

Fragment of flange from a star-shaped boss like nos. 15 and 16, recorded on a Dura record card and in a photograph at Yale (G765) but not located during my visits. The preserved point is more acute than those on bosses 15 and 16. It has the same terminal boss as the points on no. 16, with additional ones around the curves between points.

A fixing hole survives, at the base of a point rather than between them as on nos. 15 and 16.

See no. 15 for parallels.

18. Fragment of a star-shaped bronze boss (plates 2.4.O top and P).
Provenance unknown
Yale no. 1982.28.39
Dura no. unknown
Maximum preserved length 90mm

Flange fragment of another eight-point star boss, very similar to no. 16 in its edge curvature and the boss at the preserved apex.

See no. 15 for parallels.

19. Fragment of iron boss (plates 2.4.O and P).
Provenance “L8-W (Tow. 19 sap)”*
Yale no. 1982.28.38
Dura no. unknown
Maximum preserved length 128mm

*Details from a site card at Yale.
A fragmentary object of peculiar shape, best interpreted as a boss. Bosses of unusual shape are known from the Trentholme Drive cemetery outside York (Wenham 1968 95 and fig.37 no.12) and from Carnuntum which has produced eye-shaped and rhomboid bosses (*RLO* III 97 and Taf.VIII, figs.8 and 9).

Two other bosses are recorded at Yale, but were not found in the collections:

20. Circular bronze (?) boss (plate 2.4.Q top).
   Provenance L7-W
   In Damascus ??
   Dura no. unknown
   Dimensions unknown

   Known only from a photograph at Yale (neg. no. FVII 66). The print in the archives bears the following pencilled note; "Number unknown but certainly from L7-W". This object may therefore be from the Tower 19 countermine.

   The strange shape of the bowl is hard to parallel. A boss from Straubing, with a large central hole may originally have had a similar projection fitted (Walke 1965 152 and Taf.106). For general parallels see no.1.

   Provenance G3-H5
   Whereabouts unknown
   Dura no. unknown
   Dimensions unknown

   A rectangular boss of the type considered to belong to the rectangular *scutum*. Known only from a site record card preserved at Yale, which includes a rough sketch and a brief description; "Frag. iron buckler umbo with square or rectangular border, badly rusted. 8 smaller fragg. with it."

   A number of *scutum* bosses are known from Europe. The best known are the bronze examples from the Tyne and Vindonissa (Klumbach 1966 175-179, Nr.3 and 4, abb.5 and 6). There are also three iron examples from Carnuntum (*RLO* II 118 and Taf.XX nos.11, 12 and 13) and another from Aquincum (Hoffiller 1912 64).
Shield Reinforcing Bars/Grips (plates 2.4.S to U).

1. Iron shield reinforcing bar/grip (plates 2.4.S, top and T).
   Provenance: Tower 19 countermine*
   Yale no. 1982.28.44
   Dura no. unknown
   Dimensions:
   Length...490mm+
   Section...22x12mm, except at the tip, which is 28x8mm, and at the grip.

   * In photo G810A, labelled "near Tower 19, weapons from mine".

Approximately half of an iron shield bar, in four fragments. Three join together, and it is clear that a very small portion has been lost between these and the fourth for although they do not directly fit the corrosion and splitting patterns are very closely matched. The surface is deeply fissured and encrusted with oxides and concretion. However, the fractures, which probably occurred on or after excavation, allow the sections to be measured accurately.

The bar is for the most part of roughly constant semicircular to subrectangular section. The outer end is somewhat flattened and widened. At the broken end, ie around its original centre, the bar was flattened and widened into two upward curving wings, resulting in a U-section at this point. This constituted the main grip of the shield, which lay across the central aperture of the shield board, behind the boss, with the two wings projecting into the hole to enclose the wooden grip core and perhaps an iron grip bar attached to the back of the boss (see bosses 2 and 8; plates 2.4.A,B,G and H).

It is estimated that the original length of the whole bar will have been about 970mm, exactly the width of shield-board no.2.

The bar was held to the rear face of the shield board by a series of rivets, holes for which may be seen on a number of the surviving shield-boards. On oval plank shields such bars constitute a valuable transverse reinforcement behind the vertical planks. On this example, traces of wood grain are to be seen in the corrosion products on the appropriate side. However these are neither parallel nor (as might be expected) perpendicular to the axis of the bar, but at two different oblique orientations. One of these traces is pierced by what appears to be the remains of a rivet. This is not certain, but if the interpretation is correct, the explanation is that the shield-board belonging to this bar was indeed of plank construction, and that when the mine caved in it was shattered, making one fragment of wood still attached to a rivet rotate about the shank, coming to rest at the angle we now see. There are no other clear signs of rivets due to the depth of corrosion, but the flattened end was certainly designed to take one. This is paralleled on a shield bar from Doncaster, England (Buckland 1978 fig.4).

The best parallel is a shield bar from Carnuntum which possesses the same grip form (RLO III 106 and Taf.IX nos.30, 31 and 32). A further fragmentary example has been found at Vindolanda (Jackson 1985 132 and fig 47 no.2). The Doncaster shield had a plain bar in situ (Buckland 1978 249 and figs.3, 4 and 7). Other examples have been found at Newstead (Curle 1911 182 and plate XXXIV) and Caerleon (Nash-Williams 1932 76 and fig.28, nos.11-13).
2. Fragment of iron reinforcing bar/grip (plates 2.4.S centre and bottom, and T).
Provenance unknown
Yale no. 1982.28.45
Dura no. unknown
Dimensions;
Length...167mm+
Section 16x8mm at each end. Centre part widened.

Covered in thick coat of oxides etc. The centre portion of a bar like no.1, comprising the section widened out on each side and bent into a U-section to form the main grip. The surviving part is now broken in two. Extensive traces of wood grain in the corrosion products show the position of the shield board and the edges of the central grip aperture, into which the grip flanges projected. There are no traces of fixing rivets, which is not surprising as to judge from other pieces the nearest were probably 120-150mm either side of the centre to clear the 100mm radius of the typical boss. The smooth coat of oxides around the back of the grip itself seems to preserve the surface texture and form of a leather binding.

A similar piece was recovered at the Saalburg (Jacobi 1897 Taf XXXX). See no.1 for other parallels.

3. Fragment of iron reinforcing bar/grip (plate 2.4.T).
Provenance unknown
Yale no. 1982.28.47
Dura no unknown
Dimensions;
Length ....87mm
Section....22x12mm+

Part of a shield bar at the point where it flares out to form the grip. Heavily corroded and flaking.

See no.1 for parallels.

4. Fragment of iron reinforcing bar/grip (plates 2.4.S top and T).
Provenance unknown
Yale no. 1982.28.46
Dura no. unknown.
Dimensions;
Length..319mm+
Section 22x13mm

Part of a bar in three pieces. Heavily corroded and split. Traces of wood grain in the corrosion products, but it is unclear whether these represent the shield board. The variety of orientations suggests they do not.

See no.1 for parallels.
5. Fragment of reinforcing bar/grip (not illustrated).
Provenance Tower 19 countermine.
Yale no. 1982.28.49
Dura no. unknown
Dimensions;
Length..104mm+
Section 23x12mm

Identified among objects in Yale photo G810A, labelled “near Tower 19, weapons from mine”. Broken at both ends.

See no.1 for parallels.

6. Fragment of reinforcing bar/grip (not illustrated).
Provenance Tower 19 countermine
Yale no. 1982.28.48
Dura no. unknown
Dimensions;
Length..85mm+
Section 25x10mm

As no.5, identified in photo G810A. Broken at both ends.

See no.1 for parallels.

Shield Boards (Plates 2.4.S to 2.4.AS)

1. Oval plank shield (shield I, the “Homeric shield”; plates 2.4.V and W)
Provenance embankment N of tower 24
Yale no. 1935.551
Dura no. unknown
Dimensions;
Height.....1.18m
Width.....c0.95m
Thickness..5-12mm

One of three painted wooden shields found buried in the embankment behind the walls, and already published in detail (Rep. VII/VIII 331-349,369 and plates XLI and XLII). The publication concentrates heavily on the decorative painting of the outer face of the board. Sadly, this is now almost totally obliterated, apparently due to the discoloration and bubbling of some kind of binding medium applied to hold the pigments in place in the 1930s. According to Susan Matheson the paintings were already in an advanced state of decay in the 1940s. Now much of the pigment has flaked off.
The wood of the shield board is in good condition. The board consists of small planks of poplar (*Populus euphratica*). Comments here are confined to corrections and refinements of the published description. The board was made of thin planks, orientated vertically, glued edge to edge. Originally there were about a dozen, perhaps thirteen, 50-100mm wide, tapering in thickness from 10-12 mm thick in the centre to 5mm at the edge.

The basic shape is a broad oval, and the shield seems to have been convex. The degree of convexity cannot be accurately measured due to post-depositional distortion of the wood. There is a central aperture for a handgrip, originally designed to be covered by a metal boss, space for which was left in the painted decoration. The latter implies a circular boss of up to 207mm diameter, which accords well with those actually recovered from the city. However, there were no nail holes for its retaining rivets, demonstrating that it had never been attached.

According to the published account, shield 1 retained four rivets when found, "...placed without relation to an umbo and [which] must have served some other purpose" (*Rep.* VII/VIII 330). Two were on the transverse axis of the oval, 140mm either side of the centre, too far out to be umbo rivets. Another was allegedly on the right upper edge of the space reserved for the umbo (ie the bearer's right), and is shown in this position on the reconstruction (*Rep.* VII/VIII plate XLII). This is erroneous. There was never a rivet in this position, just the impression left by one belonging to another shield-board which had lain on top of shield 1. The fourth rivet was 330mm "above and to the [bearer's] left of the center". This peculiar arrangement of rivets was interpreted in terms of fixings for a grip and forearm strap, which is out of the question as the shield was designed to have a boss. Such shields were wielded by the central grip alone, and could not and did not have forearm straps. In fact the fourth of the rivet holes described is associated with a metal object, not mentioned in the report, which fits the hole perfectly. It is an iron loop holding a flat articulating bronze ring to the back of the shield (plate 2.4.V). This was probably to take a loop or strap to allow the shield to be hung up or slung over the shoulder when not in use. An attachment for a similar fitting was observed on shield 2.

The two rivets on the short axis of the shield are easily explicable. They are two of the fixing points for the iron reinforcing bar/grip which ran across the rear face of the shield. It had been torn off prior to burial. It is worthy of note that the outer portions of the board, where additional rivet positions would be expected, are broken and missing on each side. The original painting of the shield in *Rep.* VII/VIII, plate XLII (Plate 2.4.W) clearly shows the centre portions of two planks missing on the right side (bearer's left); these areas were probably ripped away when the iron bar was yanked off the back.

The painted decoration seems to have been applied to the surface after the latter had been prepared with a coat of gesso, to fill the grain and disguise the joints between planks. The edge has a series of small holes all the way round, which other finds confirm were to take twine stitching, presumably to hold a leather edge binding. The purpose of such a binding would be to prevent the wood being damaged by casual knocks and bumps. It would be too flimsy too resist a deliberate blow.

There are no very close archaeological parallels to this and the other large oval shields from Dura, but depictional evidence shows that they were a common form during the third and fourth centuries, apparently gradually replacing the earlier narrower ovals, semi-cylinders and other shapes attested from archaeology and elsewhere.

A very few more-or-less intact Roman shield boards have been found, including the Doncaster example (Buckland 1978) and the Fayum scutum (Kimmig 1940, where it was misidentified as Celtic). However, these are all earlier that the Dura examples, which are the only broad ovals known to date. That they are typical of the third and fourth century is demonstrated by contemporary depictional evidence discussed in part 2.4.10.
2. Oval plank shield (shield II, the “Amazon shield”; plates 2.4.X to Z).
Provenance embankment N of tower 24.
Yale no. 1935.552
Dura no. unknown
Dimensions:
Height......1.17m (given as 1.135m in Rep. VII/VIII 349)
Width......0.97m
Thickness....3-7mm

The shield is in much the same physical condition as no.1, i.e the board is intact as found but the painting is all but lost. The broad oval board is made of 13 poplar planks of widely varying width, glued edge to edge and orientated vertically. The board is 7mm thick in the centre, thinning to a mere 3mm at the rim. It is said to have been dished (Rep. VII/VIII 328), but the planks are now too distorted to measure this, or indeed to permit absolute certainty that it was convex. The edge lace holes, 6-8mm in from the edge and 10-12mm apart, were for twine stitching to hold a leather edge binding. Both twine and leather are gone. The paint underlay the position of the edging, and so had been applied first. Before painting the surfaces of the board had been covered in gesso. There were also traces of the fibrous material seen on the surfaces of many of the other recovered fragments of shield boards. This is thought to be shredded tendon in a matrix of glue. The relationship of this material to the gesso is obscure, but the gesso is likely to be on top. The painting on the outer face left room for a circular umbo up to 193mm diameter, but the absence of rivet holes shows that it had never been added.

A single iron nail shank survived 150mm to the (bearer’s) left of centre, on the short axis of the oval. This was almost certainly one of a series holding the transverse iron reinforcing bar/grip to the back of the board. This proves that the bar had been added, but removed before burial. It had overlain the painting on the back. Another iron shank stuck in the board survives above and to the bearer’s left of centre, about halfway along the radius. It is curved over into a loop. It is very similar to the “strap attachment” on shield 1 and is in the same position, so it is suggested that it had the same function.

Easily the most important new observation about shield 2 is the painted decoration on the back. The original publication alluded to it, but gave no details (Rep. VII/VIII 326). Given the state of the front of the shield, which is now in pieces, it was not possible to turn the timbers over, so the design had to be sketched and photographed by laying a few of the timbers at a time on a sheet of perspex and crawling underneath to study them! (Plate 2.4.Y). The result is quite unlike any of the previously published shield designs from Dura. On an overall light blue ground, lines of “hearts” in red and white radiate nose to tail from the centre, a decorative element reflected in the “wreath” on the front of the shield. Originally there were eight lines, at roughly 45 degree spacing. In between each line and its neighbour was an eight-pointed red and white star (Plate 2.4.Z).

The most noticeable features of this design, which differentiate it from the others, are its boldness and simplicity. Most of the other designs have a lot of fine and fussy detail, of figures, animals and foliage, etc. This design consists of large, bold elements.

Heart shapes similar to those on this design occur on Trajan’s Column (Plate 2.4.AS nos.16-17), and so were used by shield decorators 150 years before the time of the fall of Dura. However, they were apparently unusual, and in fact the Dura shield is more closely related to a number of shield designs in the Notitia Dignitatum of around AD400. These are commonly bold, bright, simple designs, presumably to aid unit recognition at a distance. They are often radial, and designs similar to this are known (eg legio septima Gemina, legio decima Gemina and legio Iulia Alexandria; NDOr. VII, 7-8; VIII, 19).
See no.1 for structural parallels.

3. Oval plank shield (shield III, the “Shield of the Warrior God”; plate 2.4.AA).
Provenance embankment N. of Tower 24.
Yale no. 1935.553
Dura no. unknown
Dimensions;
Height.....1.18m
Width......0.94m
Thickness..[not measured]
The third of the three painted shields found together in the embankment and already published (Rep. VII/VIII 363-368 and plate XLVI). Like nos.1 and 2 it is made of thin planks, apparently poplar, glued edge to edge and orientated vertically.

There is little to add to the published description, beyond noting the decay of the painted decoration which is much the same as that seen on nos.1 and 2. The board had never had a boss attached, although the usual central aperture proves it was intended to have one. Like 1 and 2 it had had its iron reinforcing bar fitted but removed before burial. The nail-holes for it are clearly visible across the short axis of the shield. They were at 145mm and 310mm to the (bearer’s) right of centre, and at 320mm to the left. (At 150mm to the left, the nail may have passed between two planks). Other nail holes closer to the edges of the oval were not seen due to the state of those parts of the board.

The surface was prepared for painting with a coat of gesso on both sides. There are traces of paint on the back, but no recognisable design survives. Stitching holes to secure a leather edging are to be seen around the edge.

See no.1 for parallels.

4. Oval plank shield (shield IV; plates 2.4.AB).
Provenance N8 W9 embankment
Yale no. 1982.28.88
Dura no. unknown
Dimensions;
Height....1.15m
Width....0.95m
Thickness 3-8mm
Cursorily published with the three painted shields in Rep. VII/VIII (327-8 and fig. 83). A photograph of this shield in situ appears in Hopkins 1979 187. The Report states;

“Found in the fill of the first embankment...some 17.00m south of the axis of the Persian assault ramp...Shield IV was recovered practically intact, its planks still firmly glued together, wanting only its leather edging...It showed no traces of painted decoration.”

As it survives today, while the (bearer’s) left side of the shield is almost perfect, the other is fragmentary. Most of the planks are now separate. The central aperture is unusual among the plank shields in being roughly circular (120mm x 145mm) and is slightly eccentric with respect to the grip, allowing more room for the knuckles above the horizontal handle. The aperture was cut after the board
was assembled, as on shields 1 to 3. The board is 8mm thick at the centre, thinning to 6mm close to the edge, and then tapering rapidly to 3-4mm at the edge itself. The board was convex, and probably stood about 100mm high at the centre when laid on a flat surface.

The board had also had its reinforcing bar added, but removed prior to burial. The line of nail holes for attaching it are clearly visible across the middle. Three nail holes out of a probable four survive on the intact side.

This shield had had its boss attached at some stage. The nail holes are visible, and are not orientated at "3,6,9 and 12 o’clock" but at "1.30,4.30,7.30 and 10.30", which is the orientation required by boss no.2 and others. There actually seem to be two distinct sets of holes, indicating that two different bosses were fixed at different times.

The stitching holes around the edge are 6-9mm apart, and 8-10mm from the edge of the board.

Contrary to the published report, the shield had been painted. The remains of a coat of gesso and traces of a brick red pigment are to be seen. The shield was painted after the edging was sewn on, as the area covered by the binding had clearly never had gesso or pigment on its surface.

See no. 1 for parallels.

5. Oval plank shield (shield V; plate 2.4.AC).
Provenance embankment at L7-W5
Yale no. unknown
Dura no. unknown
Dimensions;
Height....1.15m*
Width....0.95m*
Thickness 4-9mm

*Restored figures from site card

This oval shield of poplar planks was cursorily published with nos.1 to 4 in Rep. VII/VIII (327 and fig.84). It was not found in the Yale collection, despite the fact that it is entered in the Yale card catalogue. However, it is probably significant that the card contains neither a Yale accession number nor a photograph, but only a Dura site card. It cannot be identified with any of the available pieces as details such as season of discovery do not tally.

The shield was in pieces when found, and substantial portions of its lower half were missing. It had traces of pink paint adhering. The planks were 40mm to 100mm wide. Stitching holes survived around the edge.

See no. 1 for parallels.

6. Fragment of oval plank shield (Cumont fragment A; not illustrated).
Provenance Tower of the Archers (Tower 2)
Whereabouts unknown
Dimensions;
Surviving portion 520x320mm

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"Part (52x32cm) of an oval shield, made of small planks perfectly joined and well smoothed, 5 to 7mm thick, covered by a sort of parchment completely adhering to the wood; this close contact was obtained by the use of a very strong glue, with the interposition of vegetable fibres [sic] between leather and wood, and finally by the use of iron nails, which transfixed the defence and which were provided with metal roundels on each face, to hold it all together. The wood was in a perfect state of preservation...."

"The two faces are painted. One is basically dark green. One can distinguish the remains of a border, some traces of blue and three or four yellow spots, like the small ovals which we find on the other side; these here allow us to distinguish a little more of the detail. A border of scarlet, more than 20cm wide, and bounded on the inside by a narrow white band, and then another wider band of green, then a new white area after which all the rest seems to be dull green. Parallel to the white line there are near-circular motifs, with white or yellow outlines and rays, followed by a band covered with small lilac ovals, very close together each with a small white spot. All of this gives the impression of a garment of which the white line is the hem, the small ovals represent the gems and the circular ornaments the larger jewels. All the colours are remarkably strong and resistant to washing [!]".

Lack of any illustration is a serious handicap to understanding the object, and indeed the detailed description is virtually pointless without it. However, it is at least clear that the shield was of the standard plank construction, with the layers of fibre and glue and skin facing seen on a number of other fragments now at Yale. The iron nails with metal roundels are probably the attachments for an iron reinforcing bar.

See no. 1 for parallels.

7. Fragment of an oval plank shield (Cumont fragment C; not illustrated).
Provenance Tower of the Archers
Whereabouts unknown
Dimensions;
Surviving portion 1.02m x 0.32m
Published but not illustrated in Cumont, 1926 262, here translated;

"Shield...of oval form, with a parchment-like skin [facing] and a...rigid framework. The surviving fragment measures 1.02m by 32cm...the complete shield would have been about 1.1m to 1.2m on the longest axis by 80cm in width.

"The board is made of small planks 5 to 6mm thick, well smoothed and arranged edge to edge in perfect fashion. The glue is sprinkled with shredded fibre [?]; strong parchment was glued on one of the faces. It adhered only around the middle. The surrounding parts had shrivelled up.

"The base paint was green, and in the centre one sees a large area of pink, with some traces of brown, with traces of blue around the edge [?]. All the circumference of the shield was decorated with a red border, bounded towards the centre by two white lines.

"Various traces show that the reverse had also been covered with skin."

Again absence of photographs or drawings is a serious hindrance, but the reconstructed size is obviously very similar to the more complete examples found during the later Franco-American campaigns.
The plank construction, fibre, glue, skin covering and bright painting are all typical of Durene shields.

See no. 1 for parallels.

8. Fragments of an oval plank shield (Cumont fragment D; not illustrated).
Provenance Tower of the Archers.
Whereabouts unknown
Dimensions unknown

Published in Cumont 1926 263 but not illustrated.

“A dozen pieces seem to be the fragments of another oval shield, on which the painting was not applied to a skin [covering] but directly onto the wood...The little plank [sic] is covered in a thin layer of plaster, mixed with very fine vegetable fibres [sic], onto which the colours were applied. One sees pink overall, but one cannot distinguish any design. On the back, which is also painted, there only survives a single area, bright brick red in colour.

“The wood, which appears to be in good condition, is in some way damaged by age [?] and easily breaks. The paint adheres well, but is raised in scales.”

Clearly fragments of a plank shield with no skin facing, but with the usual fibre glue layer and gesso dressing seen on a number of the other shield boards.

See no. 1 for parallels.

9. Painted leather facing from an oval shield (the “Map Shield”; plate 2.4.AD).
Provenance Tower of the Archers.
Whereabouts unknown.
Dimensions;
Width .450mm+
Height 180mm+

Published by Cumont, 1925 and 1926 323 to 337 and plates CIX and CX. The two publications have almost identical wording.

One of the most famous objects found by Cumont at Dura, this painted shield facing bears part of an illustrated “itinerary” of cities and the distances between them. It has been claimed to record a route from the mouth of the Danube, across the Black Sea and through Anatolia, perhaps leading right through Syria to Dura. It is one of the most important discoveries in the field of ancient cartography to be made this century. This aspect has been fully treated by Cumont in the papers mentioned (but see below).

The only relevant information pertaining to the structure of the shield is as follows (from Cumont 1926 323).

“In 1923 we found another fragment of parchment covering for a wooden shield in [the Tower of the Archers]...”

“The portion we recovered measures 45cm wide by 18cm high...”

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There were apparently no traces of the structure of the shield board from which the skin had become detached, but the form of the shield is confirmed by the layout of the painting, which basically consists of a blue central area, painted to represent the sea and populated with ships, bounded by a curving white line about 5mm thick. It is assumed that this was parallel to the curve of the edge of the shield board. The outer band beyond the white line was red, and it was on this band that the “cities” and roads were painted. Each station was represented by a small stone building with a pitched roof. They were labelled in Greek, in white paint.

The red border was at least 100mm wide. Cumont estimated the diameter of the thin white circle to be about 650mm, but if the shield was indeed a standard oval then the small preserved portion is not sufficient to allow an accurate estimate. Assuming that Cumont’s estimate for its width is about right, its height will have been rather greater, say c750mm. Allowing for the 100mm red border around it, the shield board will have measured 950mm high by 850mm wide, plus or minus about 100mm, which puts it very close to the complete examples.

The “itinerary” painted on the border records placenames on a route from the Lower Danube, across the Black Sea and through Anatolia to Syria, perhaps ending at Dura. Cumont noted that the peculiar Greek spelling of some of the names implied transliteration from a Latin document, perhaps an official military itinerary, rather than simple copying from a Greek source (Cumont 1926 336). However, the idea that it records the march to Dura of its owner has recently been convincingly attacked by Rebuffat (1986).

See no. 1 for parallels of this type of shield.

10. Fragments of an oval plank shield (plate 2.4.AE).
Provenance unknown
Yale no. 1931.594 A-E
Dura no. unknown.
Dimensions;
Frag.A 870+ x 63 x 7-8mm
Frag.B 1035+ x 68-72 x 7mm
Frag.C 950 x 74 x 7-8mm
Frag.D/E [not measured]

Four thin planks of poplar, one in two joining fragments (D and E). None is complete but B and C can be restored to their original relationship on the basis of the patterns of insect tracks on their surface which can be matched up. All the timbers show distinct curvature, but it is not clear whether this represents an originally convex shield board or is due to post-depositional distortion. Timber B shows clear traces of tooling, including chatter marks from a plane or draw-knife and shallow facets from a sharp axe or adze (plate 2.4.AE, bottom). There are signs of layer of glue and shredded tendon (?) on both faces of the timbers. Timber D/E has fragments of a parchment-like material adhering to the glue layer, representing a skin facing which had originally covered both sides. It is pale pink, with traces of dark red paint on its surface. This timber also has part of the curved edge of the shield board surviving, confirming the original oval shape of the whole shield. Timber A has lost both ends. The original board was at least 1.035m long, which compares closely to nos.1-5.

See no. 1 for parallels.
11. Large fragment of an oval plank shield (plate 2.4.AF).
Provenance unknown
Yale no. 1982.28.91
Dura no. unknown
Dimensions:
Length 980mm+

One side of a shield of plank construction closely similar to nos. 1-5 in form and size.

Currently in a box in Yale stores, labelled "shield fragments, 1930-31 season". No further details.

Large portions of the outer edge survive, with edge binding stitching intact, although the material assumed to have been wrapped around the edges (probably skin) is now lost. The stitching holes were 15mm from the edge, 18-20mm apart. Two separate threads were used, running between each aperture on opposite faces of the plank.

The face was covered in gesso to provide a suitable unbroken surface for painting, some traces of which remain in the form of areas of pink pigment.

See no. 1 for parallels.

12. Fragments of an oval plank shield (plate 2.4.AG and AH).
Provenance unknown
Yale no. 1982.28.89 and 92 to 95
Dura no. unknown
Dimensions:
Frag. 89 950 x 150+ x 3-7mm
Frag. 94 390+ x 85mm+

A number of fragments of wood, all thought to be from a single shield, found in the same box as no. 11 labelled "shield fragments, 1930-31 season".

Fragment 1982.28.89 (plate 2.4.AG, top) is a particularly large plank representing one side of an oval shield similar in size and shape to nos. 1-5. Parts of the curved edges of the shield are to be seen at each end. The wood is split and the knots have fallen out. Both surfaces have a thick layer of glue and shredded tendon (?) laid with the fibres roughly at right angles to the grain. Both sides also have remains of a layer of thin skin or parchment, on one side stained pink with traces of dark red paint. The timber is somewhat charred. Along the edges stitching holes survive, 10mm from the edge and 18-20mm apart (plate 2.4.AH). Fragments of the twine are still in place. On what had been the transverse axis of the oval shield, 10mm in from the surviving inner edge of the timber, an iron nail is still in situ. It has a flat rectangular head, 7x10mm, and the shank projects 15mm out of the opposite side of the plank. It is bent over at 45 degrees at 10mm above the surface. This nail is interpreted as a fixing for a transverse iron reinforcement/grip bar.

Fragment 1982.28.92 (plate 2.4.AG, bottom) has no preserved edges, but does contain one side of the central grip aperture. It has the same fibrous glue and painted skin facing as fragment 89. This is again pink-stained on the outside, while the inside appears to have been painted some very dark colour, probably black. There is no sign of gesso, not surprising given the presence of a skin facing which renders it largely superfluous. The wood is slightly charred. A small fragment of wood found with it is probably part of the integral wooden grip. It too is charred.
Fragment 1982.28.93 (plate 2.4.AG, bottom) has the same facing treatment on both sides. It consists of two timbers, one of which retains its full width, in this case 80mm. The fragment comprises one side of a shield board. Part of the edge survives, enough to show that the shield was similar in size and shape to nos.1-5. Stitching holes survive around the rim, roughly 15mm from the edge and about 20mm apart.

Two other fragments found in the same box and now numbered 1982.28.94 and 95 (not illustrated) are fairly certainly from the same shield, as they have the same characteristics of surface covering etc. The skin on one side of fragment 94 is painted black.

See no. 1 for parallels.

13. Fragments of an oval plank shield (plate 2.4.AI top).
Provenance unknown
Yale no. 1982.28.86a-c
Dura no. unknown

Three fragments of one side of an oval plank shield similar in size and shape to nos.1-5. Two (a and b) represent a single plank, split along the grain. It was at least 105mm wide and up to 6mm thick, thinning to 5mm towards the edge of the shield. The surface was roughly finished. There are no traces of edge stitching. The other timber (c) has the long sweeping curve of the side of the shield, again lacking stitching holes. It retains an iron nail 25mm from the edge which is interpreted as a fixing point for an iron reinforcing bar/grip running across the short axis of the shield. There is no sign of any layer of fibre and glue on either face of the wood, but traces of gesso are visible. A layer of fine cloth seems to have been pressed into this, and pinkish paint applied over it. Alternatively, the fabric may have been glued on and then gessoed, with some of the plaster-like material working its way through the fibres to adhere to the wood.

See no. 1 for parallels.

14. Fragment of an oval plank shield (plates 2.4.AI bottom and AJ).
Provenance unknown
Yale no. 1982.28.87
Dura no. unknown
Dimensions:
375+ x 80 x 3-5mm

Part of an 80mm wide plank from an oval shield, charred at the broken end. The intact end retains the edge curvature typical of shields of the size and shape of nos.1-5, and possesses vacant stitching holes, only 4mm from the edge and 12mm apart. The corner of the plank has been neatly sawn off at some stage, probably in modern times for a wood sample although no record of this was found (plate 2.4.AJ, top). There is no sign of a fibrous glue layer or skin covering, but traces of gesso are clearly visible. Fragments of fine cloth also adhere to the surface, and as on no.13 appear to be part of the original structure of the shield (plate 2.4.AJ, bottom). These are overlain by more gesso and then paint. The colours appear to be red near the rim and black towards the middle of the shield, but this could be due to fire blackening.

See no. 1 for parallels.
15. Semicylindrical plywood shield (scutum; plates 2.4.AK to AM).

Provenance Tower 19
Yale no. 1933.715
Dura no. "F1041-1042 probably"
Dimensions;
Height.................1.06m
Width around curve...0.86m
Chord.................0.66m
Thickness............5-6mm

This is one of the most famous finds from Dura, published in some detail in Rep. VI 456-466, frontispiece and plates XXV, and XXVI. There is nothing to add to the detailed description of the painted decoration to be found in the report, but there are a number of amendments to be made to the description of the structure of the shield, as a result of inspection of the original at Yale, as well as the Dura site records and unpublished photographs of the shield as found.

The shield was in thirteen pieces when found, and it is evident from the current appearance of the board that the heavy repair work required by the many breaks was carried out with the primary objective of restoring the painted decoration, and that the actual structure of the board was partially sacrificed to that end. The result was fairly drastic. For example there is now no trace of the system of wooden reinforcing strips on the back of the board mentioned in the Report and sketched on the Dura record cards (plate 2.4.AM; Rep. VI 457. See shield board 17, plate 2.4.AN, bottom). The whole of the rear face of the board is covered in modern conservation materials. The hand grip may not be original. It is now held in place by modern nails.

Crucially, the current appearance of the board does not reflect the original curvature of the shield, which both site records and photographs agree was much more gentle than that seen today. The 660mm chord width recorded on site has been reduced to 480mm at the bottom and only 400mm at the top, a severe distortion.

The dimensions of the board are not quite as given in the report. It is not a perfect rectangle, being 1.02m high on the (bearer's) right side, 1.01m on the right, and 1.06m down the centre.

It was made of thin strips of plane wood (Platanus orientalis, Rep. VI 456 fn.59) between 30mm and 80mm wide and 1.5mm to 2mm thick. These were glued together in three layers forming a plywood board. The strips in the core layer were arranged vertically, those in the inner and outer facing layers running horizontally across the shield. The central aperture, c.120mm in diameter, must have been cut after the board was assembled.

Although no trace of the system of "reinforcing strips" has survived restoration, a detailed sketch of their positions exists in the Dura archive (plate 2.4.AM). They were very light, being only about 20x2.5-3mm in section.

The central grip simply consisted of the thickening of the central portion of one of the reinforcing strips at the point where it crossed the central aperture. This thickening apparently projected towards the bearer, rather than towards the boss as seems to be the case on most of the other shields from Dura. The heavy rawhide lashings which are recorded as reinforcing the grip on each side are now missing (Rep. VI 457).

There is some confusion and error in the publication with regard to the method of facing the board. According to the published account, both faces were covered with red-dyed skin or parchment (Rep. VI 457). The site record cards state that this also covered the grip. Then a layer of fine fabric was glued over the front face, onto which the paint was applied. My own inspection disagrees with this. The
paint is quite clearly applied directly to the skin, and there is hardly any sign of a layer of fabric, except at one point where a few square centimetres are visible. However, due to the restoration work carried out since discovery the relationship of this to the skin is obscure. A careful reading of the site cards makes it clear that when the fragments of the board were found, the fabric was seen to be under the skin, not over it. The explanation may be that the published account was made from the site cards without reference to the object itself, which allowed this critical error to creep in as the result of a misreading. The wording of the card is hard to read, but is as follows; “Fine linen cloth stretched across. Red dyed parchment front covering first ...[illegible word] underpainted red. Then three broad color areas painted across that...”. It would appear that the word “first” was interpreted to refer to the order in which skin and cloth were applied, while the context makes it clear that it actually refers to the red undercoat paint.

There is also confusion about the covering of the back of the board. This was also supposed to have been covered in red-dyed skin which overlay the reinforcing strips as well (record cards and Rep. VI 457). Puzzlingly there is a typed report in the Dura archive by du Mesnil, entitled “Note sur la face interne du scutum de la tour 19” which records that the parchment was in tatters when found and describes its colour as off-white to buff or yellow. There is no mention of red dye. A sample was analysed at the Museum d’Histoire Naturelle in Paris, where Prof. M.E.Bourdelle identified it as sheepskin. It is hard to explain the apparent contradiction. I can only suggest that the skin was indeed basically whitish, but that this had become slightly stained on the surface to a pale pink as a result of an overlying coat of red paint such as that seen on the front. Such staining is seen on some of the other skin-faced shields.

None of the rivet holes for the boss survive today, though one, with part of an iron rivet still in situ, is mentioned in the publication (Rep. VI 457) and is visible in a photograph (archive photo Y155). Four rivet holes are drawn in on the site card sketch of the rear of the board.

Unpublished photographs of the shield as found include Y154 and Y155 in the Yale records.

No other examples of the classic semi-cylindrical scutum are yet known outside Dura, but earlier versions of different form do seem to be represented. The Fayum shield (Kimmig 1940) is probably a late Republican long scutum, with a spine and somewhat rounded ends. Two first century AD shield covers from Vindonissa, identified by Gansser-Burckhardt as being from scuta, also have rounded ends (1942 74-9 nos. LV and LVIII, Abb. 49-53).

16. Leather facing and wood from a scutum (Cumont fragment B; not illustrated).

Provenance Tower of the Archers (Tower 2)
Whereabouts unknown
Dimensions 930mm x 620mm*

Published by Cumont, 1926 262, but not illustrated;
“Rectangular skin [facing] (93x62cm), the...edges of which are shrivelled up towards the centre which remains glued to small juxtaposed strips [plaquettes] of wood. The leather is thick, softer and less like parchment than fragment A [here shield 6]; the wood is only 2-3mm thick and is not perfectly smoothed. The presence of glue on both faces indicates that there had been two layers of strips arranged perpendicularly, one on top of the other. The adherence of the leather was obtained by a colloidal coating which was mixed with ligneous fibres.

“The painting was very badly deteriorated, one only sees a vague staining...of yellow and green. Only the oval hole (13x10cm), pierced through the leather and wood, is edged in dark red.”
This quite clearly describes the remains of another *scutum* of plywood. It is essentially similar in structure to no.15, but may have been considerably thicker, as one layer of strips was 2-3mm thick, compared with no.15's 1.5-2mm.

* These dimensions are not likely to represent the original size of the board, as the facing has shrivelled up. The complete shield was presumably somewhat larger.

See no.15 for parallels.

17. Fragments of a plywood *scutum* (plate 2.4.AN).
Provenance unknown
Yale no. 1982.28.90
Dura no. unknown
Dimensions of the intact corner;
Height...485mm+
Width....240mm+
Thickness 7mm

In the box of fragments from the 1930-31 season with nos. 11 and 12 was one complete corner and several loose strips from another *scutum*, hitherto unpublished.

The corner, which still retains the curvature which shows it to be part of a semicylindrical *scutum*, is either the top right or the bottom left corner of the board (as seen by the bearer). It is made of three layers of wood, the outer two arranged horizontally, the core layer vertically. The whole totals 7mm in thickness. The strips of the inner face layer are 80-90mm wide and only 2mm thick. One of the two surviving strips in the core layer is 60mm wide, the other 90mm. They are 3mm thick. The strips of the outer facing layer are, from the corner inwards, 110, 100, 150, and 90mm wide, and 2mm or even 1mm thick. Consequently, the sum of the thicknesses of the two facing layers is roughly equal to that of the core layer. The edges of the composite board are carefully chamfered on both sides. Traces of a layer of fibre in glue are to be seen on both surfaces. The fibre is roughly laid at right angles to the underlying strips. It is overlain by gesso and paint. There was no skin facing.

On the back are the remains of a system of "reinforcing strips" of wood, like those on no.15. These are quite crude, and very light, only 10-20mm wide and 2-3mm thick, 60mm in from the edges. They seem to overlie the fibre and glue, and perhaps the gesso, but underlie the paint. However, the gesso may well have seeped under them, as it seeped into the structure of the ply. These strips are held in place by small wooden pegs or dowels, 3mm thick, every 90mm. These pass through the ply. Their function is unclear. They are too flimsy to act as reinforcements, and their attachment is not firm enough for them to prevent the ply springing apart, a job served much better by the edge stitching.

The paint seems to have been applied direct to the gesso on both sides. The design is obliterated, but the base colour appears to have been dark red, while towards the centre of the board are traces of a darker area (black?) defined by a straight white line, perhaps indicating a wide decorative border to the rectangular boss, as seen on the complete *scutum* board (shield 15).

The loose strips add little to the picture, except to show that the exposed faces of the outer layers were carefully smoothed, while the inner sides were left rough, as one might expect, to aid adhesion between the glued layers. The strips vary between 50 and 150mm wide, and 1.5-3mm thick. Some surfaces bear chatter marks or saw scars.

See no.15 for parallels.
18. Fragment of a plywood shield (not illustrated).
Provenance “L7-by Tower 19”
Whereabouts unknown
Dura no. F561
Dimensions unknown*

Known only from a site card preserved at Yale and a photograph (G766), this fragment of a shield of plywood construction broadly similar to nos.15-17 may represent a fourth scutum board, but no edges were preserved to determine its shape. The description on the card states; “Fragment of laminated wood buckler. 3 ply in frag. Fragg. of painted leather covering adhering to surface - seems all dark red.”

* From the scale on the photograph the fragment seems to be about 120mm square.

Provenance embankment in N8-W1
Whereabouts unknown
Dura no. unknown
Dimensions unknown.

A brief mention of this shield appears with the description of the painted oval shields (Rep. VII/VIII, 328 fn.1);

“A large fragment of a sixth shield was found in the embankment in N8-W1. It differed from the others in being made of the same sort of plywood as the Roman scutum [shield 15] and was apparently covered with cloth or parchment. About one fourth of its oval surface was preserved with holes along the rim for lacing on a leather edging. The surface gave evidence of an overall undercoat of deep pink with traces of figured decoration too fragmentary to be satisfactorily restored. Parts of a heavy leaf border and what seems to be a male figure have been recognised.”

The object was not illustrated, but in the Yale catalogue is a card which contains a drawing of the shield by Pearson (plate 2.4.AO). It also mentions a “MS description by Pearson” which was not found. The card lacks a photograph of the object, and there is no record of a Yale accession number, so it seems unlikely that it reached America.

The details we have are very meagre. It is not even known how large the shield was. However, the drawing does allow some general comments to be made. Particularly noteworthy is the orientation of the figure, which shows that the long axis of the oval shield was horizontal, contrasting with nos.1-5. There was also no central aperture for the grip. The black spots on the drawing probably represent an arrangement of holes like those seen on no.20, most probably for the attachment of a single grip behind the board, although some other arrangement, such as a forearm strap cannot be entirely ruled out.

Its ply construction, leather facing and edge stitching show that it is related to the other Roman shields from Dura, and this is confirmed by the painting. This has much in common with the other painted shields. A broad band of concentric rings of laurel leaves etc, surrounds the central space but leaves a wide outer border, which may have had other decoration lost by the time of discovery. In place of a boss the central space encloses a single male figure, perhaps a deity, moving right with an oval shield in his left hand and his right arm raised probably holding a spear or sword now lost. The face is shown in strict frontality, and is surrounded by thick curly hair. The obvious parallel is the warrior god shield...
(shield 3). It is noteworthy that the figure is closer to the local artistic tradition than the more classical presentations of shields 1 and 2.

20. Bossless oval shield board or covering (plate 2.4.AO bottom).
Provenance unknown
Whereabouts unknown
Dura no. unknown
Dimensions unknown

This object is known only from a drawing found in the Yale records by Mr. M. Lindsay. It is a detailed sketch of another shield of the same type as no. 19, but apparently complete. There are no markings or captions to suggest where it was found, what it was made of or any other data.

It was an oval, with its long axis horizontal, and lacked a central aperture. There were stitching holes around the edge. It is not known if this was just a loose leather facing, or whether it was still fixed to its board. The drawing suggests that there were four holes around the centre, corresponding with those seen near the middle of no. 19. These were probably to hold a single horizontal grip behind the board.

The decoration was broadly similar to no. 19, with the broad band of foliage around the centre seen on shields 1, 2 and 15, with a single figure in the central space. This is a victory, flying to the right, clutching a victor’s crown in her left hand. Similar victories appear on the scutum (no. 15). The only decoration outside the broad leafy border seems to be a narrow line of paint close to and parallel with the edge. There are no details of the colouration.

21. Wood and rawhide shield (plate 2.4.AP left).
Provenance Palmyrene Gate.
Yale no. 1929.417
Dura no. unknown
Dimensions;
Length 1.55m+
Width 0.78m

Published in Rep. I 16 and fig. 4, and Rep. II 74 and plate XXVI, where it is fully described.

This, and the similar shields 22-24, consists of vertical wooden sticks woven through patterns of slits in a large sheet of rawhide which, on drying, contracted and held them tightly in place. Where complete enough to see these shields are square at one end and pointed at the other, but it is not known which end was the top. Arbitrarily, the point is deemed to be the bottom.

Only about half the shield is preserved. It is basically rectangular, but the destroyed end was almost certainly pointed like nos. 22 and 23, as the few rods which are preserved to their full length are cut obliquely. The shield would therefore have been as tall as a man, and although undoubtedly light was cumbersome.

The wooden sticks were up to 15mm thick, and were woven through slits cut in a carefully thought out pattern in a single sheet of rawhide. The skin was turned over the tips of the sticks at the straight end, and held by a thong laced between the rods. This was not to prevent the rods sliding out of the rawhide (something they could not do once the skin had dried out and contracted around them) but was partly to protect the ends of the sticks from damage and mainly to hold at least one transverse stick across
the top of the shield. This made the defence rigid, and stopped it curling up as no.22 has done. The sides were secured in a similar way, the skin being wrapped over the end stick and sewn through.

The pattern of holes in the rawhide was such that once the sticks were woven in, a surface pattern of alternate bands of skin and wood resulted. In this case, a series of wide and flaring "W"s runs down the front and back faces. Fifty-four whole or fragmentary rods survive, and this is probably close to the original number.

A "grip" was found with the shield, but was not attached. It is a piece of wood, slightly rounded, 400mm long and 30mm thick, with grooves at either end to accommodate knotted cords, presumably for fixing it to the shield. These survive in situ. It is not known where the grip was fixed to the defence.

It has been suggested that this was a protection against arrows, and was not strong enough for hand-to-hand fighting (Rep. II 75).

There are structural parallels from the Altai, where small shields made in the same manner have been recovered from tombs of the fifth century BC (British Museum 1978 47 no.30; Rudenko 1953 plate LXXXVII; Rudenko 1960 Plate LXI).

22. Wood and rawhide shield (plates 2.4.AP right).
Provenance "near Tower 19"*
Yale no. 1933.470
Dura no. F1040
Dimensions;
Overall length..........1.02m
Length of straight edges 0.76m
Width.................0.51m+

* From a site card preserved at Yale.

Not formally published, but it appears in a photograph in Hopkins (1979 191) where it is apparently confused with no.21. The structure is essentially identical to no.21. It is made from 51 vertical rods, and originally had two horizontal ones across the top to keep it flat. These were both broken in antiquity and so the shield has curled up. The sticks had been roughly stripped of bark, and are lightly faceted from the knife that whittled them to shape. The resulting surface pattern in the rawhide consists of a series of inverted chevrons. The edges were secured in much the same manner as no.21. At the top, a 50mm flap of skin was folded over to hold the stiffening rods and was secured by 3mm thick twine sewn through between the vertical rods. The same technique was used along the diagonal edges.

On the left side, around the 7th, 8th and 9th canes from the edge, about half way up is tied a loop of twine, probably an attachment for a grip.

See no.21 for parallels.

23. Wood and rawhide shield (plate 2.4.AQ top).
Provenance L7-8W
In Damascus
Dura no. unknown
Dimensions:
Overall length 1.01m
Width ..........0.48m

Recorded in the Yale catalogue as being in Damascus. However, the description on the original site card was available, along with a photograph (Damascus photograph N122). It was found in 1932-3, i.e. the sixth season. Most of the sticks were missing from this example when found, as a result of insect action. Almost identical in size and construction to no.22, it consisted of 42 rods making a chevron pattern in the single sheet of rawhide. It had the same pair of transverse stiffening rods across the top, which were secured in the same way as no.22, as were the lower edges. The edge rods were extra-thick, 10mm instead of the 5-9mm of the others. The sides of the skin were folded over and retain rows of holes which the excavators thought were for a system of thongs or cords criss-crossing the shield. Similar lace-holes are to be seen on the upper and lower edges, in addition to the twine sewing.

The site-card, preserved at Yale, identifies the hide as sheep, but this must be treated with caution.

There is no trace of the handle.

See no.21 for parallels.

24. Fragments of a wood and rawhide shield (plate 2.4.AQ bottom).
Provenance unknown
Yale no. 1931.595 a-f
Dura no. unknown

A number of loose fragments of rawhide from a shield of the same construction as nos.21-3. The wood has probably been eaten away by insect action, as on no.23.

See no.21 for parallels.
CATALOGUE PART 2.5 SHAFTED WEAPONS
(Plates 2.5.A and B)

1. Broken iron spearhead (plate 2.5.A)
   Provenance unknown
   Yale number 1982.28.58
   Dura number unknown
   Length 113mm+
   A spearhead of diamond section, with poorly defined shoulders and slightly converging edges. It is heavily corroded. The socket appears to be closed, and has a maximum internal diameter of c.18mm. No fixing nail is identifiable in the profuse corrosion products.

   The blade is too fragmentary to identify the exact form, but it is closely similar to a first century example from Hod Hill (Scott 1980 333 and fig.24.1.3).

2. Spearhead socket (plate 2.5.A)
   Provenance unknown
   Yale number 1982.28.50
   Dura number unknown
   Length 82mm+
   A broken socket, with a maximum internal diameter of 23mm. It is probably from a spearhead, but could be from a ferrule like no.5. The metal is overlapped, but not forged together, and so is a split socket. The hole for the fixing rivet is vacant.

3. Spear/javelinhead socket (plate 2.5.A)
   Provenance unknown
   Yale number 1982.28.60
   Dura number unknown
   Length 52mm+
   An open-sided socket, maximum internal diameter 14mm, which may never have been closed round a shaft, or conversely may have been forced open. In either case, it is possible that the apparent socket diameter is misleadingly large. Probably from a javelinhead, although the possibility that it was from a ferrule/groundspike like no.6 cannot be dismissed.

4. Spear/javelinhead socket (plate 2.5.A)
   Provenance unknown
   Yale no. 1982.28.51
   Dura number unknown
   Length 77mm+
   A socket of c.13mm maximum internal diameter. Although now extremely corroded and heavily fissured, this object appears to have been a fully closed socket. The fixing nail was not identified. Part of the grain of the wooden shaft is preserved by the corrosion products inside. The small diameter
suggests a javelin.

5. Ferrule/groundspike for spear or standard? (plate 2.5.A and B)
Provenance J8 Ramp
Yale number unknown
Dura number 1217
Length 249mm
The socket accommodated a relatively broad shaft of up to 26mm diameter. The object terminates in an elongated spike of square section. At the base of this is fixed a projection, perhaps not complete, which runs out at right-angles to the shaft.

The best interpretation of this is a ground-spike, probably for a large spear or standard, with a step for pushing it into, and pulling it from, the earth.

There is a fairly close parallel to this curious piece from the Saalburg (Jacobi 1897 Fig.77 Nr.1). Other parallels, albeit lacking the side projection, are to be found at Corbridge (Scott 1980 fig 24.4.1), and Straubing (Walke 1965 152 Taf 107 nr.14).

Given its provenance, an alternative interpretation is that it is a special siege weapon, like a boathook, for pushing away siege ladders etc.

6. Ferrule/groundspike for a spear (plate 2.5.A)
Provenance unknown
Yale number 1932.1720
Dura number unknown
Length 188mm
Currently at the Higgins. A scaled-down version of no.5, socket internal diameter 17mm, and without the lateral projection. The socket is open down one side and the nail hole torn through.

See no.5 for parallels.

7. Probable groundspike from a spear (plate 2.5.A)
Provenance unknown
Yale number "1929.39[?]"
Dura number unknown
Length 190mm+
Currently at the Higgins where it bears the number Q29. From its shape it may be a spike snapped from a ferrule such as nos. 5 and 6. See no.5 for parallels.

8. Possible shaft of spear (not illust.)
Provenance J8-W
Whereabouts unknown
Dura number unknown
Length 795mm+
Width 34mm tapering to 27mm
Recorded only on a site card in the Yale archives, this object was described as follows:

"Frag. round wooden shaft, painted red. Light, close-grained wood. Where paint has disappeared covered with what seems to be a pale blue [?] gray size. Part of lance or javelin-shaft?"

This object was not located at Yale or the Higgins.
CATALOGUE PART 2.6. BOWS, ARROWS AND ARCHERY TACKLE (Plates 2.6.A to M).

BOWS AND ARCHERY TACKLE (plates 2.6.H, I and L)

1. Bone bow-lath (Plates 2.6.H and I)
Provenance unknown
Yale no. 1938.717
Dura no. unknown.
L=94mm+

A damaged bone tip lath or nock plate from a composite reflex bow. Probably only a third or less of its original length is preserved.

It has a smooth outer face with a very rough, flat inner side to give good purchase to the glue holding it to the wooden core of the bow. There would have been two such laths at each end of the bow. These terminal reinforcements are common finds throughout the Roman empire and into Asia. The closest known parallel to the Dura examples in space as well as time is the Yrzi bow, a Parthian bow found near Dura (plates 2.6.A to C; Brown 1937). Considerable numbers of bow laths are known from Roman military sites as far from Dura as Bar Hill in Scotland (Robertson et al. 1975 fig.18), South Shields (Allason and Miket 1984 nos. 2.16 and 2.18), Valkenburg on the lower Rhine (Glasbergen and Groenmann van Waateringe 1974 plate 15 no.2), and Intercisa, Carnuntum and Vindobona on the Danube (Salonen and Barkoczi 1982 171 and Abb.16; for Carnuntum see RLO II Taf.XXIV; III Taf.VIII nos.12 and 13; XXXI Taf XVI nos.16 and 17). For general accounts of such compound bows, see Rausing 1967 and Payne-Gallway 1907, and now especially Coulston 1985 which concentrates on the Roman evidence and catalogues other known laths (224-234).

2. Bone bow-lath (Plates 2.6.H and I)
Provenance unknown
Yale no. 1938.716
Dura no. unknown.
L=86mm+

Similar to no.1. Incomplete.
3. Bone bow-lath (Plates 2.6.H and I)
Provenance "K2 - main street"
Yale no. 1938.715
Dura no. K568
L=81mm+

Incomplete. Probably a broken tip lath, but possibly from the grip. Note both faces are roughened, to ensure good bonding to the bowstave and to the glued tendon binding which completely covered the composite structure of the weapon.

4. Bone bow-lath (Plates 2.6. H and I)
Provenance unknown
Yale no.1938.713
Dura no. unknown
L=78mm+

Incomplete.

5. Broken archer's thumb-ring of bone (Plates 2.6.I and L)
Provenance unknown
Yale no. 1929.475A
Dura no. unknown
L=39mm+, W=31.5mm, W of aperture=c24mm, H=11mm.

Described, but not illustrated in Rep.II 73, and now published in James 1987. It is described as "certainly Parthian", but no reason is given for this statement. Lack of details about its exact provenance leaves room for doubt over whether it is a genuine relic from the time of the siege or before, or whether it is an intrusive find of medieval or later date. However, the design of the recovered arrows makes it almost certain that the defenders, and probably the attackers were using thumbrings for shooting during the siege (part 2.6.2). The ring-and-dot motif is particularly at home on bonework of the classical period, but this is far from conclusive. Its extremely good state of preservation, lacking any signs of weathering, is heavily against it being a casual surface find. On balance, it is likely that the object does date to the time of the siege, but it cannot be said to which side it belonged, the defenders or the Persians who overran the city. Thumbrings were well established in China by the Han period (Pope-Hennessy 1923 74-6 and Plate 50; Rawson and Ayers 1975 63 no.171). At what date they came into western Asia, and when they reached the classical world, are disputed questions. For shooting with a thumbring (the "mongolian release") see Morse 1885 and von Luschan 1891.
ARROWS (Plates 2.6.D to K)

Bronze arrowheads (plates 2.6.D and F).

1. Leaf-shaped tanged bronze arrowhead (Plate 2.6.D)
   Provenance unknown
   Yale no. 1938.2543
   Dura no. unknown
   L=60mm

   An early Bronze Age type. Salonen 1965 Taf.XXXV

2. Leaf-shaped tanged bronze arrowhead (Plates 2.6. D and F)
   Provenance unknown
   Yale no. 1938.2538
   Dura no. unknown
   L=29mm+

   Probably Bronze Age

3. Flat two-bladed tanged bronze arrowhead (Plates 2.6.D and F)
   Provenance unknown
   Yale no. 1938.2540
   Dura no. unknown
   L=39mm+

   Flat on one side, slightly ridged on the other. Probably Bronze Age.

4. Flat two-bladed tanged bronze arrowhead (Plates 2.6.D and F)
   Provenance unknown
   Yale no. 1938.2541
   Dura no. unknown
   L=56mm+

   Probably Bronze Age

5. Triangular two-bladed tanged bronze arrowhead (Plate 2.6.D)
   Provenance K7-W5
   Yale no. 1938.2532
   Dura no. G1378
   L=71mm
6. Leaf-shaped two-bladed tanged bronze arrowhead (Plate 2.6.D)
Provenance B3 court
Yale no. 1938.2554
Dura no. G1468
L=98mm

This object was not located at Yale. The drawing is from a photograph on a record card in the Yale catalogue. It is clearly related to no.5.

7. Three-bladed tanged bronze arrowhead (Plates 2.6.D and F)
Provenance unknown
Yale no. 1938.2542
Dura no. unknown
L=36mm+

8. Three-bladed socketed bronze arrowhead (Plates 2.6.D and F)
Provenance N8 W10 (?*)
Yale no. 1938.2534
*Thought to be Dura no. H334
L=32mm

The socket projects well beyond the end of the blades. Such socketed three-blade heads were universal in the middle east by the seventh century BC (Snodgrass 1964 151 and fig.10, type 3B1 and refs). There is a similar head from Ai Khanoum (Bernard 1973 195 and fig 41, no.29).

9. Three-bladed socketed bronze arrowhead (Plates 2.6.D and F)
Provenance G1-5
Yale no. 1932.1519
Dura no. E93
L=32mm

See no.8 for parallels

10. Three-bladed socketed bronze arrowhead (Plates 2.6.D and F)
Provenance "E7-outside W wall"
Yale no. 1932.1520
Dura no. E575
L=35mm

Similar to nos. 8 and 9, except that the blades are larger and extend further down the sides of the socket. See no.8 for parallels.

11. Three bladed socketed bronze arrowhead (Plates 2.6.D and F)
Provenance D7
12. Three-bladed socketed bronze arrowhead (Plates 2.6.D and F)
Provenance Citadel I, 8-9
Yale no. 1933.687b
Dura no. F1861
L=41mm

Similar to no.10, but with rounded shoulders.

13. Three-bladed socketed bronze arrowhead (Plate 2.6.D)
Provenance unknown
Yale no. 1938.2548
Dura no. unknown
L=22mm

The short socket only protrudes slightly beyond the ends of the round-shouldered blades. The apparently triangular section is probably largely due to heavy corrosion.

14. Three-bladed socketed bronze arrowhead (Plates 2.6.D and F)
Provenance unknown
Yale no. 1938.2537
Dura no. unknown
L=32mm

Short socket similar to no.13 but sharply defined shoulders similar to nos. 11 and 12.

15. Three-bladed socketed bronze arrowhead (Plates 2.6.D and F)
Provenance unknown
Yale no. 1938.2533
Dura no. unknown
L=41mm

The socket projects only slightly, as in nos.13 and 14, but the blades have regularly curved edges, the head reaching its greatest width at the mid-point rather than to the rear.

16. Three-bladed socketed bronze arrowhead (Plates 2.6.D and F)
Provenance M8-W6
Yale no. 1933.687a
Dura no. F1879
L=39mm

Similar to no.15 except that the blades run right to the edge of the socket.

17. Three-bladed socketed bronze arrowhead (Plates 2.6.D and F)
Provenance unknown
Yale no. 1936.2536
Dura no. unknown
L=38mm

Similar to no.16 except that the blades are more triangular than curved. This type was used by the Achemenid Persians by 500BC (Erdmann 1976 9 and Taf.1), and became the commonest type in Greece in the fifth century BC (Snodgrass 1964 153 and fig.10, type 3B3; at Olynthus, Robinson 1941 plate CXV no.2089 etc). An example of presumably Hellenistic date was found at Ai Khanoum (Bernard 1973 197 and fig.14, nos.31 and 32).

18. Three-bladed socketed bronze arrowhead (Plates 2.6.D and F)
Provenance unknown
Yale no. 1938.2535
Dura no. unknown
L=36mm

Similar to no.17. The blades terminate in different positions, and are relatively broad. See no. 17 for parallels.

19. Three-bladed socketed bronze arrowhead (Plate 2.6.D)
Provenance unknown
Yale no. 1938.2545
Dura no. unknown
L=32mm+

See no.17 for parallels

20. Three-bladed socketed bronze arrowhead (Plate 2.6.D)
Provenance L8-W101*
Yale no. 1938.2547
Dura no. D30*
L=19mm+

* Details drawn from a site record card preserved at Yale which almost certainly refers to this object. See no.17 for parallels.
21. Three-bladed barbed and socketed bronze arrowhead (Plate 2.6.D)
Provenance unknown
Yale no. 1929.618
Dura no. unknown
L=37mm

This head is of plain triangular section near the tip, while towards the rear the blades are defined from the socket by a groove and terminate in well defined barbs projecting to the rear of the socket rim. Similar to three examples in the Melgunov treasure, dating to the early sixth century BC (Barnett 1962 85 and plate VI).

22. Three-bladed barbed and socketed bronze arrowhead (Plate 2.6.D)
Provenance unknown
Yale no. 1929.619
Dura no. unknown
L=24mm

Similar to no.21 but shorter and with less well defined barbs which are cut off square with the socket rim. See no.21 for parallels.

Iron arrowheads (plates 2.6.E and F)

1. Triangular two-bladed collared and tanged iron arrowhead (Plate 2.6.E)
Provenance Tower 19 or “C3” (?)
Yale no. unknown**
Dura no. F2137*
L=60mm

* The site record card preserved at Yale has “C3” added in pencil, so the provenance of this object is uncertain. However, it appears in a photograph purporting to show objects found in tower 19 (Rep. VI plate XXIV bottom row extreme right).

** This object is currently at the Higgins Armory Museum, part of Higgins no.2165.

No good parallels are known to the writer. Fairly close is one published by Pope, and said to be from Syria (1962 79 and plate 14 no.8). It is similar to modern Turkish arrowheads (E.McEwan, pers.comm.). Given the doubt over its provenance, it could be a surface find of medieval or later date.

2. Leaf-shaped tanged iron arrowhead (Plate 2.6.E)
Provenance Tower 19 or “M8-W6”**
Yale no. 1933.691
Dura no. F1533*
L=67mm+

The tang appears to be broken.

* This object appears in a photograph labelled "finds from tower 19" (Rep. VI plate XXIV bottom row extreme left), but the site record card preserved at Yale from which these details are taken gives the provenance as "M8-W6".

No good parallels are known to the writer. The nearest is also apparently from Syria, published by Pope (1962 79 and plate 14, no.7).

3. Three-bladed tanged iron arrowhead (Plates 2.6.E and F)
Provenance unknown
Yale no. 1982.28.73
Dura no. unknown
L=40mm+

The tang is lost, the blades apparently unbarbed. This is the most common type of arrowhead found on Roman military sites. For general discussions, see Erdmann 1976, and Davies 1977. Parallels from Britain; Newstead (Curle 1911 189 and plate XXXVIII), Bar Hill (MacDonald and Park 1906 115-6 and fig.42), and many others (list in Davies 1977). From Palestine; Gamla (dated to AD67, Gutman 1981 34), Masada (cAD70, Yadin 1965 16 and plate 23B; 1966 57), Nahal Selcem (second century AD, Aharoni 1961 20 and plate 9C), Wadi Muraba’at (second century AD, Avigad 1962 178 plate 18C and fig.7,5), and elsewhere in the Judaean desert (Yadin 1963 91 nos.38-40). The type was also in use in the territory of the Hellenistic, Parthian and Sassanian empires, and as far East as Afghanistan (Ai Khanoum; Bernard 1973 196 inv.028 and fig.41), and Taxila (Marshall 1951 plates 165 no.18, and 206 nos.41 and 42).

4. Three-bladed tanged iron arrowhead (Plates 2.6.E and F)
Provenance unknown
Yale no. 1930.619c
Dura no. unknown
L=39mm+

Similar to no.3. The tip and tang are damaged.

5. Three-bladed tanged iron arrowhead (Plate 2.6.E)
Provenance unknown
Yale no. 1934.443f
Dura no. unknown
L=41mm+

Similar to no.3. The tang is broken.
6. Three-bladed tanged iron arrowhead (Plates 2.6.E and F)
Provenance E8-23
Yale no. 1982.28.68
Dura no. H113
L=71mm

Similar to nos. 3-5, but larger and with blades positioned according to bilateral rather than radial symmetry. This is a deliberate feature of manufacture. See no. 7.

7. Three-bladed tanged iron arrowhead (Plates 2.6.E and F)
Provenance B3 court
Yale no. unknown*
Dura no. G1468A
L=64mm

* Known only from a site record card with scale drawing in the Yale archives. Similar to no. 6.

8. Three-bladed tanged iron arrowhead (Plate 2.6.E)
Provenance M8-W2
Yale no. 1982.28.65
Dura no. F512
L=62mm

Relatively long and slender.

9. Three-bladed tanged iron arrowhead (Plates 2.6.E and F)
Provenance E8-62
Yale no. 1982.28.63
Dura no. H311
L=77mm

A particularly large and broad arrowhead with moderately defined barbs. The section, apparently similar to nos. 6 and 7, is probably the result of post-depositional distortion.

10. Three-bladed tanged iron arrowhead (Plates 2.6.E and F)
Provenance unknown
Yale no. 1932.1722
Dura no. unknown
L=66mm

A smaller version of no. 9.
11. Three-bladed tanged iron arrowhead (Plates 2.6.E and F)
Provenance H1-15
Yale no. 1982.28.67
Dura no. H848
L=44mm

A smaller version of nos. 9 and 10.

12. Three-bladed tanged iron arrowhead (Plates 2.6.E and F)
Provenance unknown
Yale no. 1982.28.70
Dura no. unknown
L=41mm+

The tang is lost.

13. Three-bladed tanged iron arrowhead (Plates 2.6.E and F)
Provenance Necropolis tomb 24, loculus XIV (?*)
Yale no. 1982.28.78
Dura no. unknown
L=35mm+

* Probably to be identified with Rep. IX, part ii, 57 nos. 43-47 and plate XLVI, second from right. The tang is lost.

14. A pair of three-bladed tanged iron arrowheads (Plate 2.6.E)
Provenance Necropolis tomb 24 loculus XIV*
Yale no. 1982.28.69
Dura no. unknown
L=41mm+ and 42mm+

* These are to be identified with part of a group of arrowheads published in Rep. IX part ii 57 nos. 43-47 and plate XLVI, left. The two heads are fused together by corrosion. The tangs are snapped, and the blades split by oxidation processes. The stumps of the tangs both retain traces of wood grain from the shafts in their surface corrosion products.

15. Three-bladed tanged iron arrowhead (Plates 2.6.E and F)
Provenance Necropolis tomb 22 loculus XIV (?*)
Yale no. 1982.28.71
Dura no. unknown
L=42mm+

* Possibly to be identified with Rep. IX part ii 57 nos. 43-47 and plate XLVI, third from left. The tang is lost.
Provenance unknown
Yale no. 1934.4436
Dura no. unknown
L=53mm

The tang retains traces of wood grain from the shaft in its corrosion products.

17. Three-bladed tanged iron arrowhead (Plates 2.6.E and F)
Provenance unknown
Yale no. 1982.28.77
Dura no. unknown
L=38mm+

The tang is lost.

18. Three-bladed tanged iron arrowhead (Plate 2.6.E)
Provenance unknown
Yale no. 1934.443c
Dura no. unknown
L=53mm

Like nos.9-17, but the barbs are better defined.

19. Three-bladed tanged iron arrowhead (Plate 2.6.E)
Provenance unknown
Yale no. 1982.28.32
Dura no. unknown
L=86mm

An exceptionally long arrowhead.

20. Three-bladed tanged iron arrowhead (Plates 2.6.E and F)
Provenance N7-W2
Yale no. 1934.443b
Dura no. G1929
L=50mm

Similar to no.18. Traces of wood grain are preserved on the tang. Heavily corroded. The section was originally as no.19 etc.

21. Three-bladed tanged iron arrowhead (Plate 2.6.E)
Provenance “G3 Dump”*
Yale no. 1934.443d  
Dura no. G216  
L=61mm  

* These details from a site card preserved at Yale which bears a drawing of this object. Large concretion on tip. Similar in form to no.20.

22. Three-bladed tanged iron arrowhead (Plate 2.6.E)  
Provenance unknown  
Yale no. unknown*  
Dura no. unknown  
L=44mm  

* At Higgins Armory Museum. Part of their no.2165. A smaller version of nos.18, 20-21 etc.

23. Three-bladed tanged iron arrowhead (Plates 2.6.E and F)  
Provenance unknown  
Yale no. 1982.28.75  
Dura no. unknown  
L=39mm  

Similar to no.22.

24. Three-bladed tanged iron arrowhead (Plates 2.6.E and F)  
Provenance unknown  
Yale no. 1982.28.72  
Dura no. unknown  
L=38mm+  

Similar to nos.20,21 etc.

25. Three-bladed tanged iron arrowhead (Plates 2.6.E and F)  
Provenance D4-T2  
Yale no. 1982.28.66  
Dura no. H534  
L=58mm  

All the blades are damaged, so their form is uncertain.

26. Three-bladed tanged iron arrowhead (Plates 2.6.E and F)  
Provenance L3-B7  
Yale no. 1982.28.64  
Dura no. F2132
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L=41mm

All blades are damaged, so their form is uncertain.

27. Three-bladed tanged iron arrowhead (Plates 2.6.E and F)
Provenance unknown
Yale no. 1982.28.74
Dura no. unknown
L=50mm

All the blades are damaged, so their form is uncertain.

28. Three-bladed tanged iron arrowhead (Plate 2.6.E)
Provenance M8-W8
Yale no. 1934.443a
Dura no. G1917
L=88mm

Heavily corroded, and all the blades broken.

29. Three-bladed iron arrowhead (Plate 2.6.E)
Provenance unknown
Yale no. 1981.62.33
Dura no. unknown
L=55mm+

Presumably originally tanged, this blade is now apparently broken at the rear.

30. Three-bladed tanged iron arrowhead (Plates 2.6.E and F)
Provenance unknown
Yale no. unknown
Dura no. unknown
L=63mm

This narrow head differs from nos.3-29 in its section, which seems to have been a convex-sided triangle, even allowing for corrosion products.

31. Three-bladed tanged iron arrowhead (Plates 2.6.E and F)
Provenance unknown
Yale no. 1982.28.76
Dura no. unknown
L=39mm
A smaller version of no. 30, with the same triangular section.

32. Three-bladed tanged iron arrowhead (Plate 2.6.E)
Provenance unknown
Yale no. 1982.28.80
Dura no. unknown
L = 59mm+

Similar to no. 30, but severely damaged around the tip and blades. Traces of wood grain around the tang.

33. Three-bladed double-barbed and tanged iron arrowhead (Plates 2.6.E and F)
Provenance Necropolis tomb 24 loculus XIV*
Yale no. 1982.28.79
Dura no. unknown
L = 55mm+

* Published in Rep. IX part ii 57 no. 50 and plate XLVI. At the time of discovery it still had its tang, now lost. The peculiar arrangement of double barbs is, to my knowledge, unique. It may be a specialised hunting head designed to cause maximum injury to large game in order to incapacitate it as quickly as possible.

The following arrowheads were published in the necropolis report, but cannot be identified among those preserved at Yale.

34. Pair of three-bladed tanged iron arrowheads (not illustrated)
Provenance Necropolis tomb 24 loculus XIV
Yale no. unknown
Dura no. unknown
Dimensions unknown

A pair of arrowheads fused together like no. 14, with which they were found. Rep. IX part ii 57 nos. 43-47 and plate XLVI, fourth and fifth arrowheads from the left.

35. Three-bladed tanged iron arrowhead (not illustrated)
Provenance Necropolis tomb 24 loculus XIV
Yale no. unknown
Dura no. unknown
Dimensions unknown

The tang is lost. Rep. IX part ii 57 nos. 43-47 and plate XLVI, third from right.
36. Three-bladed tanged iron arrowhead (not illustrated)
Provenance Tomb 37 loculus X
Yale no. unknown
Dura no. unknown
Dimensions unknown

The tang is damaged. Similar to no. 12. Rep.IX part ii 72 and plate LI, left.

37. Three-bladed tanged iron arrowhead (not illustrated)
Provenance Necropolis tomb 37 loculus X
Yale no. unknown
Dura no. unknown
Dimensions unknown

The tang is lost. Similar to no. 6 or 8. Rep.IX part ii 72 and plate LI, right.

38. Three-bladed tanged iron arrowhead (not illustrated)
Provenance Necropolis tomb 46*
Damascus?*
Dura no. K454*
L=41mm

* Information from a site record card at Yale, annotated “Dam.”. Largely intact head, similar to nos. 11 and 23 in size, but barbs ill-defined or damaged.

Some other iron arrowheads are more or less fully described on site-cards preserved at Yale. The following were neither located nor identified with any known heads at Yale.

39. Three-bladed tanged iron arrowhead (not illustrated)
Provenance “B2-So. dump”
Dura no. unknown
L=49mm

40. Three-bladed tanged iron arrowhead (not illustrated)
Provenance M8-W8
Dura no. G1920 or G1930

Blades damaged?
41. Three-bladed tanged iron arrowhead (not illustrated)
Provenance N8-W1
Dura no. probably G879
L=58mm

Blades damaged.

42. Three-bladed tanged iron arrowhead (not illustrated)
Provenance N8-W1
Dura no. G725
L=41mm

 Probably like no.30.

43. Three-bladed tanged iron arrowhead (not illustrated)
Provenance G1-T2 (?)
Dura no. E1223
L= apparently 67mm

Like nos.3 to 5, but complete.

44. Three-bladed tanged iron arrowhead (not illustrated)
Provenance B3-4
Dura no. unknown, possibly G1968.
L=57mm

1. Broken shaft of reed and wood (Plates 2.6.G and H)
Provenance “N8-Ramp”*
Yale no. 1982.28.35
Dura no. unknown
L=300mm+

* A site record card preserved at Yale bears a sketch and dimensions of an object which corresponds exactly to this so presumably they are the same object. Over the sketch the above provenance is given.

It is a large fragment of an arrowshaft of reed cane, 10mm in diameter, into the end of which is inserted a tapered wooden footing or foreshaft which forms the front part of the arrowshaft. In form the footing is as nos.5,6 etc. After insertion of the wooden tang into the pith of the reed, the joint was shaved flush with a sharp blade and whipped around with a binding of shredded tendon (?) soaked in glue to prevent splitting. The exposed length of footing is 131mm and the surviving portion of reed cane is 169mm long.

The footing tapers gently from 10 to 5mm and terminates in a faceted point. There is no aperture for a tanged metal arrowhead, nor any mark left by a socket. It is likely that the wooden point was the actual warhead of the arrow. Decoration consists of black paint on the first 27mm of the footing, bounded by a narrow band of red, 2.5mm wide. A second red band, 1.5mm wide, was added immediately above the junction of footing and reed. The wood of the footing is probably tamarisk.

Arrowshafts of cane with wooden footings were standard in the ancient middle east, and were already in use in Egypt from the Old Kingdom onwards (Rep.VI 438; Carter 1963 vol.III 139 and plate xlvi). Much closer parallels come from Judaea, especially the second century AD examples from Nahal Seelim, which had tanged wooden footings thrust into cane shafts with anti-split bindings. They were similar in length to the Durene examples (140-200mm), but were untapered. Some had binding around the tip to hold a tanged arrowhead (Aharoni 1961 20 plate 9A and C). Another arrow of the same period was found in another cave and had a similar untapered footing with bound joint (Avigad 1962 178 and plate 18C). The first-century AD fortress at Masada also produced some shaft fragments with iron arrowheads still attached. These appear to be wooden footings, and have a slight taper. The tips are bound. (Yadin 1965 16 and plate 23B; Yadin 1966 57).

2. Broken shaft of reed and wood (Plate 2.6.G)
Provenance L7-W*
Yale no. 1982.28.30
Dura no. F1801 (part of)*
L=235mm+

* Details from a site card preserved at Yale. Apparently found with nos.3 and 4.

A fragmentary shaft identical in construction and decoration to no.1. The reed is a little thinner (9mm) and has been hollowed out by post-depositional insect action. The junction of the footing and cane is identical to no.1 except that there is no sign of surface shaving. The anti-split binding and band of red paint are as no.1. About 108mm of cane survives. The footing is 164mm overall, of which 127mm
projects from the reed. Its tip is slightly facetted, probably from knife trimming, and is painted like no.1, 23mm of black and a 3mm band of red. See no.1 for parallels.

3. Broken shaft of reed and wood (Plate 2.6.G)  
Provenance L7-W*  
Yale no. 1982.28.31  
Dura no. F1801 (part of)*  
L=178mm+  

* Details from the site record card mentioned under no.2. Apparently found with nos.2 and 4.

A fragmentary shaft identical in construction to no.1 and with intact whipping around the first 43mm of cane. The reed is 10.5mm thick. The junction was shaved before the whipping was applied, perhaps to roughen the surface for gluing as well as to smooth the profile of the shaft. Length of surviving cane 83mm. Exposed length of wooden footing 95mm. The latter tapers from 10.5mm to 5mm. Its tip was apparently facetted and lacked any aperture for an arrowhead tang, but was bound around with glued tendon (?) whipping, perhaps indicating that it was intended to have such a head but that it was never fitted. Like nos.1 and 2 the first 24mm is painted black. There is no red band. See no.1 for parallels.

4. Broken shaft of reed and wood (Plate 2.6.G)  
Provenance L7-W*  
Yale no. 1982.28.29  
Dura no. F1801 (part of)*  
L=149mm+  

* Details from the site card mentioned under no.2. Apparently found with nos.2 and 3.

Structurally identical to nos.1 to 3. The broken end is burnt. Remaining length of cane is 31mm. Visible part of footing 118mm. The latter tapers and has a facetted tip like nos.1 and 2. The first 24mm is painted black. See no.1 for parallels.

5. Wooden arrow footing (Plate 2.6.G)  
Provenance unknown  
Yale no. 1931.591B  
Dura no. unknown  
L=180mm  

Originally 118mm projected from the reed shaft. The remaining 62mm forms the tapered and pointed plug or tang for insertion into the soft pith of the reed cane or stele which made up most of the shaft. The front part also tapers, as nos.1-4. The first 22mm are painted black. See no.1 for parallels.

6. Wooden arrow footing (Plates 2.6.G and H)  
Provenance E7-W  
Yale no. 1932.1716  
Dura no. E1245
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L=173mm

Identical in form to the footings in nos.1-4. Length of plug 71mm. Projecting part 102mm. At least the first 10mm were painted red. Beyond this the paint has flaked off, except for traces 19 and 22mm from the tip which may be from 1mm wide bands. The wood bears chatter-marks from the tool used to shave it into a taper.

7. Wooden arrow footing (Plate 2.6.G)
Provenance Tower 19*
Yale no. 1933.448b
Dura no. unknown
L=129mm+

* This is to be identified with the left hand footing of the pair from tower 19 illustrated in Rep.VI plate XXIV and briefly described on p454.

Identical in shape to no.5 except for the lost plug or dowel. It originally projected 115mm from the end of the reed. The tip is facetted and lacks any aperture for an arrowhead tang. The first 23mm is painted black. See no.1 for parallels.

8. Wooden arrow footing (Plates 2.6.G and H)
Provenance unknown
Yale no. 1934.502a
Dura no. unknown
L=135mm+

A snapped-off footing identical to those in nos.1 and 2, originally projecting 130mm from the reed shaft, and tapering from 7mm to 5mm. It is lightly facetted from the carving-down. There is no aperture for a tanged arrowhead. The first 27mm is painted black, bordered by a 2mm red band. A second band of red, also 2mm wide, was applied just above the junction with the reed. See no.1 for parallels.

9. Wooden arrow footing (Plate 2.6.G)
Provenance unknown
Yale no. 1982.28.32
Dura no. unknown
L=128mm+

As no.8, snapped off at the junction with the reed. It tapers from 9mm to 6mm. The first 24mm is painted black, bounded by a 2.5mm band of red. The tip is roughly facetted, and has no tang aperture. However, traces of glued tendon (?) whipping adhere to the tip, as no.3, perhaps indicating that it was intended to add one. See no.1 for parallels.

10. Wooden arrow footing (Plates 2.6.G and H)
Provenance unknown
Yale no. 1982.28.36
Dura no. unknown
L=77mm+

Broken as nos.7-9. It had originally projected 71mm from the cane. Part of the binding around the joint still adheres to the base. The object differs from nos.1-9 in being much shorter, more crudely finished, and unpainted. The wood is knotted. The first 29mm have been roughly whittled, probably with a fairly blunt knife. See no.1 for general parallels.

11. Wooden arrow footing (Plate 2.6.G)
Provenance unknown
Yale no. 1931.591c
Dura no. unknown
L=123mm

Complete. Originally projecting 84mm from the reed shaft, with a dowel 39mm into the cane. Unlike nos.1-10, it is cut off square and is split, probably as a result of having a tanged arrowhead driven into it. Unpainted. See no.1 for parallels.

12. Wooden arrow footing (Plate 2.6.G)
Provenance unknown
Yale no. 1931.591d
Dura no. unknown
L=145mm

Complete. Projecting originally c97mm from the reed shaft. The end is cut off square, with a central aperture which may have been to take a tanged arrowhead but which was certainly subsequently enlarged by insect action. Unpainted. See no.1 for parallels.

13. Wooden arrow footing (Plates 2.6.G and H)
Provenance Tower 19*
Yale no. 1933.448a
Dura no. F1963
L=165mm

* To be identified with the right hand footing of the two from tower 19 published in Rep.VI.454 and illustrated on plate XXIV. The published account identifies the wood as tamarisk.

Complete, but split. It originally projected c115mm from the end of the reed shaft. The end is cut square, but has no sign of a tang aperture. It may therefore have been unfinished when deposited. The tip was painted black for at least the first 17mm.

14. Shaftment with intact fletching (Plates 2.6.I and J)
Provenance Tower 19
Yale no. 1933.445a

261
Dura no. unknown
L=278mm+

Published in *Rep.* VI 453 no.1 and plate XXIV (top left) and James 1987 78 and figs 3 (bottom) and 4. The detailed description given there is substantially correct. The reed cane, 10mm in diameter, is snapped cleanly at a natural joint. The nock, 9-10mm deep, is cut at a similar joint, where the cane is solid in section. In profile the wings of the nock are curved. A whipping of shredded tendon (?) in glue was put around the end and allowed to set before the nock was cut to prevent the cane splitting during manufacture or shooting. The published account states that the length of shaft bearing the flights or vanes was sized with glue, while the plain part of the shaft was varnished. I believe this to be a misinterpretation. These canes seem to have a naturally glossy surface which has to be roughened by sanding or scraping to give glue purchase. There is no visible trace of either applied size or varnish. Rather the glossy cane was simply roughened along the length which was due to take the fletching.

Before the fletching was added the shaft was given painted decoration (the “cresting”). This consisted of a simple broad band of red paint, 25mm wide.

Three vanes were applied. The species is not identified. They seem to have been white, although this could simply be due to ageing. Each was 157mm long and reached a maximum width of 11-12mm, well forwards. The fletching runs back over the anti-split binding, up to the edge of the nock. The arrangement of the vanes is according to the “western” style of fletching, with a cock-feather set at right-angles to the axis of the nock, and a hen feather at 120 degrees either side of it. The feathers were held on by glue alone. They were not attached with a deliberately “corkscrewed” geometry to make the spin. Their bases were glued parallel with the axis of the arrow, but the natural curvature of the feathers would have been enough to make the shaft spin anyway (see drawing).

No other examples of arrowshafts with intact fletching are known to me from the classical world, although bare shaftments do survive from Palestine. These second century AD examples from the cave at Nahal Seelim in the Judaean desert also possess red and black crestings like the Dura examples (Aharoni 1961 20 plate 9A and C). Reed arrows with bound nocks and red and black crestings are found over a huge area of Asia, and over a long period. Some of the best parallels are from the “limes” of the Han Chinese empire (broadly contemporary with Dura) and its successors (Stein 1921 785 Txix.006 and 007, plate LIII; 783 Txv.a.vi.001; and especially Stein 1928 95 nos.046-48; 96 0635-7 and plate VI; 202 L.M.1.07 plate XXVI; 257 LC.v.031-34 and plate XXVI; 422 Txliii.01 and plate XLVII).

15. Reed shaftment (Plates 2.6.H and I)
Provenance Tower 19
Yale no. 1933.445b
Dura no. unknown
L=218mm+

Published in *Rep.* VI 453 no.2 and plate XXIV (top, middle), and James 1987 78 fig. 4. When found, it had much of its fletching intact. Unfortunately this has since been lost. The cane is 10mm in diameter. In construction, identical to no.14. The nock is 8mm deep. The vanes were shorter, 141-142mm long. The surviving photographs suggest that they were broadly like those on no.14 in shape. Their geometry was also the same, with a recognisable cock feather. The vanes were not corkscrewed.

The cresting is more elaborate than that on no.14. The last 18mm of the shaft was painted black, overlying the nock and anti-split binding. This was bounded by a 4mm wide red band. A large white spot was painted on each wing of the nock, and a smaller red one within, making an “eye”. About 4mm
inside the ends of the vanes is a 1mm black band. Next to it is a 5mm diameter red spot between each vane. See no.14 for parallels.

Provenance Tower 19
Yale no. 1933.445c
Dura no. unknown
L=209mm+

Published in Rep. VI 453 no.3 and plate XXIV (top right) and James 1987 fig 3 (centre right) and 4.
The broken end is scorched from the fire in the tower. The fletching is lost, except for the roots of the feathers held to the shaft by the glue. The vanes were 151mm long. Structurally identical to no.14, with cresting identical to no.15. The cane is 9.5mm thick, the nock 11mm deep. The anti-split binding around the nock stretches 30mm along the shaft and is totally covered in paint. Black covers the last 24mm, and is bounded by a band of red 11mm wide. The wings of the nock each bear a white spot, 11mm long, and on that a red spot 7mm long. The inside of the nock is also painted red. Towards the leading edge of the vanes are the narrow black band and red spots identical to no.15. Arrangement of the vanes is as nos.14 and 15, and they were of course added after the cresting. See no.14 for parallels.

17. Reed shaftment (Plate 2.6.I)
Provenance L7-W*
Yale no. 1982.28.34
Dura no. F1801 (part of)?*
L=163mm+

* Identified with an object described on a site card at Yale. Published in James 1987 fig 4, right. Of cane 9mm in diameter, structurally identical to no.14 etc. The fletching, as on the above examples, reached to the base of the nock. The vanes are lost, except for their bases still adhering to the shaft. The nock is 10mm deep and covered in anti-split binding. The vanes reached at least as far as the broken end and so were at least 150mm long. They were arranged as on no.14.

The cresting is again red and black, but of a different variant. The wings and interior of the nock are red, except for the outsides of the tips which are black. A 2mm red band surrounds the shaft 46mm from the end, and another, 20mm wide, starts 94mm from the end. For parallels see no.14.

18. Reed shaftment (Plate 2.6.I)
Provenance unknown
Yale no. 1982.28.33
Dura no. unknown
L=158mm+

Structurally identical to nos.14-17, of reed 9.5mm thick. Nock 10mm deep. The traces of the fletching are intermittent, but the vanes were at least 120mm long. As usual they were fixed with glue alone. However, they seem to have been attached in the "oriental" style, with no cock feather as such. One of the vanes is parallel to the nock, the others 120 degrees on either side. The wings of the nock are squared.
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The cresting consists simply of a broad band of black pigment, starting 92mm from the end, and 51mm wide, where a pink band begins. The width of the latter is unknown as the shaft is snapped, but it was at least 15mm. See no. 14 for parallels.

19. Reed shaftment (Plate 2.6.1)
Provenance E7-W13*
Yale no. 1932.1685*
Dura no. E1206*
L=284mm+

* The object bears no number, but its details tally perfectly with those on a card in the Yale catalogue, which gives these details.

Of cane 11mm thick, with a nock 9mm deep. It probably had anti-split binding at the nock, but this has fallen off, taking with it the overlying paint. Few traces of the fletching survive, but the vanes were at least 120mm long and arranged as on no.18. The record card says they were 151mm long. The last 173mm of the shaft is painted. Starting at the nock, there is 46mm of very pale pink, then 82mm of black, followed by another 45mm of the pink. The wings of the nock are squared. See no. 14 for parallels.

A few other fragments of shafts are recorded in the Yale archives, but could not be located in the collections;

20. Reed shaftment with intact fletching (not illustrated)
Provenance L7-W
Dura no. F1801 (part of)

On a site record card with no.17. Of uncertain length, this shaft was broken off before the end of the fletching. It had the usual anti-split binding, and white vanes apparently similar to no.14. The nock wings were painted “solid deep red”. The reed was 7.5mm thick.

21. Reed shaft with wooden footing (not illustrated)
Provenance “N8-Ramp”
Dura no. unknown
L=320mm+

A reed shaft, surviving to 257mm, with a wooden footing projecting a further 63mm. The junction is bound, as nos.1-4. On a site card with nos.1 and 22.

22. Wooden arrow footing (not illustrated)
Provenance “N8-Ramp”
Dura no. unknown
L=170mm+

An intact arrow footing, identified as tamarisk. The tip is apparently painted black. It projected 115mm from the reed shaft. Similar to nos.1-9. On a site card with nos.1 and 22.
CATALOGUE PART 2.7.
CATAPULT AMMUNITION (Plates 2.7.A to AE)

IRON QUARREL HEADS (Plates 2.7.A to L)

Socketed bodkins of square section
(nos.1-37: plates 2.7.A to C and F to J)

1. Socketed bodkin (Plates 2.7.A and F)
Yale No. 1982.28.5
Dura no. unknown
Provenance Tower 19*
Length: 110mm
Socket diameter: 15mm

*Identifiable in Rep.VI, plate XXIV, "Finds from Tower 19", bottom row, third from left.

Perfect except for some localised corrosion pitting. In part the iron is still shiny. It has the split socket standard on this type. The square-shanked fixing nail is 17mm long.

There are many parallels for this simple form. Early examples may be seen at Epirus (Baatz 1982, 229-31, and Abb 7 and Taf 45,2). They are found across the entire Empire, eg Caerleon (Nash-Williams 1932 70-1; fig.17); Cirencester (Webster 1958 75 no.38 and fig.3); Newstead (Curle 1911 188-9 plate XXXVII nos 14, 16-21); Buciumi, Rumania (Gudea 1972 Taf. LX and LXI); Gamla, Israel (Gutman 1981 34).

2. Socketed bodkin (Plates 2.7.A and H)
Yale No. 1982.28.12
Dura no. F???? (illegible)
Provenance Tower 19?*
Length: 104mm+
Socket diameter: 16mm

*Probably to be identified with a bolt head in Rep.VI, plate XXIV, upper row, second from right.

The tip is corroded. The fixing nail is intact. See no.1 for parallels.
3. Socketed bodkin (Plates 2.7.A and G)
Yale No. 1933.688 (part of)
Dura no. F973
Provenience Tower 19
Length; 107mm+
Socket diameter; 17mm

The tip is corroded. Square-shanked fixing nail in situ. See no.1 for parallels.

4. Socketed bodkin (Plate 2.7.A)
Yale No. 1982.62.30
Dura no. unknown
Provenience unknown
Length; 130mm
Socket diameter; 16mm

In virtually perfect condition. The socket still contains part of the wooden shaft. See no.1 for parallels.

5. Socketed bodkin (Plate 2.7.A)
Yale No. 1933.688a.l (also given 1981.62.69)
Dura no. F1195
Provenience Tower 19
Length; 129mm
Socket diameter; c.10mm

Published in Rep.VI, plate XXIV, top row, fourth from right. Tip of shaft still in socket. In good condition. See no.1 for parallels.

6. Socketed bodkin (Plates 2.7.A and I)
Yale No. 1982.28.16
Dura no. unknown
Provenience unknown
Length; 126mm
Socket diameter; 16mm

Extensively encrusted. See no.1 for parallels.

7. Socketed bodkin (Plates 2.7.A and H)
Yale No. 1933.688.7
Dura no. F1360(?)*
Provenience Tower 19?*
Length; 112mm
Socket diameter; 16mm

*Site catalogue gives "F1360...Tower 19, 2 coins, fragments of mail". See no.1 for parallels.
8. Socketed bodkin (Plate 2.7.A)
Yale No. 1982.28.13
Dura no. unknown
Provenance unknown
Length; 113mm
Socket diameter; 16mm

From the state of the tip, this appears to have been shot from a machine. See no.1 for parallels.

9. Socketed bodkin (Plates 2.7.A and J)
Yale No. 1982.28.13
Dura no. unknown
Provenance unknown
Length; 124mm
Socket diameter; over 10mm

Heavily oxidised. The grain of the shaft is preserved in the corrosion products. Its peculiar cruciform section is the result of internal expansion of oxidation products forcing the four faces apart. See no.1 for parallels.

10. Socketed bodkin (Plates 2.7.A and F)
Yale No. 1933.688.3
Dura no. F933 (part of)
Provenance Tower 19
Length; 104mm
Socket diameter; 16mm

Probably to be seen in Rep.VI, plate XXIV, bottom row, third from right. The nail hole is vacant. See no.1 for parallels.

11. Socketed bodkin (Plates 2.7.A and F)
Yale No. 1933.688.4
Dura no. F993 (part of)
Provenance Tower 19
Length; 98mm
Socket diameter; 14mm

The nail hole is square. See no.1 for parallels.

12. Socketed bodkin(s)? (Plates 2.7.A and E)
Yale No. 1930.620A
Dura no. unknown
Provenance unknown
Length; 142mm
This strange and badly corroded object appears to be a pair of loose heads, one inside the other, fused by oxidation. This implies that they were not shafted at deposition, but were perhaps still in a state of manufacture. See no.1 for parallels.

13. Socketed bodkin (Plates 2.7.A and I)
Yale No. 1933.688.8
Dura no. F1970
Provenance Tower 19?*
Length; 110mm+
Socket diameter; 16mm

*Identifiable in Rep.VI, plate XXIV, top row, third from right. The site catalogue gives "F993; Tower 19 spearheads. 1933.688".
The tip is heavily corroded. See no.1 for parallels.

14. Socketed bodkin (Plates 2.7.A and F)
Yale No. 1982.28.2
Dura no. unknown
Provenance unknown
Length; 111mm
Socket diameter; 14mm

See no.1 for parallels.

15. Socketed bodkin (Plates 2.7.A and G)
Yale No. 1982.28.4
Dura No. unknown
Provenance unknown
Length; 98mm
Socket diameter; 15mm

The socket, which is corroded, contains a vacant nail-hole. The tip is still shiny metal. See no.1 for parallels.

16. Socketed bodkin (Plates 2.7.B and E)
Yale No. 1982.28.2
Dura No. unknown
Provenance unknown
Length; 94mm
Socket diameter; 19mm*

*The socket may not have been properly closed if, as seems likely from the vacant nail hole, this head was never attached to a shaft. See no.1 for parallels.
17. Socketed bodkin (Plates 2.7.B and I)
Yale No. 1930.619b
Dura No. unknown
Provenance unknown
Length; 106mm
Socket diameter; c.12mm

The socket is damaged. Square-shanked fixing nail. See no.1 for parallels.

18. Socketed bodkin (Plates 2.7.B and F)
Yale No. 1933.688.5
Dura No. F993 (part of)
Provenance Tower 19
Length; 111mm
Socket diameter; 13mm

Thick layers of concretion, largely flaked off. The nail-hole is empty, but the socket retains powdery traces of the shaft. See no.1 for parallels.

19. Socketed bodkin (Plates 2.7.B and G)
Yale No. 1982.28.8
Dura No. unknown
Provenance unknown
Length; 106mm
Socket diameter; 15mm

The nail hole is vacant. This may have been shot. See no.1 for parallels.

20. Socketed bodkin (Plates 2.7.B and G)
Yale No. 1982.28.6
Dura No. F1049 (part of)*
Provenance Tower 19*
Length; 100mm
Socket diameter; 15mm

*Found with no.29. Site catalogue gives "F1049a-c; Tower 19, 2 lance heads, 1 coin". The square nail-hole is vacant. See no.1 for parallels.

21. Socketed bodkin (Plates 2.7.B and G)
Yale No. 1932.1721
Dura No. unknown
Provenance unknown
Length; 112mm
Socket diameter; 15mm
Apparently the nail hole has been torn through. See no.1 for parallels.

22. Socketed bodkin (Plate 2.7.B)
Yale No. unknown*
Dura No. unknown
Provenance unknown
Length; 99mm
Socket diameter; 17mm

*Currently at the Higgins Armory Museum, numbered Q42. The nail hole is vacant. See no.1 for parallels.

23. Socketed bodkin (Plates 2.7.B and I)
Yale No. 1982.28.17
Dura No. F973
Provenance Tower 19
Length; 101mm
Socket diameter; 20mm

Identifiable in Rep.VI, plate XXIV, bottom row, centre.

The nail hole is vacant. The socket is larger than normal, and the object is not waisted. Possibly a spear ferrule. See no.1 for parallels.

24. Socketed bodkin (Plates 2.7.B and H)
Yale No. 1982.28.10
Dura No. unknown
Provenance unknown
Length; 97mm
Socket diameter; c.14mm

See no.1 for parallels.

25. Socketed bodkin (Plates 2.7.B and I)
Yale No. 1982.28.15
Dura No. unknown
Provenance unknown
Length; 90mm
Socket diameter; c.14mm

The socket contains traces of wood grain from the shaft in the oxides. Distortion of the tip may indicate that it has been shot. Unusually, it is not waisted. See no.1 for parallels.
26. Socketed bodkin (Plates 2.7.B and H)
Yale No. 1982.28.14
Dura No. illegible
Provenance unknown
Length; 99mm
Socket diameter; 15mm

The nail hole is vacant. See no.1 for parallels.

27. Socketed bodkin (Plates 2.7.B and G)
Yale No. 1933.688.6
Dura No. F719
Provenance Tower 19
Length; 110mm
Socket diameter; 14mm

Identifiable in Rep.VI, plate XXIV, top row, fourth from left.
Unusually, this example is not waisted. See no.1 for parallels.

28. Socketed bodkin (Plate 2.7.B)
Yale No. unknown*
Dura No. unknown
Provenance unknown
Length; 84mm
Socket diameter; c.11mm

*Currently at the Higgins Armory Museum, numbered Q43. It is unusually small, but is probably still too heavy to be an arrowhead. See no.1 for parallels.

29. Socketed bodkin (Plates 2.7.B and E)
Yale No. 1933.688.2
Dura No. F1049 (part of)*
Provenance Tower 19
Length; 88mm
Socket diameter; 13mm

*Found with no.20. See no.1 for parallels.

30. Socketed bodkin (Plates 2.7.B and E)
Yale No. 1982.28.1
Dura No. F1979(?)*
Provenance unknown
Length; 99mm+
Socket diameter; c.13mm
*Number not very legible. Does not correspond to site register.
The socket is partly corroded away, but the nail is intact. See no.1 for parallels.

31. Socketed bodkin (Plates 2.7.B and J)
Yale No. 1933.688.10
Dura No. F1648
Provenance Tower 19
Length; 88mm
Socket diameter; 14mm

See no.1 for parallels.

32. Socketed bodkin (Plates 2.7.B and J)
Yale No. 1982.28.22
Dura No. unknown
Provenance unknown
Length; 90mm

Covered in a very thick layer of concretion. See no.1 for parallels.

33. Socketed bodkin (Plates 2.7.B and J)
Yale No. 1982.28.19
Dura No. unknown
Provenance unknown
Length; 105mm

Covered in a very thick layer of concretion. Section originally square. See no.1 for parallels.

34. Socketed bodkin (Plates 2.7.C and J)
Yale No. 1982.28.21
Dura No. unknown
Provenance unknown
Length; 103mm

Covered in a thick layer of concretion. See no.1 for parallels.

35. Socketed bodkin (Plates 2.7.C and J)
Yale No. 1933.688.9
Dura No. F2115
Provenance Tower 19
Length; 120mm
Socket diameter; 18mm
The nail is broken. Either a heavy bolt, or a spear ferrule. See no.1 for parallels.

36. Socketed bodkin (Plate 2.7.C)
Yale No. unknown*
Dura No. unknown
Provenance unknown
Length; 122mm
Socket diameter; 12mm+

*Currently at the Higgins Armory Museum, marked Q35. Either a heavy bolt or a spear ferrule. See no.1 for parallels.

37. Socketed bodkin (Plates 2.7.C and J)
Yale No. 1982.28.18
Dura No. unknown
Provenance unknown
Length; 133mm
Socket diameter; 16-18mm

Heavily encrusted. The exterior oxidation products preserve the grain where wood has been in contact during burial. Either a heavy bolt or a spear ferrule. See no.1 for parallels.

38. Socketed bodkin (Plates 2.7.C and H)
Yale No. 1982.28.11
Dura No. unknown
Provenance unknown
Length; 129mm
Socket diameter; c.15mm

The long point is of sub-square section. Possibly a spear ferrule. See no.1 for parallels.

39. Socketed bodkin (Plate 2.7.C)
Yale No. unknown*
Dura No. unknown
Provenance Tower 19?**
Length; 117mm
Socket diameter; 15mm

*Currently at the Higgins Armoury Museum, numbered Q42.
** Possibly to be identified with a bolt head in Rep.VI, plate XXIV, bottom row, fourth from right.

The long point is of circular section. The nail-hole is vacant. Possibly a spear ferrule. See no.1 for parallels.
40. Socketed bodkin (Plates 2.7.C and F)
Yale No. 1982.28.3
Dura No. unknown
Provenance unknown
Length; 118mm
Socket diameter; 14mm

The long head is of circular section. The nail-hole is vacant. Possibly a spear ferrule. See no.1 for parallels.

Tanged Bodkins of Square Section
(Nos.41-51. Plates 2.7.D and E)

41. Tanged bodkin (Plate 2.7.D)
Yale No. 1982.28.24
Dura No. unknown
Provenance unknown
Length; 102mm+
Maximum width of head; 22mm

The tang is lost. Presumably from an unusually large bolt.

A type common across the Roman empire, eg Caeleon (Nash-Williams 1932 71 figs 20 and 21); Newstead (Curle 1911 189 Plate XXXVIII nos 9-11); Examples are also known in Iran, at Bastam (Kleiss 1972 52 and Abb.49 nos 3,4,5,8,10 and 11)

42. Tanged bodkin (Plates 2.7.D and E)
Yale No. 1934.442a
Dura No. unknown
Provenance unknown
Length; 116mm
Maximum width; 13mm

Complete. See no.41 for parallels.

43. Tanged bodkin (Plates 2.7.D and E)
Yale No. 1934.442b
Dura No. unknown
Provenance unknown
Length; 99mm+
Maximum width; 13mm

The tang is broken. See no.41 for parallels.

44. Tanged bodkin (Plates 2.7.D and E)
Yale No. unknown*  
Dura No. unknown  
Provenance unknown  
Length; 133mm  
Maximum width; 13mm  

*Now at the Higgins Armory Museum, numbered Q44. See no.41 for parallels.

45. Tanged bodkin (Plate 2.7.D)  
Yale No. 1981.62.42  
Dura No. unknown  
Provenance unknown  
Length; 121mm  
Maximum width; 13mm  

See no.41 for parallels.

46. Tanged bodkin (Plate 2.7.D)  
Yale No. 1930.619A  
Dura No. unknown  
Provenance unknown  
Length; 82mm+  
Maximum width; 13mm  

Both ends truncated by corrosion. See no.41 for parallels.

47. Tanged bodkin (Plate 2.7.D)  
Yale No. 1933.692  
Dura No. F92  
Provenance "J7; Infill against wall B"*  
Length; 116mm+  
Maximum width; 10mm+  

*Information from a site card preserved at Yale.

The surface of this has laminated and is now largely flaked off, which has probably severely distorted its outline. See no.41 for parallels.
48. Tanged bodkin (Plate 2.7.D)
Yale No. 1982.28.23
Dura No. unknown
Provenance unknown
Length; 112mm
Maximum width; 7mm+

The heavily corroded surface has largely flaked away. It was originally considerably thicker. See no.41 for parallels.

49. Tanged bodkin (Plate 2.7.D)
Yale No. 1981.62.41
Dura No. unknown
Provenance unknown
Length; 95mm
Maximum width; 10mm

See no.41 for parallels.

50. Tanged bodkin (Plate 2.7.D)
Yale No. unknown*
Dura No. unknown
Provenance unknown
Length; 95mm
Maximum width; 10mm

*Possibly an accidental duplication of 49

51. Tanged bodkin (Plate 2.7.D)
Yale No. 1982.28.25
Dura No. unknown
Provenance unknown
Length; 93mm
Maximum width; 22mm

Completely oxidized and split apart by corrosion, it is distorted almost beyond recognition. See no.41 for parallels.
Leaf-Shaped Heads (Plates 2.7.D and K)

52. Leaf-shaped head (Plates 2.7.D and K)
Yale no. unknown*
Dura no. unknown
Provenance unknown
Length; 100mm
Socket diameter; 12mm

*Currently at the Higgins Armory Museum, unnumbered.

The socket is split. There is no sign of a fixing nail.

A type not often recognised, but actually paralleled at a number of sites across the empire, eg, Saalburg (Jacobi 1897 492, fig.77, Nr.38 and 40, and Taf.XXXIX, Nr.17 and 19); Carnuntum (RLO V fig33 no.4, RLO VII Fig 33 nos 1 and 2; RLO IX 35 fig 10 no.2); Lauriacum (RLO X 94 fig 36 no.5) and Kastell Ulmus (RLO VI 53 fl.27, 1 and 2), Vindolanda (Jackson 1985 136 and fig.49 no.34).

53. Leaf-shaped head (Plates 2.7.D and K)
Yale no. unknown*
Dura no. unknown
Provenance unknown
Length; 83mm
Socket diameter; 11mm

*Currently at the Higgins Armory Museum, numbered Q51.

See no.52 for parallels.

54. Leaf-shaped head (Plates 2.7.D and K)
Yale no. unknown*
Dura no. unknown
Provenance unknown
Length; 95mm
Socket diameter; 12mm

*Currently at the Higgins Armory Museum, numbered Q54.

The hole in the socket may be a nail-hole, torn through. See no.52 for parallels.

55. Leaf-shaped head (Plates 2.7.D and K)
Yale no. unknown*
Dura no. unknown
Provenance unknown
Length; 80mm
Socket diameter; 10mm

*Currently at the Higgins Armory Museum, numbered Q52.

See no.52 for parallels.

56. Leaf-shaped head (Plates 2.7.D and K)
Yale no. unknown*
Dura no. unknown
Provenance unknown
Length; 83mm
Socket diameter; 10mm

*Currently at the Higgins Armory Museum, numbered Q50

See no.52 for parallels.

57. Leaf-shaped head (Plates 2.7.D and K)
Yale no. unknown*
Dura no. unknown
Provenance unknown
Length; 103mm
Socket diameter; 11mm

*Currently at the Higgins Armory Museum, numbered Q53.

See no.52 for parallels.

58. Leaf-shaped head (Plates 2.7.D and K)
Yale no. unknown*
Dura no. unknown
Provenance unknown
Length; 87mm
Socket diameter; c.12mm

*Currently at the Higgins Armory Museum, numbered Q56.

See no.52 for parallels.

59. Leaf-shaped head (Plates 2.7.D and K)
Yale no. unknown*
Dura no. unknown
Provenance unknown
Length; 55mm+
JAMES: THE ARMS AND ARMOUR FROM DURA-EUROPOS

*Currently at the Higgins Armory Museum, numbered Q47.

The socket is lost. See no.52 for parallels.

60. Leaf-shaped head (Plates 2.7.D and K)
Yale no. unknown*
Dura no. unknown
Provenance unknown
Length; 69mm+

*Currently at the Higgins Armory Museum, numbered Q48.

See no.52 for parallels.

Special Incendiary Ammunition (Plates 2.7.D and L)

61. Incendiary bolt head (Plates 2.7.D and L)
Yale no. 1981.62.31
Dura no. unknown
Provenance unknown
Length; 113mm
Socket diameter; 14mm

Published, James 1983.

It is clearly the head of a shafted weapon, with a socket and a small, flattish blade, c.27mm long. There is a fixing nail 24mm from the edge of the socket. The blade, like the rest of the object, is extensively oxidised, but was certainly two-edged and probably had a lenticular section.

Connecting the blade to the socket are three curved bars, c.30mm long and c.8-9mm thick, of roughly circular section. They were not quite placed with radial symmetry about the axis; two were splayed out slightly, towards the plane of the blade.

There are no known close parallels, but for documentary evidence, and incendiary arrowheads, see Brok 1978 and James 1983.

Quarrel Heads; Addenda (not illustrated)

The Royal Ontario Museum acquired the following three quarrel heads from Yale, in an exchange apparently not recorded in the Dura archive (information kindly supplied by Dr.J.Hayes);
62. Socketed bodkin (not illustrated)
Yale No. 1931.590i(?)*
Dura No. unknown.
Provenance unknown.
Length; 122mm
Socket diameter; 18mm
Weight; 57.4g

* Given ROM No. 933.25.27 with shaft. For a full description of this object, see bolt shaft No.26 (1931.590i), with which it is allegedly associated. The poor fit of the two parts makes this association highly dubious.

63. Tanged bodkin (not illustrated)
Yale No. 1933.692*
Dura No. unknown
Provenance unknown
Length; 114mm
Maximum width; 12mm
Weight; 42.1g

Complete, square-section bodkin. The tang is slightly bent.

64. Tanged bodkin (not illustrated)
Yale No. unknown*
Dura No. unknown
Provenance unknown
Length; 73mm+
Maximum width; 20mm**
Weight; 36.4g

* Given ROM No. 933.25.30

**Very heavily corroded and fissured, resulting in considerable distortion of shape. The tang is broken.

WOODEN QUARREL SHAFTS (Plates 2.7.M to AD)

1. Unfinished quarrel shaft (Plate 2.7.M)
Yale No. 1929.434A
Dura No. unknown
Provenance unknown
Length; 337mm+
A shaft apparently unfinished as it lacks grooves or mortises for wooden flights. Fore end broken. Wood identified as Pine (*Pinus*) on file card at Yale. The shaft is slightly faceted from the knife(?) used to shape it.

No close parallels are yet known from the Roman Empire. There are a number of foreshafts from bolts of composite construction known from early Imperial contexts at Haltern (Dahm 1903, Schramm 1905) and Vindonissa (Simonett 1942), and a closely similar piece, as yet unpublished, from Qasr Ibrim in Egypt (British Museum, Department of Egyptian Antiquities; no. 78.3.21/52). However, all these pieces are very different in construction from the Dura examples.

2. Broken quarrel shaft with three vanes (Plates 2.7.M and Y)
Yale No. 1929.434b
Dura No. unknown
Provenance unknown
Length; 277mm+

Published, inadequately, in *Rep.II*, 72 and plate IX, left.

Made of Ash (*Fraxinus excelsior*). Shows various traces of the manufacturing process. The dorsal surface bears saw-marks, from the cutting of the original rectangular billet. The surface of the main part of the shaft is faceted from the shaping knife or chisel. The tail faces bear chisel or knife marks.

There are three flights, or vanes. The two horizontal stabilisers are made of a single piece of wood, slotted through a mortise. The grain is at right-angles to the main axis. The “wing-plan” is slightly rounded, with tapered edges. The vertical stabiliser is also in a mortise. It is damaged, making its outline uncertain. It is held in place with a thin wooden wedge.

The front part of the shaft is broken and charred, with worm-holes.

3. Broken quarrel shaft with three vanes (Plates 2.7.N and Z)
Yale No. 1933().446A(?)
Dura No. unknown
Provenance unknown
Length; 317mm+

Currently at the Higgins Armory Museum.

Structurally similar to No.2. It also has saw-marks on the dorsal surface, and whittling facets. The flights are arranged and fixed in the same way as No.2, but are longer and lower.

4. Broken quarrel shaft with three vanes (Plates 2.7.N and AA)
Yale No. 1935.89
Dura No. G1628
Provenance “Tour 18”*
Length; 263mm+

*The object is so labelled
The vanes are arranged similarly to No.2. The horizontal stabilisers are in one piece, with a triangular "wingplan". The vertical stabiliser is lost from its housing, because the shaft has split along the grain, across the mortise.

5. Fragment from a quarrel shaft with three vanes (Plate 2.7.N)
Yale No. 1934.502b
Dura No. G1854*
Provenance "Corner. N801"*
Length; 161mm+

*Details from a site-card preserved at Yale.

This fragment comprises the upper part of the tail of a bolt similar to No.2. Part of the horizontal mortise survives. The vertical vane remains in its slot.

6. Complete quarrel shaft, originally with three vanes
(Plates 2.7.O,X and Y)
Yale No. unknown
Dura No. unknown
Provenance Tower 19*
Length; 373mm

*Described in Rep.VI 455, and seen in plate XXIV, 2.

Made of Ash (Fraxinus orientalis), with vanes of Maple (species uncertain), (Rep.VI, 455).

This shaft was found with an iron head attached. The head was a socketed bodkin, but it has since become detached, and cannot now be identified. The overall length including the head was not recorded. The forward end is faceted, by rough whittling. The shaft is gently faceted.

The vertical stabiliser is housed in a mortise, apparently wedged with a wooden fillet. It was cut so that the grain was "swept back" like the fibres in a feather. Both of the horizontal stabilisers are missing. They were housed in (?)saw-cut grooves, in the widest part of the shaft. Unlike No.2, etc., the two horizontal stabilisers were separate pieces.

7. Almost complete quarrel shaft, originally with three vanes
(Plate 2.7.O)
Yale No. 1982.28.26
Dura No. G1798
Provenance unknown
Length; 371mm+

The rear end of the shaft is burnt. It is strongly faceted from the basic shaping.

All three flights were housed in mortises. The vertical stabiliser is lost, while both the horizontal ones are broken. The latter were separate pieces, arranged with "swept back" grain.
8. Broken quarrel shaft with three vanes (Plates 2.7.P and Y)
Yale No. 1929.434g
Dura No. unknown
Provenance unknown
Length; 304mm+

Published Rep. II 72 and plate IX, right.

The front end is broken, and there is extensive insect damage. The three flights were mounted in mortises. The left horizontal vane is lost due to insect attack. The two surviving vanes are intact, and "swept back".

9. Broken quarrel shaft with three vanes (Plate 2.7.P)
Yale No. 1931.590a
Dura No. unknown
Provenance unknown
Length; 335mm+

Heavily worm eaten. The upper vane was in a mortise and is now broken. The horizontal stabilisers were housed in grooves, but are now both lost.

10. Broken quarrel shaft with three vanes (Plate 2.7.Q)
Yale No. 1931.590b
Dura No. unknown
Provenance unknown
Length; 403mm+

A fairly large and heavy bolt, of Birch (Fagus sp.; probably identified by Prof. Record, Rep. VI 455). A patch of bark remains. Facetted. The fore-end is broken, and seems to bear a modern saw-cut, perhaps associated with earlier wood identification. The three flights were housed in mortises, and are now all lost.

11. Broken quarrel shaft with two vanes (Plate 2.7.Q)
Yale No. 1929.434d
Dura No. unknown
Provenance unknown
Length; 334mm+

Heavily insect damaged. The two stabilisers were housed in mortises. Only one survives, and is strongly swept, with sharp leading edges.

12. Damaged quarrel shaft with two or three vanes (Plate 2.7.R)
Yale No. 1933.446c
Dura No. unknown
Provenance unknown
Length; 431mm

Ash wood (*Fraxinus Orientalis*; probably identified by Prof. Record, *Rep.* VI 455). Shaft complete in length, but the upper rear part is split away. Consequently, it is not certain whether there were two or three vanes. The horizontal vanes were housed in a single transverse mortise.

The fore-end of the shaft is socketed, having had a taqg driven into it. Consequently, the wood has split.

13. Broken quarrel shaft with two vanes (Plate 2.7.R)
Yale No. 1931.590g
Dura No. unknown
Provenance unknown
Length; 331mm+

Facetted, and badly cracked, probably due to severe heating. It is also split at the tail end, making it uncertain whether there were two or three flights. The horizontal stabilisers were housed in a transverse mortise.

14. Broken quarrel shaft with two vanes (Plate 2.7.S)
Yale No. 1929.434e
Dura No. unknown
Provenance unknown
Length; 243mm+

Published *Rep.* II, 72 and plate IX.

A shaft truncated by insect action. The shaft is facetted. The two flights are in slots, and have a delta "wingplan". Saw cuts at the rear of the right vane show the flights were trimmed after fitting. Red material on the upper surface of the flights may be bark, perhaps painted. This is pealing away from the wood.

15. Broken quarrel shaft with two vanes (Plate 2.7.S)
Yale No. 1982.28.122
Dura No. unknown
Provenance unknown
Length; 269mm+

The vanes are housed in mortises. They are strongly swept.

16. Damaged quarrel shaft with two vanes (Plate 2.7.T)
Yale No. 1931.590h
Dura No. unknown
Provenance unknown
Length; 358mm+
Severely damaged by biological action, especially at the tail. The two mortised flights were strongly swept. They are now eaten away.

17. Complete quarrel shaft with two vanes (Plates 2.7.T and Z)
Yale No. 1933.446b
Dura No. unknown
Provenance unknown
Length: 458mm

The shaft is complete except for the loss of the two vanes. These were originally housed in (?)saw-cut slots. The fore end is whittled into a facetted cone, which has been inserted into a socketed head; the wood is bruised by the tight edge of the socket, and impressed by a fixing nail. Whether the head was removed in antiquity, or since discovery, is unknown.

18. Complete quarrel shaft with two vanes (Plate 2.7.U)
Yale No. 1931.590d
Dura No. unknown
Provenance unknown
Length: 382mm

The shaft is complete except for the loss of the two vanes. These were originally housed in (?)saw-cut grooves. Like No. 16, this has had a socketed head attached. The wood is bruised from the edge of the socket, and split by the driving in of a fixing nail.

19. Complete quarrel shaft with two vanes (Plate 2.7.U)
Yale No. 1930.597
Dura No. unknown
Provenance unknown
Length: 318mm

A short shaft, complete but for the loss of the two vanes, which were housed in grooves. Made of Pine (Pinus sp.). The head is tapered for a socketed head.

20. Broken quarrel shaft with two vanes (Plate 2.7.V)
Yale No. 1931.590f
Dura No. unknown
Provenance unknown
Length: 425mm+

A slightly waisted shaft, broken probably just behind the socketed head; it was clearly tapering in towards the whittled point at the place of breakage. The shaft is facetted from knife shaping, and is badly insect damaged at the rear. It is slightly bent, probably due to pressure during burial.

The two vanes, originally housed in (?)saw-cut grooves, are both lost.
21. Broken quarrel shaft with two vanes (Plate 2.7.V)
Yale No. 1931.590e
Dura No. unknown
Provenance unknown
Length; 372mm+

Made of Ash (*Fraxinus excelsior*; probably identified by Prof. Record, *Rep.* VI 455). Like No. 19 it is slightly waisted, and seems to have had a socketed head attached, and snapped off, probably deliberately. Certainly it appears to be broken where it is tapering in to the point.

The two vanes, both lost, were housed in (?) saw-cut grooves.

22. Broken quarrel shaft with two vanes (Plate 2.7.W)
Yale No. 1931.590c
Dura No. unknown
Provenance unknown
Length; 443mm+

A heavy bolt, broken at the fore end. The two vanes, both lost, were housed in (?) saw-cut grooves.

23. Broken quarrel shaft with two vanes (Plates 2.7.W and AA)
Yale No. 1982.28.28
Dura No. unknown
Provenance unknown
Length; 292mm+

A heavily worm-eaten shaft, broken at the fore end. The horizontal stabilisers, now lost, may have been made from a single piece of wood as they were housed in a mortise which completely pierced the shaft. They are now lost.

24. Broken quarrel shaft with two vanes (Plate 2.7.W)
Yale No. 1929.434c*
Dura No. unknown
Provenance unknown
Length; 195mm+

*Likely, but not certain.

Both ends are burnt. The fore end is broken. The two flights, both now lost, were housed in grooves.

25. Broken quarrel shaft with two vanes (Plate 2.7.W)
Yale No. 1931.590j
Dura No. unknown
Provenance unknown
The fore end is broken. The two vanes, both lost, were housed in grooves which were almost certainly cut with a saw.

26. Apparently complete quarrel with socketed bodkin head
(not illustrated)
Yale No. 1931.590i*
Dura No. unknown
Provenance unknown
Length; (shaft)437mm; (with head)500mm

*This object is now in the Royal Ontario Museum, numbered 933.25.27. The following description has kindly been supplied by Dr. J. Hayes:

"Wrought iron head, hardwood shaft. Solid head, with a hollow expanding socket attached. Head four-sided, of elongated pyramidal shape. Socket rather longer than head, forming a slender ‘neck’ at junction, expanding conically to open end. Socket formed of a broad strip of iron, bent round in a circle, with an open seam (widening towards end) along one side. A nail (?) with flattened head hammered through socket close to open end (blunted or twisted on inside); a possible second nail-hole to the side of it.

"Accompanying shaft (loose), of close-grained wood, thickens gently towards butt end, with conically pared point (fitting inside head). Butt end pared down on two sides to form a flat tongue with thinnish square-cut end; the chamfered transitions to main part of shaft bear median slots, continued along either side of shaft for about one third of its length, to receive thin wooden fins (‘vanes’ - to stabilise the arrow). The remains of one fin are lodged in its slot...

"Head cleaned, somewhat corroded, with some losses and holes at end of socket. Wooden shaft complete (minor damage close to tongue?), split in two across middle (glue remains); fins missing apart from some remains in one slot. Wood well preserved.

"Head: L. 122mm, D. of socket c.18mm, solid head c.11mm square in section. Weight of head 57.4g. Shaft: L. 437mm, max. W. (tongue) 37mm. Weight of shaft 42.5g. Combined L. 500mm."

It is unclear on what basis this shaft and head are considered to be associated. The socket is unusually large, and is loose on the shaft. Indications from other examples (eg. No. 17) are that the heads were small and fitted tightly. I think it unlikely that the two objects really belong together, but proof one way or the other is unlikely to be forthcoming.

27. Broken quarrel shaft with two vanes (not illustrated)
Yale No. 1929.434f
Dura No. unknown
Provenance "Palmyrene Gate"*
Length; 378mm*

*Details from Yale catalogue card. This object was accidentally not drawn. My own photographs show...
that it is faceted, and worm eaten at both ends. However, its length seems to be effectively complete. The fore-end appears to preserve part of the tapered tip, and perhaps traces of bruising from fitting of a head. It originally had two flights, in grooves.

28. Complete quarrel shaft (Plate 2.7.AB)
Whereabouts unknown*
Provenance “Tower of the Archers”
Length 290mm
*Published Cumont, 1926, 260 and plate XCVII, 2. One of two published by Cumont (see also No.29).

Details drawn from the published account. Allegedly Tamarisk. Apparently this originally had two flights, housed in (?)saw-cut grooves. Both are now lost. Referring to this object, Cumont wrote:

“Au moins l’une des deux était coupée dans une autre branche de tamaris et fixée à la premiere par une cheville, enfoncee dans la tranche, et par un fil enroulé et enduit de colle.”
(Cumont 1926 261).

The published photograph clearly shows the square-cut end and the anti-split binding, which is probably shredded tendon soaked in glue. I suspect that Cumont may have been mistaken in thinking that the shaft was composite, and that the forepart was also of Tamarisk. The function of such a structure is difficult to understand. It seems more likely that the shaft was simply designed to take a tanged head. However, it may be that the socket has the remains of a wooden peg in situ (Cumont is unclear on this point). Without inspection of the object, certainty is not possible. Certainly composite bolt shafts were used in earlier times (see no.1 for references).

29. Broken quarrel shaft with two vanes (Plate 2.7.AB)
Whereabouts unknown*
Provenance “Tower of the Archers”
Length; 210mm+

*Published in Cumont 1926 260 and Plate XCVII, 1. One of two published by Cumont (see also No.28). Described as probably Tamarisk. Burnt at both ends. The two flights, with “swept” grain, are both largely intact.

30-38. “Wooden arrow shafts”* (not illustrated)
Damascus Museum Nos. 3444 to 3452

*On a record card at Yale, which also says “Nine arrow shafts from catapulta”. No further details.
Stone Artillery Projectiles (Plate 2.7.AF)

1. Carved gypsum artillery stone (Plate 2.7.AF)
   Provenance unknown
   Yale No. 1930.533c
   Dura no. unknown
   Diameter 70-75mm

   A carefully rounded stone of whitish gypsum, with chisel-marks.

   Stones identified as artillery projectiles are often found but little useful work has been done on them. Examples include Bar Hill (Robinson et al 1975) which produced 64 balls, 23 at c. 60mm diameter (weighing 350-400g), 18 at c. 80mm (650-750g), 24 at c. 100mm (c. 1000g) and 9 at c. 120mm (1500-2500g). For balls from Strasbourg, see Forrer 1917. For the Danube frontier, see Buciumi, Rumania (Gudea 1972 66).

2. Carved artillery stone (Plate 2.7.AF)
   Provenance unknown
   Yale No. 1930.533e
   Dura no. unknown
   Diameter 70-75mm

   A rough sphere carved from soft greenish stone. See no. 1 for parallels.

3. Possible artillery stone (Plate 2.7.AF)
   Provenance unknown
   Yale No. 1930.659
   Dura no. unknown
   Diameter 60-70mm

   This pebble of brown chert-like stone is clearly a hammerstone of presumed prehistoric date. It is presumably at Yale because the excavators thought it to be an artillery projectile. Indeed, it is ideal for the purpose, being much denser than the local gypsum, about the right size and shape, and probably prone to shattering on impact. It therefore may well have been reused by the garrison for this purpose.

   See no. 1 for parallels.

4. Possible artillery stone (Plate 2.7.AF)
   Provenance unknown
   Yale No. 1982.28.117
   Dura no. unknown
Diameter 80-90mm

Another chert-like hammerstone like no.3, perhaps reused as catapult ammunition. See no.1 for parallels.

5. Carved artillery stone (Plate 2.7.AF)
Provenance unknown
Yale No. 1982.28.114
Dura no. unknown
Diameter 60-70mm

A rough sphere carved from greenish stone. See no.1 for parallels.

6. Carved artillery stone (Plate 2.7.AF)
Provenance unknown
Yale No. 1982.28.115
Dura no. unknown
Diameter 70-75mm

Greenish stone with a rough surface lacking obvious tool-marks. See no.1 for parallels.

7. Carved artillery stone (Plate 2.7.AF)
Provenance unknown
Yale No. 1982.28.116
Dura no. unknown
Diameter 65-70mm

A whitish sphere without tool-marks. See no.1 for parallels.

8. Carved artillery stone (Plate 2.7.AF)
Provenance unknown
Yale No. 1930.661
Dura no. unknown
Diameter 80-95mm

A flattish sphere of white stone. See no.1 for parallels.

9. Carved artillery stone (Plate 2.7.AF)
Provenance unknown
Yale No. 1982.28.118
Dura no. unknown
Diameter 145-150mm

A larger white stone sphere. See no.1 for parallels.
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Procopius Bellum Gothicum
Tacitus Agricola
Tacitus Annales
Tacitus Historiae
Vegetius Epitoma rei militaris
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Abbreviations
Ant. J. Antiquaries Journal
AJA American Journal of Archeology
ANRW Aufstieg und Nidergang der Römischen Welt
BAR British Archaeological Reports
BJ Bonner Jahrbücher
BASOR Bulletin of the American School of Oriental Research
IEJ Israel Exploration Journal
Jahrbuch RGZM Jahrbuch des Römisch-Germanischen Zentralmuseums Mainz
JRS Journal of Roman Studies
MZ Mainzer Zeitschrift
ORLB Der Obergermanisch-Raetische Limes der Römerrechts, Abteilung B


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Published papers
A recent paper by M. Brok\(^1\) drew attention to valuable but hitherto neglected literary evidence for the use of incendiary projectiles in warfare in the Roman world. Widely used in siege warfare, fire-arrows and bolts were by the fourth century AD known as *malleoli*, a name originally applied to hand-thrown weapons\(^2\). No archaeological evidence for any of these projectiles was known to Brok when he wrote his paper\(^3\), so the reconstruction drawings he produced relied entirely on interpretation of the literary material\(^4\). The descriptions of fire arrows presented and translated by Brok\(^5\) agree that the special iron head employed consisted of a point and socket or tang connected by a number of bars, each bowed outwards to produce a spindle-shaped cage which would hold the inflammable material. The number of bars in the cage was not specified in the sources.

In fact, a number of objects usually identified as incendiary arrowheads have been known for many years, from two sites in Britain. One was found at Wroxeter\(^6\), and five at Bar Hill on the Antonine Wall (fig. 1).\(^7\) The latter vary between 52 and 60 mm in length\(^8\), while the Wroxeter example was somewhat larger. It was slightly damaged, but its preserved length is 31/4 inches (c. 82 mm). Each consists of three iron bars, joined at their ends but bowed outwards in the middle to make just the sort of cage described in the literature. However, they lack any definite point and are tanged, not socketed. Their identification rests largely on the fact that the five Bar Hill examples were found with seven of the typical Roman three-bladed and tanged iron arrowheads\(^9\). The absence of sharp heads on these objects is not a problem; the end is long and thin enough to lodge in, for instance, a wooden target. Their form corresponds closely to the type of lightweight fire-arrow described by Ammianus for use with a low-powered bow\(^10\). A very similar iron object was found at Tell Defenneh in the last century, but was not well dated\(^11\).

In 1980, while conducting research into the collection of weapons from Dura-Europos\(^12\), which are now mostly housed in Yale University Art Gallery\(^13\), the present writer came across the following iron object (fig. 2-3).\(^14\). It is clearly the head of a shafted weapon, with a socket and a small, flattish blade. It is 113 mm in overall length. The socket is c. 14 mm in internal diameter at the mouth, with a fixing nail 24 mm from the edge. The blade, c. 27 mm long, is, like the whole object, covered by a fairly thick layer of corrosion products but was certainly two-edged and probably had a lenticular cross section. Connecting the blade with the socket were three curved bars, c. 30 mm long and c. 8–9 mm in thickness, of roughly circular cross-section. They were not quite placed with radial symmetry around the central axis; two were splayed outwards slightly, towards the plane of the blade. The writer was not able to weigh the object.

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\(^{1}\) M. Brok, Ein spätrömischer Brandpfeil nach Ammianus. Saalburg-Jahrb. 35, 1978, 57 ff. – For other background references, see: The Incendiary Arrow – 480 BC to AD 1941. Journ. of the Soc. of Archer Antiquaries 3, 1960, 22–24. – The writer is grateful to D. Baatz for reading this paper in draft and making several valuable suggestions.

\(^{2}\) Brok, op. cit. 57.

\(^{3}\) Brok, op. cit. 57. He was aware of the depiction of an incendiary arrowhead in P. Connolly, The Roman Army (London 1975) 55, but the latter work contains no references; Brok, op. cit. 62 note 22.

\(^{4}\) Brok, op. cit. 59 Abb. 2.


\(^{7}\) G. MacDonald and A. Park, The Roman Forts on Bar Hill (Glasgow 1906) 116 fig. 42,2; A. Robertson, M. Scott and L. Keppie, Bar Hill: A Roman Fort and its Finds. BAR 16 (Oxford 1975) 99 no. 14 and fig. 32,14. – Thanks are due to P. Connolly for providing the photo of the arrowheads fig. 1.

\(^{8}\) Robertson et al., op. cit. (note 7) 99.

\(^{9}\) Atkinson, op. cit. (note 6) 225.

\(^{10}\) MacDonald and Park, op. cit. (note 7) 116.

\(^{11}\) Ammianus 23,4,14.

\(^{12}\) W. M. Flinders Petrie and F. Griffith, Nebesleh and Defenneh, in: Mem. of the Egypt Exploration Fund 4 (London 1888) 79 and pl. 38,7. Unidentified iron object c. 55 mm long. Several other fragmentary iron objects depicted in the report could also be from incendiary projectile heads, but are more likely broken caltrops (p. 77 and pl. 37,9–11).

\(^{13}\) Thanks to D. Baatz for this reference.

\(^{14}\) The projected Dura Final Report VI, The Arms and Armour, has never appeared. However, much information is to be found in the Preliminary Reports. C. Hopkins, The Discovery of Dura-Europos (New Haven and New York 1979) contains an up-to-date bibliography.

\(^{15}\) One of the sets of horse armour and some other objects stayed in Syria and are now in the National Museum in Damascus. The majority went to Yale where they mostly remain except for a number of pieces including the other armoured trapper which at the time of writing are on loan to the Higgins Armory Museum in Worcester, Mass.

\(^{16}\) Yale Art Gallery accession No. 1981. 62.31. See additional copy.
At the time, the present writer was not aware of Brok's paper, but by analogy with the British finds took this to be the head of an incendiary catapult-quarrel. The socket is the same size as those of the many pyramidal-tipped quarrel-heads found at Dura, and would readily accommodate the short wooden shafts from these projectiles which, remarkably, also survived at the site in some numbers. Fig. 4 shows a reconstruction of the complete projectile based on the head and one of the shafts now at Yale. It appears, then, that this fire-bolt was designed for use with light arrow-shooting artillery.

It is hardly necessary to note how closely the Dura weapon corresponds in construction with that described in the apparently third century text which is the centerpiece of Brok's article. This object, which also dates to the third century, is to my knowledge unique in the Roman world. That the only one should be found at Dura is, however, not surprising. The city was destroyed in a siege in which most, if not all of the techniques of ancient siege warfare were employed. Mines and countermines were dug, ramps raised, and at least on the Roman side, artillery was used on a considerable scale. The latter is witnessed by the large amount of catapult ammunition found, not only iron bolt-heads and wooden shafts, but also stone projectiles. To date, no trace of the machines themselves has been found in the collections. There is no evidence as to whether the Persian attackers used artillery at Dura, but in view of the sophistication of their siege methods there it is inconceivable that they did not, even if they only used captured weapons. Specialised weapons like the Dura incendiary bolt were specifically for siege warfare, to destroy the machines of the attackers or to fire the installations of the defence. Like many of the projectile heads from Dura this one lacks an exact provenance, so there is no way of telling whether it belonged to the defenders or was fired into the town by the besieging Sassanians.

It is certain that more examples of this special type of ammunition will be discovered, or, as at Yale, will be identified in existing collections.

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17) *op. cit.* (note 16) pl. 24,2. More than a dozen are preserved at Yale.
19) The siege of Dura was in or around AD 256. M. Rostowtzeff, *Res Gestae Divi Saporis* and *Dura. Berytus* 8, 1943, 48 ff.
20) See *The Excavations at Dura-Europos, Preliminary Reports*, especially Sixth Season, p. 188 ff., "the Persian mines", and the above mentioned Bibliography in Hopkins, *op. cit.* (note 13).
21) A number were found at the Palmynrene gate and in the citadel. Some are preserved at Yale.
22) The Persians certainly had artillery at the siege of Amida, but this took place a century later; Ammianus 19.2.3. Furthermore, the pieces used by the Persians during the siege of Amida had been captured from the Romans at Singara some years before; Ammianus 19.2.8.
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Chapter 7. BRITAIN AND THE LATE ROMAN ARMY

Simon James

1.1 Introduction

In recent years there has been increasing interest in the relationship between the Roman army and the Roman-British population, and especially in the question of the effect of the army's arrival on the pre-existing Iron Age social and economic structures. Less attention has been paid to the continued role of the army in these areas in later times, least of all in the fourth century. This is hardly surprising, as there is even less documentary evidence for the fourth century than there is for the first, but the question remains an important one. In the late Empire the army was of increased importance to the lives of the civilian population in a number of ways. Its influence was pervasive, and the impression from ancient and modern writers is that it was largely destructive in economic, social and political affairs (Jones 1964, 60f, 487f; Salway 1981, 294 etc.). Soldiers were trouble, robbing and abusing civilians, killing each other in civil wars and costing the Empire dear while failing to defend the frontiers. The latter point is encapsulated in a passage from Ammianus without which no paper on this subject would be complete. A Roman official, surveying the ruins of Amida, recently destroyed by the Sassanians, exclaimed: "Behold with what courage the cities are defended by our soldiers, for whose abundance of pay the wealth of the empire is already becoming insufficient". (Amm. XX, 11, 5).

The aim of this paper is to investigate whether this general picture is applicable to the specific case of Britain. While we can only speculate or extrapolate from elsewhere about levels of taxation and the behaviour of troops in Britain, we do at least have some evidence for the size and composition of the garrison, which gives us a basis on which to build. The evidence is considered in part 2, its implications for the broader question are discussed in part 3.

1.2 Current views on the impact of the army in the fourth century

The following comments are to be found in recent books on Roman Britain:

"The forces in fourth-century Britain could have been considerably larger than those listed in the Notitia chapters [our best source, discussed in part 2], and a considerable drain on the agricultural population, who were committed to supply the annona for this large force guarding their frontiers."
"On the other hand, the army was a large and available consumer market for all forms
of supply. At the lowest level, the necessity for
arms and clothing meant that there was always an
outlet for the thriving wool and cloth trade." (Johnson 1980, 27).

"From 383 the rate of decline in Britain
became more precipitous, partly because a con­
siderable reduction in garrison strength caused
less money to circulate." (Wacher 1978, 262).

"The withdrawal or dissolution of the regu­
lar army dealt [mass-production industry] a tre­
mendous blow as contracts ceased to be honoured
or large purchases made." (Salway 1981, 661).

These extracts reflect the current consensus, namely that the
British army was still large down to the late fourth century, and
continued to be a major economic force within the diocese. The
collapse of the Romano-British economy is at least partly blamed on
the withdrawal of the bulk of these troops in the twenty-five years
starting in 383.

The basis of this view of the army is examined in part 2.1, and
a very different model, of a small army and no massive late fourth
century withdrawals, is proposed (part 2.2).

2.1 The size of the garrison; current views

The socio-economic impact of a standing army is partially a
function of its size, and we do have some data pertaining to the
numbers and composition of the diocesan garrison. We possess a
relatively good archaeological picture of fourth century military
stations in Britain, and better, there are the detailed lists of
regiments deployed in the island, preserved in the Notitia Dignitatum
(Seeck 1876). This curious document, dating to the early fifth
century, contains apparently complete lists detailing the composition
of all the provincial garrisons and field armies scattered around the
Empire. The British lists cannot be precisely dated, but it seems
safe to place them sometime around the end of the fourth century
(Holder 1982, 19). They are unlikely to represent a coherent picture
of the garrison at one particular moment, as it is possible that
several units are listed under two commands simultaneously, repre­
senting transfers not properly recorded (Jones 1964, appendix II,
Table III; Hassall 1977, 9). If this is the correct interpretation,
then the lists were being amended, incompetently, for some time after
their original compilation.

Virtually the only attempt to discuss the size of the late Roman
army in detail, on the basis of the Notitia lists, was that of A.H.M.
Jones (1964, 680ff and appendix II; for Britain, cf. p. 683). The
Notitia lists regiments, but not their strengths. Jones assumed that
auxiliary unit strengths had not changed significantly since the
Principate (1964, 680) so he applied a notional figure of 500 men to
surviving cohortes and alae, and to new formations such as vexilla­
tiones, auxilia, numeri, cunei, and those simply labelled milites.
In the new field army, the comitatenses, legions seem to have been about a thousand strong, but Jones somewhat arbitrarily assessed the old legions, now part of the frontier army or limitanei, at 3000 men allowing for the known late Roman practice of permanently detaching vexillations from them (1964, 681). Applying these notional strengths to the lists, Jones suggested that the British garrison consisted of about 28,000 frontier troops, under the dux Britanniarum in the North (NDoc.XL) and the comes litoris Saxonici in the South (NDoc.XXVIII). The size of the other British command, the small field army of the comes Britanniae (NDoc.VII, 153-6, 199-205) which consisted of two field army legions, one other infantry formation and six squadrons of cavalry, amounts to a nominal total of 5,500 men. However, at least one of these units may be the same as another listed in the Saxon Shore command, in which case it is counted twice (Equites Stablesiani Garrianonenses, NDoc.XXVII, 17 and Equites Stablesiani, NDoc.VII, 203; Hassall 1977, 9). However, this cannot be proved, so the list is here taken at face value. The British army of the late fourth century may therefore be estimated at 33,500 men.

While this is still a substantial force, it does represent a major decline in the strength of the garrison from its second century levels (Jones 1964, 59). A recent estimate for the garrison in AD 150 suggests a force a little in excess of 50,000 men (from Birley 1981, 40ff: the figure is derived from the list of attested units compiled by Holder, and applies to a period when unit strengths are more certainly known; it is likely to be accurate to within a few thousand). This suggests a decline of around 40% between the mid second and later fourth centuries. However, it is usually thought that the Notitia lists refer to the period in which the British army was rapidly dwindling around the turn of the fifth century, and that earlier in the fourth the garrison was larger, perhaps substantially so (e.g. Jones 1964, 58; Johnson 1980, 27). It is also generally believed that the small field army of the comes Britanniae was a late addition, probably sent by Stilicho (Mann 1979, 148; Breeze 1982, 156; Holder 1982, 100). This seems a reasonable assertion because as late as the 360s trouble in Britain necessitated despatch of comitatenses from Gaul (Amm. XX, 1, 1; XXVII, 8, 7). Ammianus mentions both frontier commanders in his account of the events of AD 367, but not the field army commander. These facts imply that there was no standing force of comitatenses in Britain before 367. The lists of troops under the comes Britanniae were updated if not created after 395, as they include a regiment named after Honorius (Equites Honorianani seniores; NDoc.V, 202). In any case, establishment of permanent detachments of comitatenses under comites rei militaris on a regional basis is a late fourth century development (Frere 1974, 237; Holder 1982, 100).

Britain's field army then, was probably a small, short-lived, late arrival. It may itself have been a stopgap measure to compensate for earlier large-scale withdrawals of limitanei. Whatever the truth, it seems that typically the garrison of fourth century consisted entirely of second-rate frontier regiments. Except in emergencies, comitatenses were absent.

Various lines of evidence seem to suggest that there had been many more troops in Britain in the early and mid fourth century than there were at the time of the Notitia. The absence from the lists of
any mention of forces in Wales or the North-West is held to be significant, as many sites in these areas have evidence of late occupation (Johnson 1980, 27). It has even been suggested that there had been an entire Saxon Shore-style command on the West coast, which had been disbanded before the Notitia was compiled (Jarrett 1964, 61; 1968, 90; but cf. Dornier 1971).

In addition to fort sites, finds of military equipment, largely belt fittings, on town and villa sites have led to suggestions of detachments protecting civilian centres. Urban garrisons are postulated, (e.g. Salway 1981, 330, 390), at least from the Theodosian restoration (Wacher 1978, 59), especially on the grounds that only trained soldiers could man the improved defences of the towns, many of which were getting new projecting interval towers, allegedly as a result of the events of 367. These are often taken to imply the presence of artillery, and therefore trained army artillerymen (Wacher 1974, 77f; Webster 1983). We must also include the troops in the Yorkshire signal stations and the possible lines of fortified road stations identified on Watling Street (Webster 1971) and elsewhere (Johnson 1980, 91).

Taken at face value the Notitia, the historical background and the archaeology all seem to point towards a diocese which, for most of the fourth century, was swarming with troops. The garrison may have been gradually sinking from its second/early third century levels, mainly as a result of 367 and perhaps due to its involvement with the revolt of Magnentius in the 350s, but was only down by 40% even after the disastrous withdrawals made by Magnus Maximus in 383, the commonly accepted context for the evacuation of the Welsh and north-western garrisons (Frere 1974, 234; Wacher 1978, 59; Salway 1981, 404) and removal of XX Valeria Victrix from Chester (Frere 1967, 235; Salway 1981, 404). Thereafter, despite the arrival of the comes Britanniae and the new field force, the collapse was rapid, with further withdrawals by Stilicho and then by Constantine III in 407 (Holder 1982, 19).

At best then, the British garrison was in gentle decline in the fourth century, a process which contrasts strongly with the trend of expansion seen in the army as a whole. Britain was indeed a military backwater, declining in operational importance relative to the Rhine and Danube. A garrison even in gentle decline is, in context, a sign of serious neglect by comparison with what was happening in Gaul or Pannonia.

2.2 The size of the garrison; an alternative view

This rather detailed picture is in fact based on little hard evidence, and derives from a somewhat superficial treatment of the archaeological and documentary sources. A reconsideration of the material in the light of recent scholarship allows the existing consensus to be seriously challenged.

Over the last two decades there has been a growing realization that the regiments of the late Roman army in Britain were not as large as previously thought. But as yet there has been little attempt to follow the implications through. The new work has not percolated through to general discussions about the diocese, which,
as the quotations in part 1.2 reveal, still assume a substantial military presence. The following discussion uses the new evidence to construct an alternative model of the garrison, which, it is proposed, was nowhere near as large as is usually thought. It is argued that there were few troops in the province throughout the century, and that the idea that there was a catastrophic collapse in numbers after 383 is a myth. This is not difficult, given the fragmentary nature of the meagre evidence. The proposed model also relies on inference, but at least has the virtue of being in better harmony with the currently available data.

The most important evidence for the size of late regiments in Britain comes from Hadrian’s Wall. A number of forts have fourth century barrack blocks which do not consist of the traditional blocks of double rooms but rows of individual huts, usually referred to as chalets (Wilkes 1966, 130). In his initial discussion of these barracks, Prof. J.J. Wilkes suggested that they indicated a reduction of some 40% in the size of garrisons on the basis of the decline from ten to six rooms per block at Housesteads (1966, 130, 136). Most writers now identify these as soldiers’ married quarters, largely on the basis of trinkets found in the chalets at Housesteads, and child burials within the walls at Chesters and Malton in Yorkshire (Mann 1979, 147; Daniels 1980, 190; Holder 1982, 98; Breeze 1982, 156, 158). Intramural burial of infants is an especially strong indicator that families were now living in the forts. If each chalet really did house a soldier and his family, then a dramatic reduction in unit size is implied. Instead of the 500 men assumed by A.H.M. Jones for these wall forts the actual complement would be less than 100 men. Daniels suggests figures as low as 80 men at Housesteads, 10% of the original military cohort strength, and perhaps 8.5% of the third century complement at Wallsend (1980, 190f).

Hadrian’s wall was largely manned by old cohortes and alae. The hinterland was largely garrisoned by new units such as cavalry vexillations. These regiments probably arrived under Constantius I and Constantine. They include the Equites Crispiani, named after Constantine’s son Crispus (executed in 326; NDOc. XL, 20; Holder 1982, 98). They might have been around 500 strong when they arrived, and it has been argued that they are unlikely to have shrunk much thereafter (Holder 1982, 99). This is questionable, given Constantine’s massive diversion of manpower to the field army, which in my opinion is unlikely to have passed these relatively high-ranking units by (Zosimus II, 34). In this connection, it is significant that chalets are not confined to the old garrisons on the wall itself. They occur at outpost forts like High Rochester and Risingham (Daniels 1980, 176, 181), and hinterland forts as well. They are almost certain at Malton and have been claimed at Segontium (Daniels 1980, 181). The forts of the Saxon Shore have produced virtually no evidence of barrack design, but Portchester, the best explored and probably base of the Numerus Exploratorum (NDOc. XXVIII, 21; but see Cunliffe 1975, 430f.) has produced an assemblage of material more suggestive of ordinary domestic than military life. From the shoes, jewellery and other finds it is clear that women and children lived in Saxon Shore forts too. In the light of this, it seems reasonable to assert that it was standard practice among all the regiments of the British limitanei for families to live in forts, and that the regiments must therefore have been very small, perhaps around 100 men if not smaller.
There is supporting evidence for such small frontier units from other parts of the Empire. Duncan-Jones has produced evidence from various sources for cohortes of a hundred or even fifty men in the East (1978, 553f.). Synesius of Cyrene records that the most effective regiment in the province was only forty men strong (Epistulae 78, AD 411; Tomlin 1979, 265). Small units were not confined to unimportant provinces. Recent research, including unpublished work by Mark Hassall, has indicated the same phenomenon in the forts on the Rhine and Danube where the garrisons are known from the Notitia. Many of the fourth century stations, either on new sites or erected within earlier forts, are too small to hold more than a few score of men. For example, Eining, base of Cohors III Brittonum (NDoc.XXXV, 25), was in the fourth century reduced to only c.10% of the area of the old auxiliary fort. Bburgle, Pinianis, held by Cohors V Valeria Frygum (NDoc.XXXV, 29) had space for a century at most, and Iany, as a cavalry fort, could not hold more than two turmae (Johnson 1983, 53f.). Intercisa, an old auxiliary fort, was able to hold no less than three late cavalry regiments (Cuneus Equitum Dalmatarum, Cuneus Equitum Constantianorum and Equites Sagittarii; NDoc.XXXIII, 25, 26 and 38). There are many other examples. The case of Intercisa also suggests that new units as well as old cohortes and alae could be small. This is confirmed by documentary evidence for a unit of Equites Sagittarii in Egypt only 121 men strong (Duncan-Jones 1978, 548).

Returning to Britain, and the legions of the diocese, it has been pointed out that the Notitia records Legio II Augusta at Richborough (NDoc.XXVIII, 19), a fort which certainly could not have held more than a fraction of the original 5,000 or 6,000 men of the unit (Frere 1974, 236; Holder 1982, 98). It could not accommodate much over 1,000 men assuming dependants lived outside the walls (Duncan-Jones 1978 534). Richborough is only 12% or one eighth the area of Caerleon legionary base. Jones' estimate of 3,000 men is clearly too high, and in any case 1,000 men compares well with the size of contemporary field army legions (Jones 1964, 681f).

Applying revised estimates to the Notitia lists, taking 1000 men for the legions and 100 for other units of limitanei, we arrive at totals of 4,600 men under the dux (ignoring missing entry NDoc.XL, 46; Seeck 1876), and 1,800 men in the Saxon Shore command. The total of 5,500 assigned to the comes Britanniae in the earlier estimate may be allowed to stand as these are all taken as field army troops, and comitatensis regiments were maintained at higher levels of manning, on the evidence of literary sources (cf., for example, cases quoted by A.H.M. Jones 1964, 681f.; Holder 1982, 99). This suggests that the British army was only about 12,000 strong at the end of the fourth century.

We have seen that a number of writers believe that the garrison was bigger earlier in the century, and it is true that one branch of the military establishment is missing from the Notitia. No British-based naval forces are recorded. They obviously had existed in the late Roman period. References to marine operations appear in a number of sources, and Vegetius describes camouflaged British patrol craft (pictae) used for intercepting raiders (Vegetius 4, 37). The
Notitia records the stationing at Paris of the Classis Anderetianorum (NDoc.XLI, 23), a flotilla named after the Saxon Shore fort at Pevensey. This provides evidence for the transfer of naval units out of Britain before the time of the Notitia and also shows that at least one Saxon Shore fort had a squadron of ships based on it besides its land garrison. (An infantry unit also named after the Pevensey base, the Milites Anderetiani, NDoc.XLI, 17, may have been the original garrison alongside the classis, and was also transferred out of the diocese at some time before the end of the century.) It may be that all the forts originally had such pairs of units based on them. Such a dispersed deployment of ships as well as soldiers makes sense given the length of coast to patrol and the inability of ancient ships to stay at sea for prolonged periods. The complexities of controlling such a straggling joint land and sea command might also explain why it was under a comes rather than a lower ranking dux. Whatever the case, it is clearly likely that Britain once had a strong naval arm which had gone by the time of the Notitia.

These examples, and the case of the Seguntienses, evidently once the garrison of Caernarvon which by the time of the Notitia had been transferred to Illyricum (NDoc.V, 213), show that units had indeed been transferred out of the diocese.

The garrison might also have been much larger if unit sizes were run down to the levels suggested here only late in the fourth century. But chalets were already in use on Hadrian's Wall in the early years of the century (Wilkes 1966, 128ff.). This may be taken to indicate that the reduction had taken place by that date, a conclusion independently confirmed by documentary evidence which seems to show that small regiments existed in Egypt under the Tetrarchy (Duncan-Jones 1978, 548f.; for an ala of under 120 men, a cohort of 164 men and a unit of Equites Sagittarii 121 strong, mentioned above).

We must also consider the other troops, not mentioned in the Notitia, like town and villa garrisons. Firstly, provision of external towers on city walls does not automatically indicate that artillery was installed. Projecting towers were mainly for enfilading the walls, with bows or hand-hurled missiles. Their appearance need not imply that regular troops were being deployed to man them; indeed, the opposite case is equally persuasive, namely that the addition of towers allowed effective defence with less well-trained men, even citizens armed with hunting bows and stones. If cities had regular garrisons, why do these not appear in the Notitia? Odd finds of crossbow brooches and belt-fittings belonging to military uniforms are explicable in other ways. For example, field army troops were normally billeted in towns, so it is likely that on the occasions when they were present in Britain they spent time in the cities and could have deposited equipment in them. Perhaps the most likely example of this is Catterick, where some buildings seem to have been converted to military use late in the fourth century. Weapons and other items of military gear were found in them (Wacher 1971, 171ff.). Odd pieces could also have been deposited by troops on leave (legal or otherwise), in transit or deserting. The well-known Lankhills burials probably do represent soldiers resident in the town, but they could have been guarding a state clothing factory rather than the town per se (NDoc.XI, 60; Johnson 1980; Clarke 1979,
Finally, military uniform need not indicate troops at all. Civil servants also wore it in this period, as their service ranked as militia (Tomlin, 1976, 191; Johnson 1980, 97f.; Salway 1981, 387, 410). One would expect to find such officials in the towns, and indeed in villas; middle and upper-ranking civil servants are quite likely to have been villa owners. If villas had to be garrisoned, why were they not fortified? There is adequate reason to doubt the existence of standing garrisons in Romano-British towns and villas.

We have already seen that a large area of Britain, Wales and the North-West was ungarrisoned according to the Notitia, even though many fort sites have fourth-century occupation and there were even some new foundations such as a Saxon Shore-style fort at Lancaster. The Seguntienses provide at least one case of a unit transferred out of the area. The forts were allegedly evacuated by Magnus Maximus, who is also supposed to have removed the XXth legion from Chester (see above). Against this view, it must be said that the character of occupation of a fort is very difficult to prove. Military equipment is rare on late sites. It is often impossible to decide on archaeological grounds whether occupation is civil or military (Johnson 1980, 86). In the fourth century, the distinction is increasingly blurred, and proof of military occupation really depends on discovery of appropriate inscriptions, very rare at this period. In fact, for most sites in Britain, including for instance Portchester, the only unequivocal evidence that they were still official military stations is the entry in the Notitia (R. Reece, pers. comm.). The material evidence from Portchester may be interpreted as representing "a basically civilian community, among whom were billeted a small militia" (Cunliffe 1975, 427). Archaeological evidence suggests that by the time of the Notitia, Lympne may not have been garrisoned at all, despite its inclusion in the Saxon Shore list (ND0C.XXVIII, 15; Cunliffe 1980, 287ff.).

While it must be accepted that some units did leave during the fourth century, it may be asked whether all these forts in the West really did have garrisons at all (as opposed to civilian squatters). If they did, were these all transferred out or merely redeployed within the diocese to stations mentioned in the Notitia? If they were all removed, what is the evidence that they went in 383? The latter is discussed below, but to illustrate the flimsiness of the current view let us take the case of the XXth legion, supposedly the most important of the withdrawals made by Magnus Maximus. In fact, the latest evidence for its existence, let alone its presence in Britain, are coins of Carausius, almost a century before the time of Maximus (RIC Carausius 82, 83, 275). To count the legion as part of the late garrison, and attribute its departure to Maximus is guesswork. It might equally have been destroyed or removed under the Tetrarchy, or at any other time before the late fourth century.

Even if we assume that all the forts in Wales and the North West with late occupation had been garrisoned by units withdrawn before the Notitia was compiled, then on the new strength estimates this would still only add a few thousand to the 12,000 or so of the Notitia, many of whom were in any case recently arrived field army troops.

Given these observations, it may be claimed that the regular
garrison of Britain was small, under 20,000 and possibly under 15,000, throughout the fourth century, and that the real collapse in numbers belongs not to the period of Maximus and after, but much earlier, to the third century.

There is evidence that the garrisons of the North were very severely depleted in the later third century. Many of the forts south of the Wall were abandoned (Mann 1979, 146; Breeze 1982, 146), while the units on the Wall itself were probably run down to the levels suggested by the chalet accommodation of the early fourth century. Less is known of the fate of the legions, especially VI Victrix at York (Ramm 1971), but the well-explored bases of II Augusta and XX Valeria Victrix show parallel developments. Both Chester and Caerleon were being run down in the second half of the third century, as barracks and other buildings were demolished and not replaced (Jarrett 1964, 63; 1968, 88, 90; Boon 1972, 61ff; Strickland and Davey 1978, 28; Strickland 1981, 428, 433f.). This indicates that large parts of the legions were away and not expected to return, at least in the foreseeable future.

The explanation of the disappearance of so many troops is not hard to find. Britain, generally peaceful during the third century, was being used as a source of badly needed reinforcements to fight in the almost continuous foreign and civil wars raging across the Empire. There is direct evidence for vexillations of II Augusta, XX Valeria and probably VI Victrix as well as auxiliaries being despatched to the Continent (CIL XIII, 6780 of AD 255 and CIL III 3228 = ILS 546). As Prof. Anthony Birley pointed out at the conference, these troops are unlikely ever to have returned, because the foundation of the breakaway Gallic Empire prevented it. It is quite feasible that most of II Augusta and VI Victrix and the whole of XX Valeria had been withdrawn bit by bit before the accession of Constantine. With the remains of II Augusta at Richborough, there is no reason to believe that either Caerleon or Chester were still legionary bases by that time (Jarrett 1964, 63; 1968, 90; Strickland 1981, 433f.). How many troops were left in Britain by AD 300 is unknown, but it is unlikely to have been over 20,000. The new regiments which are supposed to have arrived in the wake of the suppression of Allectus and the Constantian restoration, including the new cavalry vexillations, can have done little to restore numbers if they were as small as seems likely after the army reforms of Constantine. Further units continued to arrive thereafter, for example the Numerus Sol ensium, the Numerus Pacensium and the Numerus Nerviorum Dictensium, (NDOc.XL, 23, 28 and 29). These have been attributed (on no hard evidence) to the Theodosian restoration, probably as replacements for troops destroyed in 367 (Holder 1982, 19, 132). Likewise, the permanent field force of the comes Britanniae is envisaged as replacing units rather than increasing the army.

The available evidence, then, is explicable in terms of a garrison reduced to some low figure in the later third century, say between 10,000 and 20,000 men, and staying in that bracket throughout the fourth century due to attrition and withdrawals on the one hand and occasional reinforcements on the other.

If this is so, how did Magnus Maximus and Constantine III find enough troops to mount their expeditions to the Continent? These two
usurpers, along with Stilicho who, according to Claudian, withdrew a legion (de bello Gothico, 416-8), are credited with removing the bulk of the garrison. According to the views expressed here, there was no large army for Maximus and his successors to take. The answer to this is that the operations of Maximus and Constantine need not have involved the British limitanei in any active role at all. Firstly, it is sometimes assumed that Maximus was dux Britanniarum (Frere 1974, 404), and that therefore the troops he took across the channel will have been mainly limitanei. In fact, we do not know what command he held in Britain. He could easily have been a comes rei militaris (Johnson 1980, 101; Salway 1982, 402), in charge of an expeditionary force of Gallic comitatenses, like Count Theodosius sixteen years earlier. He seems to have been campaigning against the Picts and Scots, and defeated them in 382. Such a command is also a more credible power base than a lowly ducate for an attempt at the purple. Under these circumstances, Maximus would have had little use for the local forces, which I envisage as fairly sparse and too poorly trained or equipped to pitch against hostile comitatenses. They would have been better employed staying put and simply holding the diocese for the new emperor, while he tried to win over the rest of the field army. On this model, Maximus only took out the troops he arrived with.

Claudian records that in 401-2 'the legion...which was set to guard the furthest Britons, which curbs the fierce Scot and while slaughtering the Pict scans the devices tattooed on his lifeless form' joined Stilicho to take part in campaigns against the Goths (de bello Gothico 416-418). The obvious temptation is to identify this legion with VI Victrix from York, but this is of course pure surmise. To my knowledge this is the only evidence for troop withdrawals made by Stilicho. The creation of the field army under the comes Britanniae, often attributed to him, might indeed have been to compensate for large withdrawals of limitanei. It might instead have been a net reinforcement in the face of increasing military pressure on the diocese.

Finally, we have no indication of the scale of Constantine III's expeditionary force, or its composition. It might not have included any British limitanei at all. The troops he took could have been just the field army. This was apparently largely composed of Gallic comitatenses who had only been in Britain for a few years, perhaps having originally been sent by Stilicho for a campaign against the Picts and Scots (Frere 1974, 406f.), but subsequently becoming a resident force. Their natural desire to defend their homeland may explain the apparent eagerness of the British army to intervene in Gaul in the wake of the barbarian invasions of 406 (Frere 1974, 408). Once in Gaul Constantine consolidated his strength by taking over units left leaderless by the onslaught of the invaders (Salway 1981, 428).

Clearly it is possible to construct a viable model for the history of the British army in the last decades of its existence which does not require massive withdrawals of the standing garrison. Our meagre scraps of information are equally consistent with the limitanei remaining untouched (except perhaps for Claudian's legion) because they were no use for serious campaigning, while the actions of Maximus and Constantine III may be explained in terms of the
comings and goings of Gallic comitatenses.

2.3 The defense of Britain in the fourth century

Here then is an alternative to the current myth of a large regular army in the later period and massive withdrawals at the end of the fourth century. In its place is proposed an alternative myth, that of a small army and few withdrawals, because most of the soldiers had left a hundred years before. If the known facts may be made to fit in with this deliberately extreme alternative interpretation, it may be objected that it is inherently unlikely. The obvious stumbling-block is that it took 50,000 men to hold and defend Britain in the second century, while it is suggested here that two hundred years later perhaps 10,000 or 20,000 poorly trained limitanei did the job with the additional problem of coastal defence as well.

However, we have only been discussing the number of regular troops normally deployed in Britain. In operational terms the garrison did not stand alone. The field army in Gaul could and did act as a strategic reserve for emergencies. There are a number of known cases of comitatenses being despatched to the diocese when the garrison could not cope. This happened at least twice in the 360s alone (Amm. XX, 1, 1, AD 360; XXVII, 8, 7, AD 367). Other likely occasions are Constans' winter visit of AD 342-3 (Amm. XXVII, 8, 4), the service of Valentinian's father Gratian as comes of an unspecified command in Britain around the middle of the century (Amm. XXX, 17, 3) and, as we have seen, perhaps Maximus' operations in the North in 382. A further expedition probably took place under Stilicho (Frere 1974, 406f.).

The late Empire supplemented purely military defensive measures with diplomacy and the payment of subsidies to barbarians. It has long been thought that the Roman authorities cultivated friendly relations with the peoples immediately north of Hadrian's Wall, so that the Votadini and others acted as buffer states between Roman territory and the Picts (e.g. Frere 1974, 405f.). This view has been questioned, as the slender evidence we have is at least as consistent with conflict as with cooperation (Salway 1981, 386) but it would be surprising if the Romans did not strive to reduce pressure on the frontier with such treaties and bribes as were used elsewhere.

There is also the widespread belief that defence of areas of Wales was handed over to local chieftains so as to free troops for service elsewhere. This is usually attributed to Magnus Maximus (Frere 1974, 406). If this really did occur, it would further augment the military defences.

Finally, there is the notorious question of the use of barbarian laeti and foederati to supplement the regular army in Britain. Employment of large numbers of foederati, i.e. allied barbarian groups of dubious loyalty serving under their own rulers, is a phenomenon which becomes important after our period, and is unlikely to have had much significance in Britain. Laeti, barbarians settled in Roman territory and given land in return for military service, were around much earlier. Magnentius is said to have been the son of a laetus settled in Gaul (Frere 1974, 389). There is no direct evidence that laeti were present in Britain (Johnson 1980, 97), and the
idea is somewhat out-of-fashion since the realization that fourth century animal-style belt fittings are not of Germanic but of Roman manufacture (see above). The Notitia lists settlements of laeti in Gaul but breaks off before reaching Britain (NDOc.XLII). The list is sometimes said to be mutilated, so it is not known whether there was originally a British section. In fact, it would be surprising if there were no laeti in the diocese, as Britain was something of a dumping ground for captured barbarians at various times, starting with the sending of 5,500 Sarmatian cavalry in AD 175 (Cassius Dio 71, 16, 2). Closer to our period, Probus sent over large numbers of Vandals and Burgundians who performed some kind of military role on the island (Zosimus 1, 68, 3). Allectus had large numbers of barbarian troops (admittedly described as mercenaries, but by a very partisan source; Pan. Lat. viii (v), 16, 2), while Ammianus records 'a large and strong force of Allemani' in Britain in AD 372 (Amm. XXIX, 4, 7). There is, then, direct evidence of substantial numbers of barbarian troops, of uncertain official status, stationed in Britain at various dates. As such forces are not included in the Notitia army lists, they are likely to have been laeti and as such largely self-supporting, supplementing the regular army without adding significantly to the military budget.

The defences of late Roman Britain were more substantial than the Notitia alone leads one to believe. On the other hand, it may be asked whether Britain really needed 50,000 men for defence in the mid-second century. Compared with the size of many nineteenth-century colonial armies in relation to the scale of their task, this is a very high figure, notwithstanding differences in military technology. Such a large number of troops may have been maintained because some conquered areas were not fully pacified and it was expected that further advances were to be made, for example in Scotland. Up to the time of the Severans, the army was kept at high levels ready for offensive action.

It may be that trouble in the fourth century was frequent, but mostly on a relatively small scale, especially coastal raiding. Even the disaster of 367 (assuming Ammianus was not exaggerating to enhance the image of count Theodosius, the reigning emperor's father) may have been a minor affair by comparison with events on the Rhine and Danube. After all, an expeditionary force of only four regiments, 4,000 men at most, was decisive, suggesting that fairly small forces had crossed the wall - and met limited resistance from a thin garrison. Britain was insulated from major incursions around most of her perimeter by the sea. The short land frontier was guarded with a concentration of units which compares favourably with that seen on the Rhine and Danube at the time. For the most part, the defences were reasonably adequate, as the prosperity of at least the upper strata of fourth century British society confirms.

3.1 The army, taxation, finance and trade

The third part of this paper looks at the impact of the regular army on the diocese. Little specific attention has been paid to this question. The extracts quoted in part 1.2 reflect the prevailing view that the garrison was large, and still a powerful economic force.
They also make a number of assumptions about the role played by the army in the functioning and fate of the diocesan economy. The detailed questions of military contracts and the link between coin circulation and the presence of troops are matters for others to discuss. Of concern here are the general points to emerge from these quotations, namely that the British economy was largely dependent on the continued presence and spending power of a large garrison, and that the disappearance of the latter was largely responsible for the collapse of the former.

A more detailed model of this economic role has recently been presented by John Mann. He contrasts the underdeveloped highland military zone with the productive lowland civil zone;

'Throughout the Roman period, the organization of cities in the lowland zone must have meant a nett outflow of revenue from that area to the Roman authorities. The main taxable resources of Britain lay in the lowland zone, and cities were organized there precisely to ensure that the maximum revenue was extracted at the minimum of cost to Rome; the cities had to organize the collection of taxes to Rome at their own expense...'

‘In the military zone, the situation was precisely the reverse. The continuous payment of troops in the frontier area by Rome represented in effect a continuing subsidy of that area. The resulting economy was completely artificial, and must have been accompanied by an equally artificial increase in population. Thriving settlements grew up at every fort, economically dependent on the pay of the troops. Once the payment of troops ended with the end of Roman control, so the whole artificial economy collapsed.’

(Mann 1979, 150ff.).

This view has recently been echoed by Evans, who has seen 'the economic collapse of the frontier zone, which had relied on the permanent subsidy of army pay' as a direct result of the withdrawal or disbandment of the Northern garrison at the end of the fourth century (Evans 1983).

While the model is valid for the first to third centuries, there are difficulties with it for the fourth. There can be little doubt that such subsidy as there was must have been much reduced in the late Roman period, if only because the troops there were limitanei who, it is thought, were poorly paid and supplied (Jones 1964, 653ff.). This reduction will have been far more dramatic if the surviving units were reduced to 20% or less of their original strength as suggested above. With the switch from disposable cash pay towards payment mostly in kind, from the late third century the subsidy to the military zone will have virtually vanished. Other explanations must be sought for the region's supposed prosperity during the subsequent hundred years. Perhaps after the initial military impetus, the economy of the region became largely self-
sustaining, as in the South (R. Reece, pers. comm.). The establishment of the civitas Carvetiorum might be a manifestation of this success.

It is easy to see Mann's model in purely British terms; the productive South subsidised the North and West via the net export of tax revenue from the former to pay the soldiers in the latter. However, this is to ignore the overall structure of the imperial taxation system. Both in theory and in practice, provinces did not support their garrisons in isolation, because all provinces, including those without garrisons, contributed taxes to the fisc. These taxes were, and still are, equated with army pay. For example, Cerealis, addressing the Treveri and Lingones: 'Stability between nations cannot be maintained without armies, nor armies without pay, nor pay without taxation' (Tac Hist 4, 74). As Birley has remarked;

'The Severan lawyer Ulpian defined tributum, tribute or 'direct' taxes, in terms of army pay: 'and indeed it is called tributum because it is contributed to the soldiers' (Digest 50, 16, 27)

The etymology may be false, but that is immaterial. The relationship between army and taxes was often noted in antiquity, generally in an unfriendly spirit' (Birley 1981, 39. See also the passage from Ammianus quoted in part 1.1).

It is usually said that maintenance of the army was by far the biggest single area of revenue expenditure. The sources, such as they are, do indeed suggest, or even state that it was the largest item on the imperial budget (Birley 1981, 39; Hopkins 1980, 117). This is not to say that it took the majority of state revenue, although that is often thought to be the case. Recently, Hopkins has attempted to estimate the income of the state and the cost of the army in AD 70 (1980, 117ff., 124ff.). The arguments are persuasive, although Hopkins is the first to admit the wide margin of error in his calculations. With this caveat, his figures suggest a state income of around 800 million HS per year, with the army of 300,000 men costing over 400 million HS, i.e. roughly half the budget. Whatever the true proportion, I would argue that it was rising and continued to do so, since while there is apparently no evidence for major increases in rates of tax or in the taxed population (Hopkins 1980, 123), it is almost certain that the size, and therefore the cost of the army had risen significantly by AD 150. Birley has recently published detailed estimates for its size at that date (1981, 40ff.). These are based on units known or reasonably believed to have been in existence in 150 and are therefore unlikely to be far out. They suggest an armed force of well over 400,000 men, approaching 50% more than Hopkins' figure, pushing the estimated cost of the army, taking Hopkins' parameters, towards 600 million HS. This figure is even more likely to have constituted the majority of expenditure.

The bulk of the tax revenue raised to pay for this came from the relatively wealthy and populous provinces of the interior, such as southern Gaul, Spain, Africa, Egypt, Asia Minor and Syria. But if the majority of it went on army pay and supply it was spent where the
army was, in the poorer provinces on the frontiers. The result was the same as that postulated by Mann for Britain, but on a far larger scale; a net flow of wealth from the 'core' provinces to the periphery. The implications of this phenomenon have been much discussed, in terms of the Empire as a whole (Jones 1974, 127; Hopkins 1978, 41; 1980, 102) and individual areas (Birley 1981, 47ff. on Illyricum; Drinkwater, 1983, 65ff., 128f. on Gaul).

Britain constitutes an extreme case, perhaps the extreme case. It was not a particularly large or prosperous province, but in the first and second centuries it had an exceptionally large army. Birley's figures, referred to above, allow its size to be estimated with a fair degree of confidence (Table 1). Depending on the size of the legion, it was around 50,000 to 53,000 men, a remarkable concentration of manpower. Indeed, at that date Britain had the largest garrison of any single province in the Empire. For comparison, Birley's tables give a combined strength of 46,200 for the garrisons of the two Germanies (admittedly excluding numeri and fleets). This means that in AD 150, there may well have been more troops in Britain than on the Rhine. On the basis of Birley's figures we can determine the proportion of the army in Britain (Table 2). The figures suggest that around 12.5%, or one eighth of the total armed force of the Empire was in the province. (NB The figures include a nominal 1,000 men for the classis Britannica, but ignore numeri. These were of unknown size and number, but as they were probably small they are unlikely significantly to affect the equation.) In the first century the fraction may have been higher still, as the island garrison might have been larger, while the size of the army as a whole was almost certainly rather smaller.

If Hopkins is correct in suggesting that military expenditure took half of all state revenues, then Britain alone, with one eighth of the army, will have absorbed one sixteenth of the total budget. Unless the province produced one sixteenth of the revenues — and she was far from being the richest of the forty or so provinces — she must have been a net importer of revenue, perhaps on a large scale.

The balance of revenue and expenditure was certainly regarded with concern by the governing classes in Rome for, according to Appian, certain provinces were actually costing the government money to keep (Birley 1981, 45). It might be objected that British silver production might have offset part of the cost of her garrison, but among the loss-makers 'Britain was singled out for mention; 'the better part of the island is Roman but even this brings no profit' ' (Appian, praef. 15, quoted in Birley 1981, 45).

However, there is reason to think that by the fourth century Britain had ceased to be a drain on the government, but had become a net contributor of funds and resources, an exporter rather than an importer of revenue. The best known evidence for this, recording large-scale shipments of resources probably raised as tax in kind from Britain to the Continent, is Julian's grain-fleet feeding the Rhineland. This is mentioned in at least four sources (Amm. XVIII, 2, 3, Eunapius, Fr. 12; Julian ep. ad Ath. 280A, C; Zosimus III, 5), a fact which might itself suggest an exceptional event, although Ammianus implies such shipments per se were routine.
### TABLE 1 THE SIZE OF THE GARRISON OF BRITAIN IN AD 150 (after Birley 1981, 40-42)

<table>
<thead>
<tr>
<th></th>
<th>BRITANNIA</th>
<th>GERMANIA SUPERIOR and INFERIOR combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total auxilia</td>
<td>35180</td>
<td>14320 + 7880 = 22200</td>
</tr>
<tr>
<td>Total legionaries¹</td>
<td>15000 (18000)</td>
<td>2 + 2 legions = 20000 (24000)</td>
</tr>
<tr>
<td>Total Garrison²</td>
<td>50180 (53180)</td>
<td>42200 (46200)</td>
</tr>
</tbody>
</table>

---

1. Assuming legion strength of 5,000 or, in brackets, 6000.
2. Excluding fleets.
TABLE 2 THE GARRISON OF BRITAIN AS A PROPORTION OF THE ROMAN ARMY IN AD 150 (after Birley 1981, 40-42)

<table>
<thead>
<tr>
<th></th>
<th>BRITAIN</th>
<th>EMPIRE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total auxiliaries</td>
<td>35,180</td>
<td>224,000</td>
</tr>
<tr>
<td>Total legionaries</td>
<td>15,000 (18,000)</td>
<td>140,000 (168,000)</td>
</tr>
<tr>
<td>Fleet</td>
<td>1,000</td>
<td>30,000</td>
</tr>
<tr>
<td>Rome</td>
<td>-</td>
<td>11,500</td>
</tr>
<tr>
<td>Overall total</td>
<td>51,180 (54,180)</td>
<td>405,500 (433,500)</td>
</tr>
</tbody>
</table>

1. Assuming legion strength of 5000, or, in brackets, 6000.
2. *Classis Britannica* strength is a guess. Overall naval strength figure is the tentative estimate from Birley 1981, 42.

Percentage of manpower committed to Britain in AD 150

At 5,000 men per legion; At 6,000

\[
\frac{51,180 \times 100}{405,500} = 12.62\% \quad \frac{54,180 \times 100}{433,500} = 12.49\%
\]
General considerations point to a change in the official balance of payments between Britain and Rome. In the fourth century Britain probably produced an increasing share of imperial revenue from the Gallic prefecture. This may have been only a relative increase, simply because unlike Gaul and many other areas, Britain escaped large-scale barbarian disruption in the third century. Of course we have no figures to tell us whether Gallic agriculture was permanently and seriously affected or not. On the other hand there are signs that British agricultural output (and therefore revenue output) was increasing absolutely. The later third and early fourth centuries have been characterized as a period of innovation in Romano-British agriculture, and possibly increased production (Jones 1982, 101f. for botanical evidence; King, in this volume, has also detected changes in bone assemblages broadly dating to the third century). However, in the absence of sufficient comparable data from elsewhere, we cannot be sure that this was not a general phenomenon.

Perhaps we can get further with the other half of the equation, government expenditure in Britain, which broadly correlates with the size of the garrison. It has been argued that the extremely large garrison of the first and second centuries underwent a dramatic reduction in the mid to late third century, and thereafter was kept at a low level. Even if this hypothesis is rejected, and the existing view of a substantial late army is upheld, it remains true that Britain's share of the army was greatly reduced, because the army was expanding. Taking A.H.M. Jones' estimates (1964) for the British army, which in my opinion are far too high, we may express them as a percentage of total army strength:

\[
\frac{33,500}{600,000} \times 100 = 5.58\%
\]

It is apparent that Britain's share has dropped by more than half, from over 12% in the second century to under 6% in the late fourth. The balance of troop deployment in the North-West of the Empire had shifted dramatically from virtual parity between Britain and the Rhine in AD 150 to overwhelming concentration on the latter. The balance of expenditure will have changed even more extremely, as the expensive part of the army, the comitatenses, were usually all south of the Channel. Britain's garrison of second-rate limitanei will have taken much less than 6% of the military budget.

It is likely that this major redeployment of the army was alone enough to reverse the flow of revenue across the Channel. Perhaps for the first time Britain's revenues exceeded the cost of her garrison. A surplus was at last available for export, to fill Julian's grain ships. On this model, in the fourth century Britain became financially profitable to the government for the first time. With the agriculture of Gaul henceforth under permanent threat of barbarian disruption, Britain, defended by the sea which also made bulk shipment of supplies from her relatively cheap, may have been of increasing strategic importance as a source of supply while, paradoxically, her army was run down. Eumenius may not have been exaggerating unduly when he said:
'Without doubt Britain...was a land that the state could ill afford to lose, so plentiful are its harvests, so numerous are the pasturelands in which it rejoices, so many are the metals of which seams run through it, so much wealth comes from its taxes, so many ports encircle it...'
(Panegyric to Constantius, 11, 1).

3.2 The impact of the army on the British

The effect of these changes on the Romano-British was probably very limited, at least in financial terms. Since the first century, they had paid to the government taxes which were largely spent in other areas. The difference was that whereas revenue had been mainly raised in the South and spent in the North it was in the fourth century partly spent in the North, partly on garrisons around the southern coasts, and partly exported to Gaul or beyond. They had to face a changeover to taxation in kind, and perhaps major increases in rates of tax, but these were common to all parts of the Empire. North Britain is where the real change in circumstances must have occurred, as the subsidy from taxation dwindled with the garrison, but as we have seen the economy of the North was apparently sturdy enough to survive until the end of the Roman period.

The significance of the changes to the economy of Roman Britain is harder to assess. Contrary to the views quoted in part 1.2, it seems to me that the garrison of the fourth century was too small and poorly paid to have had much direct effect on the economy of the British provinces. It would have provided a fairly miserable market by comparison with the army of two hundred years earlier. However, there is the possibility that British farmers and textile producers did well out of contracts to supply the massive concentrations of troops in Gaul, and that it was not the withdrawal of the British garrison which dealt the economy its death blow, but the loss of vital export contracts with the disruptions following the events of AD 383. This model of a largely export-dependent economy is a mirror of that envisaged for the early Empire by Hopkins (1980) and others, in which the core provinces earned back taxes sent to pay soldiers on the frontiers by exporting goods to the frontier provinces. In the first and second centuries, Gaul exported to Britain on a large scale, probably in part as a result of this process. With the situation reversed in the fourth century, with most troops south of the channel and tax revenue flowing out of Britain instead of in, one might expect a compensatory flow of exports from the island. However, there is not much evidence for this, beyond references to a few items of British manufacture in Diocletian's price edict. There is little sign of large-scale export of manufactured goods to parallel the imports of the early Roman period; for instance no significant late Romano-British pottery exports to match earlier importation of samian and other fine wares.

In fact, this is inherently unlikely to have been the case. The army could only act as an economic dynamo generating production and trade only so long as it was paid in cash, spent cash, and so long as taxes were raised in cash. With the changeover to taxes and pay largely in kind from the later third century, the army ceased to have
this central role. Goods were simply demanded, there was no longer a question of buying on the open market or of establishing contracts amenable to profit. Consequently, Julian's grain shipments do not represent commercial export, but shipment of levied supplies. In the fourth century, the army and state did not stimulate production of, for example, British woollen products, but would simply have demanded certain quantities, as leather, copper, iron and charcoal were demanded for the state factories, and grain, clothing, horses and recruits were levied for the army (for various examples of taxes in kind, cf. CTh. VII, vi; X, xxii, 2; XI, xvi, 15 and 18; XL, xxii, 3). As there was little cash tax to be transferred to the frontiers and earned back, the state ceased to stimulate trade, especially interprovincial trade, which implies a substantial decoupling of the army and the economy in the fourth century. If the British economy flourished in the fourth century, it was not from selling to the army and government. The direct impact of the late army on the economy was probably quite small, and has been generally exaggerated in the past.

It is increasingly apparent that large-scale commercial activity, the market function of towns and especially interprovincial trade were all undergoing an overall decline in Britain, and indeed elsewhere, from the fourth century (R. Reece, pers. comm.). It is tempting to suggest that this is a direct consequence of the loss of the army's 'dynamo effect' at the same period, although this is probably too simplistic. Other factors will have played a part.

Paradoxically, Britain may actually have benefitted from needing only a small number of soldiers to defend her in the late period. Elsewhere in the Empire, army and government were a major source of disruption.

The army as a whole is supposed to have been much larger in the fourth century, and there is no doubt that the other branches of the imperial service, notably the civil service were greatly enlarged. The central government, the sacred comitatus of the emperor, made up of the consistory and the central ministries with their staffs, battalions of servants and hangers-on, plus 3,000 imperial guards, must have totalled many thousands on its own (Jones 1964, 367). In addition there was a multiplication of regional administrations as provinces were subdivided and grouped into dioceses which constituted another tier of government. On top of these, there were installations such as the thirty-five state arms factories (James forthcoming) and state mills (Wild 1976), adding tens of thousands to the list. The army and the great imperial machine which had evolved to extract from the provincials the supplies needed to keep the military and state functioning, were maintained by the tax system. At first sight, the structure of the latter, with its censuses and variable inductions, seems to have been designed to spread the load fairly evenly. But, as in the early Empire, expenditure was still concentrated towards the frontiers, because that was where the army, the factories and usually the sacred comitatus itself were to be found; it not on the frontier line, at least in the frontier provinces. There is evidence that revenue, including goods raised as tax in kind, was shipped from rear areas to the frontier zone. The British grain shipments in the reign of Julian are a case in point. Large-scale movement of supplies from Aquitania to Northern Gaul is also attested (Amm. XVII, 8, 1, AD 358; cf. also XIV, 10, 3-4). Other
cases of movement of supplies from one diocese to another, if not between prefectures, are attested in the East, where special officers responsible for such transfers are recorded (primipilares; Jones 1964, 459; CTh. VIII, iv, 6, AD 358, etc.).

Nevertheless, it is quite clear that in practice the load placed on the frontier provinces was much greater than that borne by those to the rear, as a direct consequence of the concentration of soldiers and officials in the former. One of the most obvious manifestations of this was billeting. Regiments of comitatenses were frequently stationed in towns when not on campaign, and were billeted in private houses. The law required the owner to give up a third of his house to his uninvited guests (CTh. VII, viii, 5, AD 398). Additional demands, for food, fuel and bedding, though technically illegal, became the norm (Jones 1964, 631; CTh. VII, iv, 12, AD 364; VII, ix, 1 and 2, AD 340). It is not surprising that exemption from billeting was a much-prized privilege (e.g. immunity for fabricenses, CTh. VII, viii, 8; Jones 1964, 631 for other examples), although no-one was exempt if the sacred comitatust itself was in town.

Other burdens included provision of pasturage and fodder for horses. Although fodder rations (capitus) were provided by the tax system, hay and chaff were collected by the soldiers from the areas immediately surrounding their stations (Jones 1964, 629; CTh. VII, iv, 9 AD 364), and pasturage obviously had to be local. The latter became a serious cause of complaint as cavalry horses exhausted the grass of public land and private estates (Jones 1964, 629; CTh. VII, viii, 3 AD 398; 4 and 5 AD 415).

To these, and the myriad other inconveniences of having troops constantly stationed nearby we must add the special demands of campaigning. The comitatenses on the move are unlikely to have been any less troublesome to the provincials than the comitatenses in winter quarters. Everyone was liable to compulsory services like baking bread and biscuit for troops (Jones 1964, 629). On-the-spot requisitioning of animals was probably the rule, legal or not. And all this fell on areas which already had to pay taxes like everywhere else, and which were also exposed to periodical barbarian raiding or full-scale invasion and devastation. Areas like north-east Gaul thus faced a triple burden, from taxation, barbarians and the extra demands of their defenders and the government.

For most of the fourth century, Britain, from what we know of her history, apparently escaped quite lightly. Insulated by the sea from most large scale invasions, her relatively small army was for the most part adequate for the task, so visits by comitatenses were infrequent, visits by the emperor rarer still. Britain's regular forces consisted of fixed-base regiments many of which had been in their stations for centuries and which were still mostly confined to the periphery of the diocese. They were presumably fully integrated with their local communities, from which they derived most of their recruits. Because she escaped the attentions of the worst of the Empire's enemies, Britain also escaped the perhaps equally damaging attentions of the central government and the field army. It may be said that the late Roman army had relatively little direct impact on the lives of the population of Roman Britain because, fortunately for the Britons, it was mostly busy somewhere else.
Nevertheless, its indirect role was vital, firstly and most obviously by defending the frontiers, for the most part successfully, and permitting life to go on relatively undisturbed by barbarian incursions. A second, more subtle possibility is that Roman life and economy in Britain depended on the continued commitment of the Roman state and its armed forces to the island.

One of the most remarkable things about Roman Britain is the speed of collapse and the totality of the disappearance of Roman life after the final severing of ties with the Roman government around AD 409. Especially significant is the observation that this process seems to have taken place before the Saxon take-over, and not as a result of it; the fifth century is increasingly seen as Sub-Roman rather than Anglo-Saxon for much of lowland Britain (Taylor 1982, 8).

According to a common view of the late Empire, from the Tetrarchy the Empire was structured to allow the effective extraction of resources from increasingly reluctant and impoverished taxpayers to supply the enlarged army and state machinery. Parallel with this, and partly as a result of it, was a process of increasing social stratification, in which the poor grew poorer as the independent peasant farmer was forced to sell his land to pay taxes, and eventually became a legally tied serf, or colonus, working the fields of some wealthy landlord. The larger land-owners grew richer, as they controlled much of the collection of taxes, which were largely in kind as supplies to the state. Such revenue, in the form of grain, was presumably what filled Julian's ships. The landowners could take a handsome rakeoff while avoiding payment of their own dues via influence with the government, steadily expanding their wealth and power. As chief figures in local government and society, they enjoyed a symbiotic relationship with the state, as they effectively controlled much of the state's income, but were at the same time dependent on the state, the law and ultimately the army as guarantors of their position and power.

How far this process went in Britain is unknown, but the decline in small farms in some areas, the appearance of increasing numbers of nucleated settlements (villages of coloni?) and the development of luxury villas in the fourth century are consistent with it.

If this model is valid, then it represents a change in the economy. As the trading economy of the first to third century declined, it was replaced by a situation similar to that thought to have pertained in the late Iron Age, when local magnates extracted produce from their subordinates as tribute, and exported it across the channel for personal profit.

These economic changes, and the decline of classical urbanism in Britain which can no longer be seriously denied, meant that outside the state, army and ruling class, by the end of the fourth century there was probably little left of Romanitas among the bulk of the population of Britain.

In continental Europe, Roman government was replaced by new barbarian central authorities virtually without hiatus, causing relatively little disruption to the local political structure, leaving most of the local aristocracy in place in many areas. This is best
seen in Italy, which the Ostrogoths took over complete with its Roman civil service and political structure, which they used rather than replaced. For the most part, the landowning class survived by coming to an accommodation with the new power.

Britain was different. It was cut off from the Empire, but not immediately overrun by foreign groups. The commitment of the state and the army were suddenly ended, and apparently not replaced by any authority of comparable power. Overnight this would have undermined the power of the local elite, perhaps causing a political crisis leading to a very rapid collapse of local government. On this model, all the most Romanized groups of British society would have disappeared at once; the army withdrawn or dispersed; state officials, perhaps expelled; and local magnates, unable to maintain their position without the courts or soldiers at their backs. Such a political and social crisis could have led to the collapse of such manufacturing and market activity as may still have been functioning by then, leading to the disappearance of identifiably Roman material from the archaeological record. A catastrophe for landlords, potters and mosaicists, perhaps, but with towns already largely depopulated, and a peasantry all but untouched by Roman culture beyond brooches and coins, the effect on Britain as a whole would have been slight.

While the probably small and more certainly poorly-paid British garrison may have had little direct role in the internal life of the province, its presence allowed such Roman life as survived to go on. In fact, its presence demonstrated the continued interest of the state in the diocese. The events following the end of that interest in 409 suggest that by that time Romanitas in Britain was no longer capable of surviving on its own (if indeed it ever had been) but was dependent for its continuation on the Roman government and the army.

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SIMON JAMES

Dura – Europos and the Chronology of Syria
in the 250s AD*
EVIDENCE FROM DURA EUROPOS
FOR THE ORIGINS OF LATE ROMAN HELMETS

BY

Simon James
British Museum, London
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Of the various ways of drawing a bowstring and releasing an arrow, there are two which seem to have been standard in the Mediterranean world and the Middle East in classical and medieval times. The first of these is the so-called Mediterranean release in which the first two or more fingers of the right hand rest on the bowstring, with the nock of the arrow between the fore- and middle finger. The shaft rests on the left hand on the left side of the bow stave. On release, the bowstring is thrown to the left, against the left arm, which is commonly protected by a bracer. Variants of this method of release are thought to have been universal in the classical world and in the Parthian and Sassanian empires, down to the period of the Hunnic invasions of Europe if not later.

It is thought that at some date in late antiquity a new technique was introduced by nomadic peoples from Central Asia. This was the so-called Mongolian release, in which only the thumb holds the bowstring. The arrow is not gripped by the fingers, but held to the string by a slightly sprung nock or simply wedged between the thumb and a knot on the string itself. Unlike the Mediterranean release, the shaft sits against the right side of the bowstave, and on release the string tends to be thrown outwards from the left arm, making a bracer unnecessary. However, the great strain placed on the thumb required the wearing of a ring to spread the load over the ball of the thumb to prevent cutting and ensure a smooth release.

The date and place of invention of the Mongolian release is unknown, but jade rings identified as thumbrings imply its use in China in Han times, i.e. contemporary with the Parthian and early Roman empires. It is more likely to have been invented by Central Asian nomads to whom skill at archery was of great social, military and practical importance.

Jon Coulston's excellent and very thorough review of the available evidence found nothing to indicate that the Mongolian release was known in Iran or the West before the later fourth century. However, incompletely published evidence from Dura-Europos in Syria indicates that it was employed in the Middle East, by Rome, Sassanian Persia or both, by the mid third century AD.

Dura was a garrison city of the Roman empire besieged and destroyed by the Sassanians in the mid 250s AD. The city was
never reoccupied, so there are no later phases overlying the Middle Roman deposits. The joint Yale-French Academy excavations between 1928 and 1937 recovered large quantities of exceptionally well preserved arms, including archery equipment, deposited during the siege.

During the course of the excavations a broken ring of polished bone, certainly an archer's thumbring, was recovered\(^9\) (Figs.1 and 2). Unfortunately, no exact provenance was recorded. At the time, it was described as "certainly Parthian",\(^10\) but no reason was given so it may reasonably be suggested that the thumbring could have been a casual surface find, an object dropped on the site by some hunter in later times.\(^11\) The simple ring and dot decoration of the object itself is hardly diagnostic, but its state of preservation is significant. Material which had not been deeply buried on the site was in very poor condition due to the penetration of the surface layers by the winter rains which facilitated chemical and biological degradation. The ring is therefore likely to have been deeply buried, which in turn suggests that it does belong to the siege period. But clearly, this is hardly conclusive.

The crucial evidence comes from the fragments of arrow shafts found at the site (Figs.3 and 4). Some come from contexts sealed during the fighting, so their dating is beyond doubt. The best example is a shaftment with its fletching intact, the only one from the Roman empire.\(^12\) The main point of interest is the positioning of the fletching. Arrows designed to be shot using the Mediterranean release must have a space between the tail end of the vanes and the nock to accommodate the fingers holding the arrow to the bowstring, or the fletching will be crushed. The Dura arrow has no such gap; the vanes extend right back to the edge of the nock. I therefore suggest that this arrow can only have been shot with the Mongolian release, which requires no gap as the fingers do not grip the arrow.\(^13\) Several other less well preserved shaftments bear traces of their fletching.\(^14\) Although the vanes have fallen apart, the base of each feather still adheres to the reed shaft so it may plainly be seen that in each case they extended to the edge of the nock. No surviving shaftment from Dura has the tell-tale gap, but the sample is so small that this cannot be seen as proof that all arrows were of

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{Fig.1}
\caption{The Dura thumbring, Yale no. 1929.475A (photo; author).}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{Fig.2}
\caption{The Dura thumbring.}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{Fig.3}
\caption{Details of shaftments from Tower 19. Yale no. 1933.445A (bottom) and 1933.445C, showing the vanes reaching the edge of the nock.}
\end{figure}
Fig. 4: Shaftments from Tower 19 (left to right, 1933.445A, B, and C), and from "L7-W", the wall in the vicinity of the tower (right).
the attested design.

The Mongolian release, then, was employed at the siege of Dura. It is rather more difficult to decide who was using it. Three of the shaftments were found inside tower 19, where the famous scutum and horse armours lay. This would seem to suggest that they belonged to the defenders, as the tower collapsed and sealed its contents before the Persians overran the city. However, in the absence of adequately detailed records and plans, the possibility that they were shot into the tower by the attackers cannot be ruled out.

To conclude, the Dura evidence demonstrates that the Mongolian release was known on the borders between the Roman and Sassanian empires by the mid-third century AD, over a century earlier than has hitherto been believed. How widespread was its use at the time is a question which remains unanswered. The absence of contemporary depictions may suggest that it took a long time to become common in the Middle East. Alternatively, it could be a salutary warning of the dangers of using depictional evidence for such fine technical details of military history.

ACKNOWLEDGEMENT

I would like to thank Yale University Art Gallery, and in particular Ms. Susan Matheson, for permission to publish the Dura thumbring and arrows.

FOOTNOTES

1. RAUSING, 1967, 28; COULSTON, 1985, 278.
2. COULSTON, 1985, 277-8.
3. MORSE, 1885; COULSTON, 1985, 275-8.
4. MORSE, 1885, 16; LUSCHAN, 1891, 670; COULSTON, 1985, 276.
5. POPE-HENNESSY, 1923, 74-6 and plate 50; RAWSON & AYERS, 1975, 63 no.171.
6. COULSTON, 1985, 277.
7. COULSTON, 1985, 276-8.
8. The best introduction to Dura is HOPKINS 1981 which also contains a full bibliography. For the excavations, see CUMONT 1926; the Dura Reps and the series of Final Reports.
which remains incomplete. For the most recent discussion of the date of the siege, see JAMES 1985.

9. Yale University Art Gallery inventory no.1929.475A. Dura field number, if any, is lost. The object was briefly mentioned in Dura Rep. II, 73-4. Its surviving length is 39mm, width of aperture c.24mm, and height 11mm.


11. COULSTON, 1985, 276.


13. This was suggested in Dura Rep. VI, 453, a reference overlooked by Coulston, and by myself until this paper was already in draft.


15. Yale nos.1933.445A to C. The provenance of 1982.28.34 appears to be "L7-W", which is the city wall in the vicinity of tower 19.

16. Tower 19 collapsed when the Persian attackers fired the mine they had dug beneath it, with the intention of bringing down the tower and adjacent wall to create a breach which could be carried by assault. The collapse therefore occurred while the defenders were still in control.

17. COULSTON, 1985, 276-8.

ABBREVIATION

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CUMONT 1926: F. Cumont, Fouilles de Doura-Europos 1922-3, (Paris 1926)


JAMES 1985: S.T. James, 'Dura-Europos and the chronology of Syria in the 250s AD', Chiron, XV, 1985, 111-24


MORSE 1885: E.S. Morse, 'Ancient and modern methods of arrow-release', Bulletin of the Essex Institute, XVII, 1885, 3-56


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THE FABRICAES: STATE ARMS FACTORIES OF THE LATER ROMAN EMPIRE

Simon James

INTRODUCTION

'The harsh necessity of war has invented the guild of fabricenses, which guards the decrees of the Emperors with a kind of immortality... for this guild arms, this guild equips Our army.

1. Hence provision has been made that such persons shall be subservient to their own skills, and when they have been exhausted by their labours, they, together with their offspring, shall die in the profession to which they were born...'

In this dramatic language Theodosius II portrays the fabricenses, or imperial armourers, as an hereditary caste of 'industrial serfs', labouring until they died to forge the arms which defended the beleaguered empire. The reality of these state arms factories was a good deal more prosaic, but the text quoted above does emphasise the genuine strategic importance of the work of the armourers.

Beyond brief articles in the major classical encyclopaedias there has been no thorough study of these factories, the fabricae, perhaps the most numerous and important of a number of classes of state production centres, which also included the mints, textile factories and purple-dye works.

The following pages are intended to be a full consideration of the fabricae, their staff - the fabricenses - and the context of these within the imperial service and the empire.

SOURCES OF EVIDENCE: 1. THE NOTITIA DIGNITATUM

Apart from a number of references in ancient writers and historians (see below p.259), there is a considerable quantity of relevent imperial legislation to be found in the Codes of Theodosius and Justinian. But the most important sources for understanding the distribution of the factories and the variety of their products, are the lists to be found in the Notitia Dignitatum.

The relevant sections are Oriens Chapter XI and Occidens Chapter IX, which list the offices, military units and government installations under the control of the Master of the Offices of the Eastern and Western empires respectively, at a date sometime in the early fifth century AD. The Eastern section lists fifteen fabricae, while the Western list contains twenty (see Table I and Fig.1). In addition, the lists of officials under each of the two magistri include individuals entitled subadiuvae fabricarum. There were three in the East and an unspecified number in the West.
Both the Eastern and the Western factory lists convey essentially the same information, noting the city of location of each fabrica, with, it would seem, information on what each was producing. The individual entries are grouped by region under headings which, with three slight exceptions, correspond to dioceses in approximate geographical order from East to West.

Before the information in the lists can be analysed, it must be tested for its reliability and completeness, insofar as this is possible. Superficial inspection makes it at once apparent that there are some corruptions and/or omissions, apart from simple spelling errors. For example, only one of the entries for the four East Illyrican factories includes information on what was produced there. Seeck believed that the three other fabricae in this group were not accompanied by any classification because they were general arms works, and not specialised like many others. Yet other factories producing a general range of arms are listed as such, e.g. Argentomagus, armorum omnium, while Seeck is prepared to explain the absence of a production category for the Soissons entry as a lacuna. Taking these observations into account, it seems preferable to regard the absence of categorisation for these Illyrican fabricae as something other than a deliberate omission. The Eastern list also contains a clear corruption, resulting in some confusion amongst the lists for Pontica, Asiana and Thraciae (see Table II). Sardis Lydiae is listed under Pontica, but was actually in Asiana; similarly Hadrianopolis, entered under Asiana, was actually in Thraciae. Clearly what has happened is that the Asiana and Thraciae headings have each been displaced down the list by one line. They may be restored, so that Thraciarum duae now lies correctly above its two entries, Hadrianopolis and Marcianopolis, and Asianae una falls above Sardis.

There now remains the problem of a heading reading Ponticae quatuor, followed by only three entries. Seeck amended quatuor to tres, but this seems less satisfactory than the other alternative, that originally there had been four entries, and that the fourth was later deleted or accidentally omitted. The confusion in the existing manuscript may well be an attempt at a correction by a later copyist.

Since there is a strong probability of an omission in the Pontica list, the possibility that there are others elsewhere must be considered. At the broadest level, if the existing entries are projected onto a distribution map (Fig.1), it is clear that large parts of the Empire are wholly devoid of fabricae. This applies not only to Spain, Africa, Peninsular Italy and the Islands, but also (and this is surprising considering their military significance), Britain and Egypt. Jullian suggested that the lists of fabricae for these areas are missing from the Notitia. The absence of these hypothetical lists from the existing manuscript might be due to deliberate erasure or accidental omission during copying, perhaps by truncation. However, we can at least test the latter possibility, due to the regular geographical structure of these and the other Notitia lists.

A number of other catalogues of government installations and provincial dignitates in the Notitia are set out according to a standard pattern. One of the fullest examples is the list of praesides, divided, as always, into an oriental and occidental part.
Like the fabrica lists, the individual entries are grouped together by diocese, except that those in Galliae and Septem Provinciae are listed together, as are those in Italiae and Suburbicaria. These diocesan groups are then set out in the geographical order outlined in Table III. Essentially similar sequences are to be found in other Notitia lists, such as those for consulares. More directly comparable to the fabrica lists, is the register of state textile factories, the gynaeceae, another group of state production centres. Unfortunately, only the Western half of the list is preserved, but this again follows the same geographical course of arrangement (Fig. 2). These examples and others (such as the lists of consular governors and vicariates) show that the longer of the geographically-organised lists follow a consistent and fixed order of notation by diocese around the empire, which is set out in Fig. 3.

If this is applied to the fabrica lists, the position of Jullian's hypothetical missing lists can then be seen. Starting in Oriens, it is immediately obvious that fabricae in Aegyptus should be at the head of the Eastern list. In the West any fabricae in Peninsular Italy, the Islands, Africa, Spain or Septem Provinciae should fall between the lists for Italia and Galliae. This is confirmed by the fact that the last entry in the Italia list is Lucca, which actually lies in Suburbicaria. Although it is put in with the factories of Italia, it is placed after them, as Suburbarian entries should be. Likewise, although Argentomagus is included in the list for Galliae, it actually lies in Septem Provinciae. According to the theoretical order, it should be listed before the fabricae of Galliae itself, and indeed it comes at the head of the Gallic list. It is not possible to maintain that lists for Italy and the South-West have been lost. They should have been placed right in the middle of the Western list, and the fact that there were actually fabricae in two of these dioceses, Lucca and Argentomagus, and that each was incorporated into the list of the neighbouring diocese, suggests that they were two isolated outliers which were not considered worthy of separate diocese headings.

The conclusion must be that Jullian's hypothetical extra lists never appeared in the Notitia and that there is no evidence that there were any fabricae in Egypt (see next section), Peninsular Italy or the South-Western provinces. This leaves only Britain, which the order model suggests should come at the end of the Western list, the position most vulnerable to damage. If the other blank areas never had fabricae, then it is unlikely that Britain had any either, but there is more room for doubt in this case, and this question is considered in more detail below (p. 263).

SOURCES OF EVIDENCE: 2. OTHER LITERARY SOURCES

Having shown that the internal evidence suggests that the fabrica lists are substantially complete, the external evidence for factory locations must then be considered as an independent check. In the works of ancient writers and historians there are references to fabricae at Nicomedia, Caesarea Cappadociae, Damascus and Edessa, Hadrianopolis, and Cremona. Malalas mentions three fabricae at Antioch, where the Notitia records only two; but it is likely that he is including the body of barbaricarii or precious metal smiths known
to have been at Antioch. These craftsmen were involved in certain aspects of arms production, and were sometimes referred to as fabricenses, although they belonged to a different branch of the imperial service. Ammianus also contains a possible reference to one of the Trier fabricae, and circumstantial evidence for the two factories at Augustodunum (see below p.275).

Jullian cited a law from the Theodosian Code as evidence for a fabrica at Constantinople by the time of the Notitia, but the text refers specifically to barbaricarii. There is no evidence for a fabrica at the Eastern capital before Justinian.

SOURCES OF EVIDENCE: 3. SUBLITERARY TEXTS

A papyrus document discovered in Egypt contains references to fabricae. The governor of the Thebaid is ordering that smiths be sought out and forcibly sent to him for work in the fabricae. The date, AD298, is Tetrarchic, and this may seem to provide evidence for the setting up of state arsenals in Egypt at this date. However, we have seen that no fabricae are recorded in Egypt in the Notitia. Is the latter incomplete? The historical context of the papyrus makes this conclusion unnecessary. In AD298 war was raging in Egypt. Diocletian had arrived personally to suppress the dangerous usurpation of Domitianus. Egypt was swarming with troops, and the population was restive. The climax was the long siege of Alexandria, which ended in spring 298. Under war conditions, it is not surprising to find a governor impressing craftsmen to help out in the fabricae, which in this case are most probably regimental workshops or possibly temporary facilities linked to the siege. There is no solid evidence for state arsenals in Egypt before Justinian.

SOURCES OF EVIDENCE: 4. EPIGRAPHY

There is also a small quantity of relevant epigraphic material, consisting mainly of the tombstones of fabricenses. There is one from Salona, one relating to Marcianopolis, two from Sardis Lydiae, and no less than six from Concordia. A further inscription mentions a 'comes fabricarum of the whole civitas of Beneventum', but these fabricae are unlikely to be arms works. The rank of comes fabricarum is unknown in this context, and in any case, arsenals as far south as Beneventum are unlikely (see below p.263). Seeck suggested that this comes was in charge of building work, fabricae being used in its more general sense to mean a place of construction. Less ambiguous is an inscription from Ravenna, set up by Sertorius Silanus, v(ir) p(erfectissimus) praepositus/ fabricae, dating to the reign of Constantine. It is possible that, like the fabricae of Beneventum, the Ravenna establishment was not producing arms. It may well have been preparing ship's fittings for the Praetorian fleet based there. There still remains a strong possibility, however, that this inscription records a fabrica armorum not mentioned in the Notitia.
Sources of Evidence: 5. Conclusion

Except for the doubtful cases of the Egyptian papyrus and the Ravenna inscription, the independent evidence relating to fabrica locations is in complete agreement with the Notitia lists. It seems reasonable to conclude, therefore, that the Notitia lists form a sound basis for a consideration of fabrica distribution. Before doing so, however, it is necessary to look at the production categories which accompanied each entry in the registers.

The Categories of production of fabricae in the Notitia

Most of the terms used in the Notitia lists are readily interpreted. Arcuaria clearly refers to workshops making bows, ballistaria to artillery production, hastaria to spears, sagittaria to arrows, scutaria to shields and spatharia to swords. It is also fairly certain that scordisci are military saddles. More problematical, due to their overlapping meanings, are the terms loricaria, armorum and clibanaria. It has been suggested that the latter refers to heavy cavalry armour, from clibanarius, or that it refers to iron cuirasses in general, loricaria referring to leather defences. Armorum has been taken to refer to weapons of offence. There is, as yet, no real evidence for the widespread use of leather or rawhide armour in the Roman period, so the interpretation of loricaria and clibanaria in this way will not stand. Secondly, the term arma is not confined to weapons of offence, but is a general term for the panoply, including armour, helmet, shield and weapons, excluding missile weapons (tela). It is worth noting that arma, as used in the Notitia, does not include shields, as indicated by the recurrent use of the phrase scutaria et armorum, especially in the Eastern lists. The two terms must be mutually exclusive here. It seems sound to interpret clibanaria as heavy cavalry armour workshops, on the basis of the distribution of these fabricae in relation to the units they served, as revealed in the Notitia. While only part of one Western fabrica is given over to clibanaria, in the East, three entire factories are devoted to such work. This strong oriental bias is reflected by the distribution of units of catafactarii and clibanarii, with only three regiments in the West, and no less than fourteen in the East.

There remains, then, the question of the distinction between fabricae loricariae and fabricae armorum. Presumably both types of workshop were involved in the production of body armour for infantry and perhaps lighter cavalry. The loricaria centres are confined to the West, and it is no coincidence that this is also where the only centres described as fabricae spathariae are to be found. It is suggested that for reasons unknown, swords and body armour were produced in separate factories in parts of the West, whereas along the Danube and throughout the East, they were made in the same workshop. Hence, the more general term arma was used. This seems to resolve the problem. In connection with armour, it is curious to note that helmets are nowhere mentioned in the Notitia lists, especially so since helmets are the only item of late Roman armour which are well known in the archaeological record. It is possible, however, that they were made in the general arms works, the fabricae armorum.
Finally there is the problem of the Edessa armamentaria. Armamentarium is a workshop category unique to that city. This has been regarded as a factory producing naval equipment, presumably because the word armamenta is often used to denote marine fittings. However, there is no evidence of a standing Euphrates fleet at this date and the Notitia contains no mention of such production establishments (although see the Ravenna inscription p.260 above). But armamentaria also means 'arsenal, armoury, weapons-store'. Malalas records that the Edessa arms factory was built 'for the nearer supply of arms'. The Edessa armamentaria may therefore be explained simply as a major arms depot attached to the fabrica scutaria at the city, a strategic stockpile for the forward resupply of forces operating against Persia.

If nothing else, the categories outlined above imply an often astonishing level of specialisation of production. Is this impression accurate? The correspondence between the distributions of clibanaria and heavy cavalry regiments has been discussed above, but could production of items as basic as arrows really have been confined to fabricae in the West? Some of the Concordia inscriptions specifically mention the fabrica sagittaria listed by the Notitia, vindicating even this most extreme case of specialisation. The Notitia registers of arms factories seem, then, to be essentially complete, and the appended details of their products reliable. There are grounds, therefore, for relying on the results of an analysis of the distribution pattern revealed in the Notitia.

THE DISTRIBUTION OF FABRICAE

At the most general level, it is not possible to say whether there is any particular significance in the fact that, while there are twenty factories in the West, there are only fifteen in the East. It is not certain whether this is due to differences in the relative sizes of the armies of the two halves of the empire, or to a systematic difference in size of the Eastern and Western fabricae, or to the extent to which state production in the two halves of the empire was complemented by private production. The latter possibility is discussed below (p.282).

As might be expected, the factories producing for general requirements are most common; shield and armour centres are spread evenly across the Eastern and Northern frontier zones, and form the largest classes of fabricae (Figs.4 and 5).

The specialist fabricae occur in smaller numbers, and are irregularly distributed. Centres producing missile weapons are confined to the West (Fig.6). The only bow factory in the empire is at Ticinum and is complemented by two arrow factories at Concordia and Matisco. The only ballistariae are at Augustodunum and Trier. Conversely, the Eastern bias of clibanaria has already been commented on (spathariae are considered as part of the general group, as they are evidently associated with Western loricariae, see above p.261).

There are thus two distinct classes of fabricae, centres producing equipment used by the majority of ordinary fighting units and centres making equipment for specialist units. As might be expected, the former are numerous and widely distributed. The latter class consists of
smaller groups in distinct concentrations.

In the past little attention has been given to the significance of the distribution of the fabricae. Why, for instance, were there apparently no factories in Britain, Egypt or the Southern empire? Seeck proposed that the overriding factor was internal security. He believed that Diocletian had set up the fabricae and sited them only in places where the Tetrarchs could observe them in order to prevent arms stocks from falling into the hands of usurpers. This certainly might explain their absence from Britain or Egypt, both of which were scenes of major revolts during the Tetrarchy. Diocletian was particularly hostile to the Alexandrians as he had to mount a prolonged siege of the city. His continued distrust of the city, and perhaps Egypt in general, may indeed have dissuaded him from establishing arsenals there. On the other hand, it is my opinion that Britain lacked factories not because the Tetrarchs feared a repetition of the troublesome revolt of Carausius, but because the province no longer had a large army. Consequently, it had no more need of its own arsenals than Spain or Africa; it could be supplied from the main concentration of capacity in Northern Gaul.

Seeck extended his line of argument to explain factory specialisation as well, by suggesting that it was a measure intended to prevent army commanders from being able to arm their troops completely from the factories in any one area. This is a far from satisfactory explanation. It is incredible that Diocletian would have allowed any fear of usurpers to override strategic and other considerations in the siting and output of his factories across the entire Empire, whatever special reasons there may have been for excluding Egypt. In any case, if a revolt did break out among the principal army groups on the Rhine, Danube or Eastern fronts, production was not sufficiently dispersed to prevent them seizing all they needed from a handful of nearby centres.

What is clear is that the fabricae were located broadly where the bulk of the army was, in the zone behind the Rhine and Danube, and throughout the Eastern frontier provinces (Fig.1). Despite their strategic significance, the military importance of Britain and Egypt was very much reduced in the fourth century. Major activity was concentrated on the Northern and Eastern frontiers. The Southern empire had almost no troops, and so had no need of fabricae. The arms factories appeared only where they were needed. A more detailed scrutiny of the map of fabricae reveals an interesting pattern in the distribution of centres producing body armour across the Empire (excluding the specialist clibanaria). For each major zone of the frontier there are precisely two such centres, listed in Table IV. The pattern is so regular that it betrays deliberate planning. This suggestion is confirmed when the same information is projected onto a map showing provinces and dioceses (Fig.4), and it can be seen that the pairs of armour factories correspond exactly with the dioceses. In two cases, one of the pair lies to the rear of the diocese it serves, but this is explained below and does not affect the truth of the equation, as the map demonstrates. Only the diocese of Dacia has no armour centres, but this is certainly because the Notitia fails to record what its known fabricae were making. When the distribution of fabricae scutariae is considered in the same way, an even more remarkable
pattern appears (Fig. 5). Along the entire length of both the Rhine and the Danube, each frontier province has one shield factory (the only possible exception is Dacia Ripensis, where it is not known what the fabrica was producing). As with the armour factories, some of these centres are to the rear of the areas they served.°

There is no such obvious pattern in the East, but this is because there is no simple linear frontier here, but rather a deep zone of garrisoned provinces of varying importance.

This remarkable correspondence of fabricae scutariae with European frontier provinces, and of pairs of armour factories with frontier dioceses is highly significant. Such a regular distribution is unlikely to have arisen by accident, and can only be satisfactorily explained by the existence of a deliberate planning policy behind at least those factories making the basic panoply.°° There seems to be ample justification, therefore, for postulating an armaments factory system, established as a single conception rather than piecemeal.

Before considering the implications of this, it is important to examine the distributions of specialist centres. Clibanaria have been considered above (p. 261) and their Eastern bias was shown to reflect that of the units they served.

The same cannot be said of factories producing missile weapons, all of which are concentrated in the West (p. 262). This distribution is curious considering that large numbers of archers were employed in both halves of the empire,°° and even more so since archery had always been an Eastern speciality. Peoples from the fringes of the Eastern empire, even Persians, continued to supply the best archers. Why, then, were the fabricae in the West?

The answer may be that such centres were unnecessary or impracticable in the East. It is possible that it was simply not feasible to organise the best bow makers into factories because many of them were tribesmen, or at least not urban craftsmen. John Lydus reveals that bows were raised as a tax in kind, perhaps an easier solution to the supply problem.°° Some of the skilled archers of the Eastern regiments, who used bows from childhood, may well have made their own weapons and ammunition.°°

The situation in the West was quite different. With no important local tradition of archery, there was no comparable native tradition of production. While it is not certain that bow production was entirely confined to Ticinum,°° there was a sound motive for centralisation of production. The horn which was a vital component of the composite reflex bow used by the Roman army had to be imported into Europe.°° Ticinum's location is suitably central for distribution of finished bows North and East.

Coulston has suggested that the two arrow factories were specially designed to supply the field army, again at strategically convenient places.°° If so, this may suggest that they are relatively late additions to the system, as the field army per se did not exist during the Tetrarchy when many, if not most, fabricae were founded.
Why artillery fabricae occur only in the West is a mystery. It is possible that for some reason the production of catapaults remained with artillery units or in private hands in the East. There is certainly evidence for private activity in this field in the sixth century AD, but the question will have to remain open.

THE FOUNDATION OF FABRICAE

There is no direct evidence for the date of the establishment of most of the fabricae. One of the few direct references is Malalas' statement that Diocletian built fabricae at Edessa and Damascus, and three at Antioch. Lactantius records Diocletian's foundation of fabricae at Nicomedia. Largely on the basis of these references it is widely assumed that the fabricae are a Tetrarchic phenomenon.

It is true that many fabricae are not attested until later in the fourth century, while the only record of others is in the Notitia itself. However, some may have existed before Diocletian. The origins of the fabricae are considered below, so let it suffice here to observe that the scutariae at Aquincum, Carnuntum, and Lauriacum might be expected to have grown out of the earlier army fabricae of the legionary bases at those sites, and were not new creations of Diocletian. Despite the lack of direct evidence, plausible dates can be suggested for the foundations of a number of fabricae. For example, Lactantius reveals the construction of the Nicomedia fabricae to be part of the great building project which Diocletian undertook at his favourite city of residence. It is highly likely that the Tetrarchic fabricae of Antioch were also part of such a major scheme, which, as at Nicomedia, included the erection of a palace. The Tetrarchy was remembered as a period of rebuilding and restoration of cities and there are a number of other cases where construction programmes of this time probably included the construction of fabricae. A good case is Thessalonica, which was not particularly important until Galerius chose it as his residence. A major building programme caused by the arrival of the emperor, his court and units of troops, provides the only apparent motive and opportunity for the setting up of a fabrica at this site which was relatively remote from the frontier zone. Augustodunum provides a similar case, where Constantius Chlorus initiated a general restoration of this important city, seconding troops and even importing artisans from Britain. This work is well documented, and again, is the most likely context for the construction of the fabricae of Augustodunum. The same arguments could be applied in the case of Sirmium and other sites.

As to the date when the fabricae were organised into the system outlined above, a terminus post quem can at least be established, since the distribution of scutariae depends on the map of provinces as it was reorganised by Diocletian, and more conclusively, the distribution of armour factories relates to the dioceses which were a Tetrarchic innovation. The system cannot, therefore, be pre-Tetrarchic, and indeed, for a number of reasons, fits best into a Diocletianic context. If it was set up at a later date in the fourth century, the system would still fit the civil and administrative geography, but not the military geography. From the early fourth century onwards this ceased to be closely related to the provincial structure, primarily due to the
separation of civil and military organisation, a process which started under Diocletian, but was only completed under Constantine.

During the Tetrarchy, the army was still on the frontiers, and mainly under the control of provincial governors. At the time, the military and civilian hierarchies were still integrated, and so the provincial and diocesan distribution of the general arms works related them automatically to the civilian organisation which supported them, and to the garrison organisation which they supplied. From the beginning of the fourth century provincial governors started to lose their military command functions, which went to new officers, duces of the frontier zones, men often commanding troops of more than one province. Although the process began under the Tetrarchy in some areas, it only became general under Constantine, who also set up the permanent mobile field army. From this time the civil and military geography ceased to be identical. Clearly, fabrica distribution fits best under the Tetrarchy, and this is supported by the fact that the only certain foundation dates of fabricae are in this period, at Nicomedia, Edessa, Damascus and Antioch. It is significant that these include both general arms works and specialist centres.

Several lines of evidence converge to make it fairly sure that the basic structure of the fabrica system was a Tetrarchic innovation. Even if this hypothesis is accepted as valid, it does not rule out the possibility of later additions to, or changes in the system. Two such possible cases appear in the Notitia lists, and might be explained as additions or alterations after the original composition of the registers. The Notitia lists are unusual in that not only are they arranged in geographical order of dioceses, but within each diocese the individual entries are also carefully ordered, with two exceptions (see Fig.7). The North Gallic group of fabricae are strung out in a line along the road from Boulogne to Trier (Fig.8), and are listed in West-East order, except that Ambianum, the most westerly and therefore theoretically first, is entered last. Similarly, in Illyricum, the fabricae are listed from South to North. Salona, as most southerly, should be the first entry, but comes last. These two could be additions to the original list, but this is unlikely since both belong to the 'basic arms factory' category, and so, at most, are replacements for other factories now abandoned. It is more likely that they simply represent the re-siting of two fabricae whose staff were transferred en masse to a different city. Such relocations of government production centres are attested in the Notitia, and of particular interest is the case of the gynaeceum at Salona which was originally at Bassiana on the Danube, east of Sirmium. It is suggested that the Salona fabrica was also originally at Bassiana which is, in any case, a more typical site for a lower Danubian fabrica, being close to the river and the main highway across the Balkans to Italy; and that both installations were moved to the hinterland when the frontier zone became untenable in the late fourth century. The Ambianum case may well be susceptible to a similar explanation, in that it represents a change of location, recorded as an order anomaly in the list, from a more forward site, possibly at Tongres. The implications of all this for the history and dating of the Notitia are discussed in Appendix 1.
FACTORS DETERMINING THE LOCATION OF FABRICA\(E\)

Jullian, one of the few writers to consider the rationale behind fabrica distribution, suggested that access to raw materials was the main factor.\(^{129}\) He observed that Augustodunum and Caesarea Cappadociae were in important iron mining zones. Argentomagus,\(^{130}\) Nicomedia,\(^{131}\) Sardis Lydiae,\(^{132}\) and Trier\(^{133}\) may also be added to the list. The suggestion in no way contradicts the explanation of fabrica distribution outlined above, which postulates a government plan to set up certain types of factory in given provinces of dioceses. Jullian's suggestion may be an explanation of the choice of a particular site for the factory within its designated area. Access to iron seems an eminently reasonable explanation.\(^{134}\)

However, there is one important anomaly, in that the fabricae of Italy are such a great distance from the mines of Noricum which presumably supplied them.\(^{135}\) Why were they not nearer to the mines, where they would also be nearer to the troops? Clearly other factors were at work.

If it is accepted that most of the sites were chosen during the Tetrarchy, then close proximity to the army may also be discounted as a major factor. Certainly the fabricae were in the frontier dioceses, but nevertheless, often scores or even hundreds of miles to the rear of the actual frontier where the troops were stationed, many days travel for a wagon.\(^{136}\) The key to the problem is found in the Notitia lists themselves, which record fabricae under cities of location. It is clear that the fabricae were at urban centres, usually major ones, often provincial or diocesan capitals.

The basic requirements of the fabricae must be considered. They needed secure sites to prevent arms falling into the hands of barbarians or bagaudae, accommodation for work forces and dependents, and access to raw materials as well as food, goods and services for their staff. Finally, they needed communications with means of transportation to get the finished weapons to the army.

Urban wall circuits, often containing settlements which were considerably reduced by AD 300, certainly furnished accommodation and security. With regard to the question of materials, Jullian over-emphasised the need for iron. Many factories would not have needed large quantities. Fabricae making bows, arrows or shields would have had a greater need for wood and other organic materials which were more widely available in the provinces. Those centres whose production required large amounts of iron - such as clibanaria etc. - do actually tend to be in the iron-making zones, for indirect reasons outlined below (p.269). The fabrica required a broad variety of materials and fuel, food, clothing etc, and it is not difficult to identify the mechanism of collection. The entire basis of administration and tax collection in the empire was the city council, which was expected to assemble taxes from its territory for collection by imperial officers.

By the end of the third century, this system had been extended so that the decurions were responsible for collecting taxes in kind, food, materials and bullion.\(^{137}\) The machinery for assembling the materials for the fabricae already existed. Needless to say, all these cities
were nodal points on the road system, and many were also on navigable waterways, allowing easy distribution. Major cities, then, were the obvious places to locate the fabricae. The government simply 'plugged in' the new installations at the places where the raw materials were being assembled. The finished items could then be fed straight into the distribution system. The latter consisted of vehicles impressed by the government to move supplies from the city-centred collection points of the army.

The Law codes lend support to this reconstruction in edicts mentioning levies, not only of iron, but of wood and charcoal as well. Furthermore, a law preserved in the Code of Justinian proves that the transport services were indeed used to move arms along the major arteries in the manner suggested.

In considering the subject of communications, it is worth noting that groups of fabricae are often strung out along the main regional strategic highway. This is most clearly to be seen in Northern Italy where all but one of the fabricae are on the major road from Aquileia and the Danube provinces in the East, to Milan and the Alpine passes in the West (Fig.9). Similarly, the factories of Northern Gaul all lie on the road which arcs west and then north from Trier to Boulogne, the road providing a lateral communication behind the late Roman frontier in modern Belgium, and linking the garrison of Britain with their sources of arms in Gaul (Fig.9). Further examples include the centres dotted along the strategic road through the Balkans from Aquileia to Constantinople, and those in Asia Minor. For Northern Illyricum (Noricum Ripense, Pannonia I and Valeria), where there was no major through-route, the Danube provided the thoroughfare.

While the foregoing seems to produce a coherent explanation of fabrica distribution and location, it has so far failed to take into account one further vital factor, namely, the availability of skilled manpower. The armourer's trade was a specialised craft; what were the sources of such manpower for the new factories?

The obvious source for these artisans (apart from the army) is the old, supposedly free-enterprise arms industry of the Principate. Less is known of the industry in the first three centuries AD than in the fourth to sixth, either in terms of organisation or of location. However, there is some evidence for a tendency for fabricae to be located where communities of armourers already existed. An obvious instance is Antioch, for centuries a military base which must have developed considerable production capacity (whether military or 'private') after, if not before the arrival of the legionary garrison. In this particular case, the strategic and economic necessity of fabricae located at Antioch probably happened to be in harmony with the location of skilled manpower, but in other cases there seems to be a conflict. Why, for example, were fabricae established as far from the frontier as Augustodunum, when many other Gallic factories were much further forward? That city actually held two factories, one of which was highly specialised. It was clearly a particularly important centre, and the best explanation is that there was a major industry already in existence there, or at least in the area. This is supported by an inscription of the third century, and it may well be that the tradition of arms production in the region goes back to preconquest...
times. An almost identical case can be made out for Argentomagus, which is even further from the frontier zone.

It is probably significant that both these examples are in iron-producing zones, as indeed is Sardis Lydiae, another centre remarkably far from the frontier. Not surprisingly, many iron-mining areas developed advanced metal-working industries, including arms production, from early, often pre-Roman periods, so that when sites were chosen for the new state factories, these pre-existing centres exerted an attraction which outweighed other considerations. To this extent then, it may be that iron production centres had some indirect influence on fabrica distribution, and so the argument comes full circle to Jullian's original hypothesis (see above p.267).

This analysis raises as many questions as it answers. Since there already was an arms industry, why were the factories built at all? The origins of the fabricae and the fabricenses must now be considered.

Origins of the Fabricae and the Fabricenses

It was postulated above that at least some, if not most of the fabricae, grew out of pre-existing industries at such places as Augustodunum. In an area such as Pannonia there is no real evidence for such a native industry and it may be significant that the late Roman fabricae in that part of the empire occur at the sites of the old legionary bases at Carnuntum, Aquincum, and Lauriacum. Since these were also the only major urban centres in the region, it is likely that during the Principate, local arms production was also centred on them, with the army producing for itself, or being supplied by artisans (including veterans) in the attached civil settlements. Further down the Danube, Ratiaria may provide a similar case. Within the legionary bases are workshops identified as legionary fabricae. A discussion of whether or not the identifications are correct, and if so, whether they were the sites of actual army production rather than simple equipment maintenance during the Principate, would be out of place here. Nevertheless, it has been suggested - even assumed - that the late imperial fabrica at Carnuntum was housed in the structure identified as belonging to its supposed legionary precursor.

While there is no proof of this, it does serve to raise the point that fabricenses, who appear as a homogeneous group in the fourth century, may have had their origins in two different sources, civilian industrial communities (e.g. at Augustodunum) and the army itself. If the Lauriacum hypothesis is correct, then the change from legionary fabrica to 'imperial' fabrica would have been nominal, the factory and its workers ceasing to be part of the legion and coming under direct central government control. But it is evident that the government generally built new installations, and the new system must have required an immense effort of construction and organisation. MacMullen has asked why the state had to build arms factories - 'Why not simply confiscate them [i.e. the private establishments]?', More fundamentally, why did the state have to involve itself directly in arms production at all?

Motives ascribed to Diocletian for this act of state interference
(assuming that it was this Emperor's decision) fall into two groups, political and economic. Among the former, Seeck suggested that fear of rebels contributed to the take-over, in order to deny arms to usurpers. Ensslin suggested that the fabricae were set up because existing sources were inadequate to supply Diocletian's 'greatly increased' army. However, the degree of expansion of the army is hotly debated, and it is by no means proven that Diocletian's army was vastly larger than the army of Severus. MacMullen proposed that the immediate reason for the establishment of fabricae mentioned in Malalas was the Persian threat. Yet the North was also threatened. MacMullen also made the vague suggestion that the new factories were linked with Diocletian's concern at the trend towards more skimpy equipment among the soldiers. The present writer is not convinced of the existence of any such general trend, at least before the later fourth century, nor would it be easy to relate to the new fabricae.

The economic explanations are more satisfactory. Seeck observed that the inflation of the third century led to tax in kind. Since arms cannot be so acquired, the state had to make them. MacMullen cites 'the chaos of the currency', but goes no further. The effects of the great third century inflation on the arms industry may be considered in more detail. Whether he bought his arms privately or had them issued, the soldier of the Principate had to pay for his equipment himself. Whether by direct payment or as stoppages, the cost fell ultimately on his pay, which was, of course, in cash.

The nature of the armaments industry of the principate has recently been discussed by several writers. Bishop has made a strong case for a largely self-sufficient army, at least in the first century AD, and has played down the importance of private production. However, the situation is far from clear in the East, where the city-based legions had access to many private craftsmen. Even in the West, other authorities detect a trend away from purely 'in-house' production, for arms and other equipment, in the second and third century. What are we to make of the rather thin, disparate and often apparently conflicting evidence? For the present, it seems reasonable to conclude that there was no great uniformity across the empire or over time, and that in some areas, the army provided entirely for itself, while in others, private craftsmen made a substantial contribution. While there certainly were some, perhaps many, specialist armourers, production of certain weapons could have been a standard part of the repertoire of bronze-smiths and blacksmiths, to be taken up as occasion required, allowing expansion of capacity in emergencies.

The effect of third-century disruption on arms production capacity can clearly be imagined. The civil wars and foreign invasions of the mid-third century led to massive dislocation of the established military infrastructure as legions were moved and split up, auxiliary regiments dispersed or destroyed, and many forts, with their production and storage facilities, were abandoned, at least temporarily. On the Rhine, Danube, and Euphrates, the army's capacity to supply itself with arms would almost certainly have been reduced, just at the time when, due to increasing rates of attrition, demand for arms was increasing. The nature of the effective part of the army of the 260s and 270s, a mobile striking force, was ill suited to self-supply. Temporary field forges are not ideal for making swords, armour and helmets. Under such
circumstances, it may be suggested that the army became increasingly dependent on civilian production.

But civilian craftsmen were also vulnerable to military disruption. Even in secure areas they were threatened by other pressures, perhaps most importantly the collapse of the coinage. Private armourers could not legally sell to the public for private possession of arms was an offence and export was banned. For armour and shields their only legal market was the army, which presumably paid in cash. The result of the inflation was to make the cash near worthless. Soldiers could not buy arms, and armourers could not afford raw materials. Presumably they either starved, or turned their skills to other work. Under such circumstances, if the state wanted arms it had to maintain the armourers, give them food and pay and provide them with raw materials in exchange for weapons.

In practice, armourers had always been dependent on the state as their only legal customer. The government could dictate conditions, and close supervision had long been exercised. This may well have been something more than quality control, and even as early as the second century state regulation may have been so tight that 'private industry' is an inappropriate description. Inflation was affecting the economy well before the Tetrarchy, and it may be expected that the change from cash payments to direct maintenance of armourers occurred long before AD 284. In this case, all Diocletian did was to take the next logical step of officially incorporating the armourers directly into the imperial services, regularising the de facto situation and putting things on a properly organised basis.

The fact that Diocletian did have to go to the expense of building accommodation for the new state fabricae, suggests that the existing private industry was not organised in large production units, but consisted of individuals or small groups; private fabricae on such a scale were not available to be 'nationalised'. The careful accounting of materials and scrutiny of work force and product which are such features of the established system in the fourth century clearly necessitated centralized facilities into which the hitherto separate artisans were drafted: hence the building programme. Locating the manufacture and stockpiling of arms in compounds which could be guarded inside walled cities, would also have a beneficial security aspect, not so much against marauding barbarians, for it would cut down the availability of Roman arms outside the frontiers, whether lost as booty or exported. Within the frontiers it had long been illegal for provincials to bear arms. The law is repeated forcefully in the fourth century and with good reason. Gaul especially was plagued with the rural disturbances caused by the bagaudae, a shadowy group, perhaps dispossessed peasants turned to brigandage, in numbers large enough to cause serious disruption. The defensible locations of the new fabricae helped to deny them arms.

REVOLUTION IN THE ARMS INDUSTRY REFLECTED IN HELMET DESIGN

This period of upheaval and reorganisation in the arms industry also saw a sudden break in continuity in the design of helmets. The first three centuries AD had seen a progressive development of design,
ever greater elaboration and improvement of protection, as the neck-guard form deepened and broadened, throat-flanges were added to the cheek-pieces, and the helmet skull became strengthened by reinforcing bars (Fig.10). Sometimes around AD 270-300, this tradition was abruptly replaced by a totally different one, incorporating a new range of helmet designs which were both simple and functional. These had in common a skull made in two halves joined and reinforced by an iron strip running over the top of the head from brow to neck, with separate neck-guard and cheek pieces.

Clearly, the design standard for helmets had been completely re-thought. All the established types required a large amount of very skilled work, especially to make the helmet bowl and neck-guard, which were worked from a single piece of metal. They had to be the correct thickness at different points, and often had raised panels or corrugations worked into them for additional rigidity. Fashioning accurate hinges for the cheek-pieces was also a relatively delicate, time-consuming job. The new helmet types did away with all the most complex elements. The abandonment of the one-piece bowl in favour of composite construction eliminated the need for difficult forgings, for the bowl was now made in two halves, each of which was often itself made of three smaller plates, all much simpler forgings which were rivetted together. The fore-and-aft strip which connected the two half-shells was usually of T- or box-section for rigidity, eliminating the need for additional reinforcing bars which had been a constant feature of earlier imperial helmets. Finally, the neck-guard and cheek-pieces were much less elaborate than hitherto, cut out of flat plate and given the appropriate curvature, then attached to the bowl by laces, leather straps, or sometimes buckles. Complex hinges were generally abandoned (Fig.10).

What was the cause of this apparently sudden revolution in helmet design? It seems unlikely that it can be explained solely in terms of changing fashion, if only because there seems to be no overlap in time between the old and the new designs. The earlier types were still current in the mid third century and the new pattern helmets were established by the beginning of the fourth. What had happened to make armourers completely alter their repertoire and also reduce their standards (for even the magnificent silver-plated and bejewelled 'officer's' helmets of the fourth century are often structurally crude by comparison with third century examples)? It seems to the present writer that this must be linked to the reorganisation of the arms industry which occurred at the same period. Hitherto, it is supposed, the individual craftsmen often worked to produce fine pieces commissioned by wealthy soldiers on a private basis. But with the 'nationalisation' of the industry, the armourers no longer worked to private orders but almost certainly to fill quotas set by the government. Since the state was now paying, it exercised control over the quantity and quality of the product. Hence the new range of helmet designs which appears, probably in response to a government specification for a design which provided similar protection for much less cost and time. The helmet ceased to be the work of art that it had been in the third century. It is not surprising then, that quality deteriorated so sharply, for the smiths had neither the time nor the profit motive to produce more than the absolute minimum standard. The new system, it would seem, delivered the goods but could not maintain
the quality and pride of craftsmanship.

ADMINISTRATION AND OPERATION OF THE FABRICA SYSTEM

The Notitia records not only the details of the factories, but also some details of the bureaucratic superstructure which controlled them. This was part of the ministry of the magister officiorum of each half of the empire. Considerable attention has been given by other writers to the fact that, since the fabrica system apparently antedates the title of magister officiorum, the factories must originally have been under the control of some other department. Much confusion and disagreement surrounds the question of who was originally in control of the fabricae, and at what date and under what circumstances the factories passed into the hands of the magister. This question is dealt with in detail in Appendix II, which concludes that they probably belonged to the magister from the inception of the office under Constantine the Great.

The Master of the Offices of each half of the empire had subordinates called subadiuvae fabricarum, drawn from the agentes in rebus. There were three such officers in the East, but the Western list is not specific. The Eastern figure may have increased to four in the fifth century. These men were very senior officials indeed, drawn from the highest grade of agentes, holding the rank of principatus. The subadiuvae of other ministries were of considerably lower status. The fact that these posts went to such senior men, who, within the master's officium were second in status only to his personal assistant and his deputies, serves to underline the high priority given to the maintenance of the state arms factories. The post of subadiuva fabricarum was held for one year before the incumbent proceeded to yet higher honours.

No mention is made in the Notitia of the scrinium fabricarum, apparently a full-scale bureau of fabrica administration which existed in the East by the reign of Leo, and to which the subadiuvae fabricarum were annually appointed. Since the Notitia chapters dealing with the magistri do not mention other scrinia within their ministries, it would seem that the establishment of the scrinium fabricarum as such, must post-date the Notitia and pre-date the reign of Leo, putting it in the first half of the fifth century. Whatever the date of foundation, the scrinium fabricarum is presumably the same as the scrinium fabricensium mentioned in Justinian's Novel, LXXXV, permitting us to trace the bureau to AD 539. The bureau probably had the standard complement of clerks, although the only ones recorded are chartularii, apparently accountants.

There is very little evidence of how the scrinium functioned, but we may assume that not only did it deal with all aspects of fabrica administration, supply and production, but also legal jurisdiction over, and disciplinary control of the fabricenses, for all these functions fell to the Master and his officium. The fabricenses were the largest group under the Master's control, probably far outnumbering the scolae.

It has been suggested that each subadiuva controlled all the
fabricae of one diocese. While there is no direct evidence for this, there may well be some truth in the idea as the fabricae were largely distributed on a provincial and diocesan basis (cf. p.267). Details of the process between the request for, and the delivery of arms to a particular unit are lacking, but it is possible to reconstruct it in outline, by analogy with the process used for other supplies. 'The Masters of the Soldiers were before the beginning of each indiction to send to the imperial scrinia returns of unit strengths, and the Praetorian Prefect was to check issues made by the suspetores against these returns...'. It may be inferred that requests for arms followed a similar course, passing from the unit concerned up to the office of the magister militum, whose department then forwarded the requisition to the Master of the Offices. The scrinium fabricarum would then direct the appropriate factory to make or release from stock the specified arms. The Praetorian Prefecture was also involved in the process, for it held ultimate responsibility for the collection, shipment and delivery of arms consignments. The magister officiorum had 'to notify the eminent Prefecture, and state the quantity of arms and the place from which they are to be transported, in order that the Prefect may immediately order the illustrious governor of the province to provide ships or vehicles out of those belonging to the public for the conveyance of said arms...'. Presumably this procedure was the responsibility of the prefect's scrinium armorum mentioned by John Lydus, who tells us little except that the office 'has definite payments from the provinces, I mean bowstrings, horn and other things. And for the emergencies of war, it provides by direct requisitions'. From this it seems that the scrinium armorum had a variety of duties, including the procurement of arms not made in the fabricae (e.g. bows in the East, probably raised as tax in kind, cf. p.264 above) and responsibility for delivery of supplies to, and movement of product from the fabricae.

THE NATURE OF THE FABRICAE AND THE ORGANISATION OF PRODUCTION

It is unfortunate that so little is known of the functions of the fabrica administration, but the historians are virtually silent on the matter. A good deal more is known about the individual fabricae themselves, although this is based almost entirely on the Notitia and the Law Codes. Before looking at this evidence, the archaeological evidence, or lack of it, must be examined.

All fabricae seem to have been at urban centres, and were presumably intramural for security reasons. Yet none of the historically attested ones has yet been indisputably identified on the ground. Possible candidates include the legionary fabricae (if they are correctly identified) in the middle of the Danubian bases, but the archaeological evidence is meagre and ambiguous, and no inscription has been found to prove that the legionary fabricae became the state fabricae of the fourth century. Certainly the best candidate so far is Building A at Sardis. This well defended late Roman enclosure of large, but indeterminate size stands in the midst of the city. However, once again there is no specific evidence that this is indeed the fabrica. While it is not suggested that the Severan foundation at Corbridge is a fabric in the sense under discussion, both this and the legionary fabricae may be used as analogies to give an idea of the scale of the
later establishments. In area, these early complexes range from about 0.1 to 1.0 hectares, but average less than 0.25 hectares. Corbridge falls in about the middle of the range, and it has been suggested that it could accommodate 100-150 men in its barracks, perhaps more. As will be shown below, the post-Tetrarchic centres were probably on this sort of scale, or not much larger in area. Considering the fact that perhaps most of the cities known to have had fabricae are dozens, even hundreds of times bigger than this, and that very few have seen archaeological excavation on a significant scale, it is not surprising that the fabricae are so elusive.

All this assumes that the fabrica was localised within the city. J.P. Wild believes that the roughly analogous imperial gynaeceae operated as a scattered cottage industry, but arms were politically sensitive, so it may be expected that they were walled in and guarded in a defined compound, containing workshops and warehouses, as at Corbridge in the third and fourth centuries AD.

No description exists of the fabricenses at work, but it may be expected that each man worked individually to produce finished pieces from scratch. It is possible that there was some division of labour in the production of some items; for example, metal and wooden parts of shields may have been made by different workmen. The only real hint of such specialisation comes from Sardis where a tomb inscription records a fabricensis who is also described as zographos or painter. They probably worked to production quotas assessed in terms of finished pieces. As discussed above, supervision was close, with strict accounting of materials and quality control perhaps facilitated by dividing the fabrica into a number of officinae like the mints, although there is no evidence of such divisions. It is difficult to see how some of the specialist fabricae could have operated on this basis, since neither artillery nor heavy cavalry armour was suited to mass production. The latter was required in relatively small quantities and it is likely that each full suit of armour had to be tailor-made to fit an individual soldier (and perhaps his horse too). The needs of artillerymen were also highly specialised and required the highest standards of craftsmanship available often to make unique pieces of equipment for siege-warfare. Direct liaison between these factories and the specialist units which they supported is to be expected, and so it is not surprising to find in the mid-fourth century a unit of ballistarii and a unit of cataphracts at Augustodunum, the site of the only Western cavalry armour factory, and one of only two artillery factories in the empire. Did these units send damaged and worn equipment to their fabricae for refurbishing? This raises the broader and perhaps unanswerable question, to what extent did army units in general repair their own equipment? For example, was Corbridge a centre for the servicing of equipment rather than its manufacture? Was old equipment recycled to the fabricae for complete refurbishment?

THE FABRICENSES: STATUS, ORGANISATION AND RANKS

The status of the fabricenses within the imperial service differed from that of any other group of workmen. Although they were artisans, they ranked higher than those who worked in the imperial textile factories or gynaeceae, or in the mints. These were slaves, but the
fabricenses and the related barbaricarii were free men (though legally tied to their work) and service among their ranks counted as a full militia. This status gained them the same privileges, legal exemptions and rights to draw the annona as government clerks or soldiers, and like them they were regarded as milites.

The staff of each fabrica were organised into some kind of corporate body resembling the so-called guilds of civilian artisans, resulting in a strange mixture of civil and pseudo-military organisation among them. It has been observed that each factory was organised like a military unit, commanded by a praepositus, with a primicerius, and many lower grades, all possessing the names of army ranks. But of course, all these military titles had passed into standard usage in the civil service as well, and so the military analogy should not be pressed too far. The unusually high status of these artisans reflects their importance to the imperial service. Within the jurisdiction of the Master of the Offices, they seem to have been second only to the Scolae among his priorities.

Fabricenses were also very numerous. No exact figures survive, but estimates may be made. The only contemporary estimate is that there was a 'great multitude' at Hadrianopolis. As MacMullen says, 'to supply the Roman army, (the fabricae) had to be big. If, as seems likely, they were modelled on legionary fabricae, they may each have housed a couple of hundred workers...'. Jones' analogy of fabricae and army units might suggest greater numbers, perhaps four hundred to five hundred men, but this is highly speculative. With thirty-five fabricae known to have existed, these figures would give estimates of the order of 7,000 to 17,500 men engaged on arms production across the empire, with perhaps twice as many dependents. Even the higher figure is not unreasonably large to supply an army of (supposedly) half a million or more.

After the army and the civil service, the fabricenses were apparently the largest group in the state employ. They were unusual among the branches of the imperial service in that they were organised into what was more or less a trade guild, or consortium fabricensium. The government made membership compulsory, and used it as a means of enforcing joint responsibility for recovering losses incurred through embezzlement by individual fabricenses. A roll of members was carefully kept. It is unclear whether there was one guild for all armourers, as one law seems to imply, or whether each fabrica had a separate guild for its staff. A law of Theodosius suggests that the guild had an elected hierarchy of men who apparently looked after the accounting of the materials for which all were responsible. Whether these officers also dealt with quality control and supervision is unknown, and even more problematical is the question of whether they are to be identified with the junior officers whose army style ranks are well attested in inscriptions. Were there separate guild officers and supervisory officers? If they were identical, to what extent were they elected, promoted by seniority or appointed by the government? It is hard to believe that any but the lowest were appointed by ballot!

The so-called non-commissioned officer ranks used in the late Roman army and civil service were, in ascending order of importance:
circitor, biarchus, centenarius, ducenarius, senator and
primicerius. A number of tombstones of fabricenses are known, each
recording the rank of the deceased. There are three inscriptions of
ordinary fabricenses, one from Salona and two from Concordia,
from a cemetery which also produced two of biarchi, and one of a
centenarius. A second centenarius is attested at Marcianopolis.
Two recently discovered monuments at Sardis Lydia were, belonging to
fabricenses of the rank of ducenarius. Another gravestone, of a
scutarius of the rank of senator, found at Nicomedia was interpreted by
Grosse as a fabricensis at the fabrica scutaria at that city. The
lack of any mention of the fabrica within this text makes it more
likely that the individual concerned was a soldier of a unit of
scutarii (a common unit designation in the later Roman army) rather
than a shield-wright.

The most senior rank, apart from the fabrica commander himself,
that of a primicerius fabricae is not attested on any known
inscription, but it is the subject of a law issued in AD 390.

The only posts of this military-style hierarchy not directly
attested so far are circitor and senator, but it may be assumed that
they were used.

The duties and methods of selection and promotion of these
officers remain generally obscure. However, one man, Flavius Zenis,
seems to have entered the Marcianopolis fabrica with the rank of
centenarius, having served in the army, suggesting some form of
'direct commission' to some ranks. A little more is known about the
most senior 'NCO' grade, that of the primicerius, apparently a sort of
foreman. He held his post for only two years, before being retired and
given membership of the protectores, a considerable honour for a 'mere'
artisan.

Each fabrica had a director or commander called a praepositus
fabricae as is illustrated by the tombstone of Flavius Romulianus,
praepositus fabricae at Concordia. At Ravenna there is an inscription set up by Sertorius Silanus
praepositus fabricae during the reign of Constantine. No fabrica armorum is otherwise attested at Ravenna, so
this example is uncertain. Ammianus mentions fabrica directors in three
separate incidents. In one he uses the title praepositus fabricarum,
but the official concerned was probably the commander of the Trier
barbaricarii, and thus nothing to do with the fabricae proper at all. Elsewhere, Ammianus consistently uses the title tribunus of the
directors of the fabricae at Cremona, and Antioch. This is the
only source to use tribunus rather than praepositus, and there have
been various attempts at an explanation. It is probable that
Ammianus simply used tribunus as a general term for commander, and did
not mean it as the official title, which probably was praepositus.

The ranking of the praepositus fabricae within the imperial
service is not clear. The Constantinian Ravenna inscription, which,
if not set up by a fabrica commander was set up by an officer in a
comparable post, records that the rank was held by a man titled vir
perfectissimus, and therefore a member of the equestrian order. The
tombstone of the Concordia praepositus does not mention such a title,
but it probably dates to the end of the fourth century when the title vir perfectissimus had greatly declined in importance and was even being granted to regimental quartermasters.\textsuperscript{239} The Notitia contains some further clues as to the status of the office. This document seems to be primarily a catalogue of official posts important enough for the emperor himself to appoint their incumbents. These were the prized posts of the laterculum maius, and most of the lists are in terms of appointments, i.e. field army unit commanders, or the procuratores of mints and clothing factories.\textsuperscript{240} The less important frontier commands were not part of this system, and formed the laterculum minus. The Notitia simply records that the factories were under the magistri officiorum, but does not list them by their commanders, who are nowhere mentioned. This suggests that despite the strategic importance of the factories (evident from their prominence and the attention given to them in the lists), their directors were not very important men, and their posts were probably part of the laterculum minus.\textsuperscript{241} If the Ravenna praepositus is accepted as a valid analogy, if not actually an arms factory commander himself, then his title of vir perfectissimus (still quite an exalted rank under Constantine), and the insignificance of fabrica commanders in the Notitia may reflect a serious decline in the prestige and importance of the post during the fourth century.

Little is known of the praepositi beyond a few names.\textsuperscript{242} Were they drawn from the civil service, ambitious, wealthy citizens, decurions buying posts in the service of the emperor to escape their curial duties, or from other sources? All may well have been represented. One director of the Cremona fabrica, involuntarily embroiled in a court intrigue, found himself out of his depth and appealed to be told what was going on, for he himself admitted that he was a 'somewhat rude and plain man'.\textsuperscript{243} He, at least, was no worldly-wise civil servant versed in the ways of court life.

It is not beyond the bounds of possibility that some or most of the praepositi were drawn up from the fabricenses themselves. It has already been seen (p.277) that after two years service, the primicerius fabricae was promoted to the corps of protectores. This parallels a practice in the army where soldiers who achieved the rank of primicerius were likewise promoted to the protectores.\textsuperscript{244} It seems that the corps acted as a kind of staff college, and many unit commanders were drawn from it. There thus existed a route by which common soldiers might reach high commands. Perhaps a similar practice existed in the fabrica service, with praepositi being drawn from retired primicerii fabricarum among the protectores. Such men would have an intimate knowledge of the workings of the system.

THE FABRICENSES: CONDITIONS OF SERVICE, PRIVILEGES, RECRUITMENT AND DESERTION

The fabricenses were tied to their jobs, as were many other professionals both within and outside the service of the state. Despite Theodosius' epic vision of armourers labouring until they dropped,\textsuperscript{245} there is evidence that fabricenses could retire, even if they did not become primicerius (p.277). A law exists which defines the legal privileges of fabricenses, which continued 'even after their term of service had expired'.\textsuperscript{246} The tombstone of Zenis indicates that there

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was a fixed length of service; he signed on for twenty years.\(^{247}\) One of the Concordia tombstones is of 'Flavius Calladinus veteranus militavit in fabrica sagittaria...'.\(^{248}\) It is most likely that Calladinus was, like Zenis,\(^{249}\) an army veteran who transferred to the fabrica on discharge.\(^{250}\) However, the lack of any details of an army career may indicate that his veteran status comes from service in the fabrica. However, there is no evidence that fabricenses were entitled to retirement grants of land or money, and even in the army many veterans preferred, or were forced, to stay with their regiments. Eventually, soldiers were legally entitled to stay on until they died. It is likely that a fabricensis could only afford to retire if he was lucky enough to have a son to replace him at the forge and support him in his old age.

The staffs of fabricae were mainly kept up to strength by the sons of fabricenses replacing their fathers, as the law required.\(^{251}\) However, there was apparently a shortfall significant enough to require outside recruitment, presumably as a result of childless marriages and early deaths, etc. One source of recruits was army veterans,\(^{252}\) since in the fourth century the government assisted them to take up a trade.\(^{253}\) A law of AD 412\(^{254}\) details the procedure for scrutiny of recruits to the fabricae, and is particularly interesting because it makes it clear that (at least at that time) there was actually a pressure of volunteers to get into the factories; conscription was unnecessary. The main reason for the close scrutiny of recruits was to ensure that the applicant was not already liable to service in some other compulsory trade or post, especially in a city ordo, which was always unpopular and evaded if possible. Decurions in the fabricae are discussed below.

While constrained to remain in their jobs, the fabricenses were, nonetheless better off than the majority of the provincial population because of the privileges following from their employment in the service of the emperor, which was a militia. Like soldiers and civil servants that they were exempt from compulsory public service or curial duties, even when retired.\(^{255}\) They also had immunity from billeting of troops or officials in their homes and workshops (unless the Sacred Comitatus itself was in the city\(^{256}\)). They further enjoyed the privilege of being liable to appear before no court save that of their ultimate superior, the Master of the Offices, a right which was extended to their wives and families.\(^{257}\) Such legal privileges and immunities were a common feature of the late imperial service, where officials of each branch of the state were accountable only to their heads of department. Soldiers of the comitatenses, for example, were answerable only to the magistri militum.\(^{258}\) The result might be interdepartmental warfare and attempts at empire building, as ministers tried to enhance their influence by impinging upon or poaching each other's territory. Rufinus' 'theft' of the fabricae is a case in point (Appendix 2). People like the fabricenses naturally looked to their superior and patron, in this case the magister officiorum, for protection. The magister is to be seen acting in this capacity in the Codes, for example, securing the fabricenses' aforementioned immunity from billeting in AD 405.\(^{259}\)

While protecting the armourers from outside interference, the Master also had to ensure that they stayed at their jobs. Desertion of
officials and citizens from compulsory duties was a common occurrence in the late Empire, and the introduction of the branding of fabricenses (in imitation of army practice), suggests that the staff of arms factories were no exception. Fabricenses may not have deserted because life in the factories was intolerable; they were better off than many civilians. There are indications that many were tempted, rather than driven away from their jobs. Two curious laws imply that fabricenses were in considerable demand as estate managers, presumably because of the accounting skills possessed by many of them. It would appear that the more ambitious were tempted in significant numbers to desert the security of the fabricae for this lucrative but illegal career.

Indeed, the fabricae cannot have been too unpleasant, for there were other deserters trying to get into the relative haven of their ranks. These men were mostly decurions from the city councils. A common method of avoiding the onerous burden of curial responsibility was illegal entry into government service. The Praetorian Prefect held the responsibility for keeping these men in their posts so that the civil administration could function, and he was constantly combing the ranks of the army and civil service for runaways to return to their positions. The Codes contain several texts on the subject, including one specifically about the procedure with regard to decurions in the fabricae. These laws were promulgated over a period of seventy years, and make it plain that apprehension of decurions in the fabricae was a perennial task for the prefecture. For those who were caught, length of service, no matter how great, was no protection.

THE FABRICENSES IN SOCIETY

It is unfortunate that so little is known about the role of the fabricenses in the lives of their cities. It would be of particular interest to know something of how they ranked socially in the local community. They were a numerous and permanent presence of imperial servants in the cities. In this they were unlike the army, stationed either permanently on the frontier or billeted temporarily in the cities for the winter, or the civil service, whose representatives in a city were far less numerous, but probably more influential than the average fabricensis.

How, then, did the community as a whole view the armourers in their midst? On the one hand, they were the visible manifestation of a government whose exactions strained local resources (and a large proportion of those resources were flowing into the fabricae themselves). On the other hand, many fabricenses were local men, by blood fully part of the local community, and, like any other citizens, owned houses in the town. Fabrica service, as a militia, brought privileges and exemptions, giving the armourers advantages over their neighbours. Whether these advantages were commonly exploited and abused is unknown.

Little is known of the relative or absolute wealth of the fabricenses. MacMullen has described them as 'industrial serfs' and indeed, the fact that the armourers were branded might seem to suggest that they lived in fairly desperate circumstances. However, the recent
discovery of a stone tomb with wall paintings belonging to a junior officer (ducenarius) of the Sardis fabrica has led Foss to suggest that at least some fabricenses were quite affluent, although his speculation that the individual concerned was an equestrian is to be rejected. Generalisation on this question is not useful. It is highly likely that there were systematic differences in wealth and status between fabricenses who were plain milites and those who occupied the officer posts (it would be surprising if there were not) and, in any case, the lot of the staffs of the individual fabricae may have varied widely in different areas at different times. For example, in the early fifth century the fabricenses in the West must have suffered as the provinces which supported them disintegrated, and the army they supplied dwindled away. The armourers in the factories of the largely intact Eastern empire seem to have prospered.

It is from these Eastern centres that the only historical glimpses of the fabricenses at large come, and it is clear that they could be a source of considerable trouble to the city authorities. Christian sectarian rioting in Caesarea Cappadociae involved most of the population, but 'especially those concerned in the manufacture of arms, and the Imperial weavers. And indeed, these are the hottest in matters of this kind, having the audacity, being made bold by their freedom of action'. The second sentence suggests that the fabricenses' legal immunities tempted them to flout the law, with virtual impunity. Furthermore, it is known that this was not a unique instance and it is clear that whether they were materially better off than other citizens or not, the fabricenses were evidently a prominent element in city life, and were prepared to use their local political weight if only in the violent religious dissensions of the period.

A more peaceful and altogether happier picture of the life of a fabricensis is to be found in this Christian tomb inscription:

'With good fortune. Flavius Zenis lived for 50 years; having served in Legion XI Claudia, he enrolled in the fabrica of Marcianapolis for twenty years service as a centenarius; he lived a blameless life with his wife and children and many friends, and in leaving his life, leaves behind as heirs both his wife Aurelia Martima and his son Nominatus aged twelve. He left married daughters and four unmarried. His son Marcianus died aged 20; he lived with his wife 30 years; his daughter Valeria died, married, aged 22; he had 12 children; his heirs erected this stele as it is necessary to do for the sake of his memory. Farewell, passerby.'

THE LATER HISTORY OF THE FABRICAE

In the Eastern empire it is possible to trace the history of the fabricae far beyond the time of the Notitia, mainly via the Codes. The fate of the fabricae in the West is more problematical. The oriental factories continued down to the early Byzantine period, and the Code of Justinian contains several fifth century texts on the subject. Justinian himself issued a Novel on arms production and the fabricae in AD 539. The latter is the latest existing legislation to discuss them. Fabricenses are also mentioned by Constantine Porphyrogenitus in
Justinian's Novel is particularly interesting in that it reveals the existence of a considerable private arms industry alongside the state capacity in the early sixth century. Does this suggest that the armament industry had never been completely nationalised? It has already been noted that certain areas of production were probably never organised into factories (p.264). The absence of weapons from Diocletian's Price Edict is instructive, and probably suggests that there was no private production and so no need for the government to specify what it will pay. It is suggested that the independent craftsmen (i.e. not state-employed), which figure so prominently in Justinian's Novel LXXXV, represent a reappearance of commercial, or at least black-market production. Alexandria seems to have been a particularly important centre of this industry, and Justinian decided to take action against this dangerous source of arms for the provincials and foreign enemies. The Novel provides for the smiths to enter the fabricae if their work is adequate and they are willing. There is no evidence of any fabrica in Egypt before this time, so perhaps Justinian organised the Alexandrian industry into one (cf. p.263).

There also seems to have been a fabrica at Constantinople by AD 539, which must be a late foundation post-dating the Notitia, which does not mention it. It is not known whether there were other significant changes in the Eastern fabrica system in the later fifth and sixth centuries. Seeck stated that 'a number of fabricenses were attached to the individual military units and they were then known as deputati', a view which is reiterated by MacMullen. This conclusion was based on Novel LXXXV, chapter 1, which discusses these deputati who clearly were armourers assigned to units, but the text nowhere states that these men were seconded from the fabricae. While this is one acceptable interpretation of the term deputatus, it might equally mean simply 'conscript', i.e. a civilian armourer drafted into service in the army. Consequently, there are no firm grounds for believing that the deputati were seconded fabricenses, especially in view of the fact that much of Novel LXXXV was concerned with eliminating private production and drafting the armourers into the service of the government, especially into the fabricae.

If Justinian's wishes were complied with, the Eastern fabricae were rejuvenated by an influx of skilled recruits in the mid-sixth century. The West, however, presents a wholly different picture. Laws pertaining to the fabricae continued to be promulgated in the name of the Western emperor down to the reign of Anthemius, but they mostly originated at Constantinople so that the appending of the Western ruler's name may only have been a formality. Existing opinion is divided over whether the Western fabricae survived down to the time of the Ostrogothic kingdom of Italy, as some believe.

The only evidence for this period consists of two texts in the Variae of Cassiodorus, an important Roman civil servant in the government of Theodoric the Great. The first, entitled 'formula de armifactoribus', is a standard form for a letter from the king appointing an officer to command a body of soldiers and armourers. The second, entitled 'formula ad PPO de armifactoribus', is a similar
set formula for the royal letter notifying the Praetorian Prefect of the appointment.\textsuperscript{285} It is worth setting out in full these texts, which have been little studied, in a literal translation from the highly involved Latin by Dr. Robert Ireland.

XVIII. Formula de armifactoribus
Consider well what you are taking on, and you can understand that you are not to employ your place in sinful actions. For to make arms well, is to desire to guard the safety of all, because, as soon as he has seen them, the enemy is terrified by them, and begins to lose his courage, if he realises that he has nothing like these. And thus, from such-and-such an indictment, we have set you above the soldiers and makers of arms [armifactores], induced by our opinion of your character, so that you may demand of the craftsmen such a work as you may know may please us. Let security resulting from our absence not lead you astray. We can see what you are doing. For indeed, by our experience of most subtle enquiry, we are able at first glance to detect mistakes by craftsmen, and also to judge what has been properly carried out. Take care, therefore, of the diligence and attention with which that is to be made which is known to be about to be submitted to our examination [sic!]. Act, therefore, so that no venality may sink you, because what is done wrong in such a matter is unforgivable. Make sure that you are not punished in respect of your evil actions. This is a work which brings death and safety, the death of sinners, the preservation of property, an always necessary aid against the evil. It is said that Phoroneus first offered this art to Juno that he might make his invention holy by the auspices of this deity, as they believed. Their things are necessary in war, becoming in peace. And last of all, these make weak and frail mortals stronger than all animals.

XVIII. Formula ad PPO de armifactoribus
By the reports of many, we have discovered that so-and-so, a man of excellent character, can carry out faithfully that which has been entrusted to him. Consequently, your Illustrious Magnitude is to know that we have chosen him, so that he may be both in charge of the soldiers, according to ancient custom, and may give instructions to the makers of arms [armifactores], so that they may carefully fulfill their customary tasks that no offence may be found in them. Although negligence anywhere is dangerous, this is a serious blow if the apparatus of war is neglected. For indeed it is the equivalent to treachery to remove from the army that with which it is agreed it is armed. To these [the armourers], your Providence will allot their customary tasks so that the necessary things may be more easily required of them, since the excuse of food is removed from them [sic].

It is worthy of note that the rank, title and geographical location of the dignitas are nowhere mentioned. Also, neither the term fabrica nor fabricensis appears. Thirdly, the latter formula is addressed to the Praetorian Prefect, even though the magister officiorum still existed under Theodoric.\textsuperscript{286} These texts do at least
prove that the Ostrogoths maintained a government supervised, and probably state-run arms industry. However, the fabricae as they are presently understood in the fourth century had evidently ceased to exist by this date. It is to be remembered that the fabricae formed part of a complex supply system for the Western army, so it would be expected that they would disintegrate along with the rest of the system and the army itself in the fifth century. The communities of armourers presumably lived on in their cities (at least in Italy), and will have had little trouble making a living in a trade in great demand in war-torn fifth century Europe.

They were presumably still there when Theodoric established his kingdom in Italy with a large, well-equipped army which had great need of their services.

One of the most remarkable things about Theodoric is that he was an ardent romanophile. He took over and repaired the Roman tax system and civil service in Italy and in most aspects of government closely followed imperial tradition, maintaining the principal ministers in their old jobs. It would not be unexpected, then, if he also imitated the maintenance of a state arms industry. The Ostrogoths continued to raise the annona for the government and army, and the reference at the end of the formula XVIII to the 'excuse of food' may be an allusion to the right of the armourers to draw it as royal servants.

Whatever the exact status of what looks to be a revived state industry, it was now under the Praetorian Prefect rather than the Master, for formula XVIII is addressed to the former and explicitly mentions his control of the armourers. He supervised production, and the curious passage about the 'excuse of food' probably indicates that the armourers were kept working by the threat of the withdrawal of rations.

A little more information can be gleaned from the context of the two formulae. Cassiodorus put together the the twelve books which go to make up the variae at the end of his public career, after his term as Praetorian Prefect, while Byzantine armies were overrunning the Italian peninsula in AD 535-6.²⁸⁷ Ten of the books are composed of official letters apparently drawn from the correspondence files at Ravenna. The remaining two, books six and seven, are of different material, the nature and purpose of which Cassiodorus himself explains in his preface to the work:

'...I do not wish others the difficulty I frequently run into in conferring titles of honour, so that they produce rough and hasty compositions on the spur of the moment, and so in books VI and VII, I have included the formulae for [letters of appointment to] all official positions'.²⁸⁸

The formulae are broadly arranged in order of diminishing importance, so that those for the Praetorian Prefect and the Master of the Offices are in book six. The two armifactores texts are well into book seven, suggesting that they are not very senior. What, then, was the rank and title of the official concerned? It is clear that he was not only in charge of the armourers but a body of soldiers as well, but it is his responsibility for the armourers which receives repeated
emphasis in both texts, and the milites are mentioned only in passing.

Some of the other formulae in the same part of book seven pertain to officials entitled comes civitatis, officers who commanded the garrisons of such cities as possessed them. Some of these comites were given duties over and above purely military ones. For examples, the comites of Naples and Syracuse were responsible for administering the ports of those cities. The two arms-related formulae are adjacent to those for various comites civitatum. It is therefore reasonable to suggest that the two formulae in question related to appointments of comites civitatum to commands of garrison cities with communities of armourers. Supervision of the armourers was an extra duty like control of the port at Naples. The passing reference to soldiers is also explained, as command of these would be taken for granted as the basic duty of the comes: it was his special additional responsibility which required emphasis. These officers probably held their posts in the old fabrica cities of Northern Italy. Ticinum, the site of a bow factory in the fourth century, is known to have had a comes so the formulae may refer to him and perhaps others.

In Italy then, a derivative form of the state arms industry survived into the sixth century, even if the characteristics of the fourth century itself were no longer evident. The fate of the armifactores of the Ostrogothic period or the fabricenses of Gaul and Illyricum after the time of the Notitia is even more obscure. The outline of the collapse of the West gives a rough guide to the latest possible dates of survival. For instance, the Trier fabricae are unlikely to have survived the withdrawal of the imperial court to Arles in AD 413, and the loss of control of Northern Gaul accompanied by the disintegration of the army, makes the survival of the Gallic fabricae after the 420s unlikely. When the Pannonian and Moesian fabricae ceased to operate is equally unclear. It may have been at about the same time as that suggested for the Gallic centres, although there are indications that it may have been significantly earlier. Ammianus records that in AD 378 Aquincum was deserted and Carnuntum too dilapidated to serve as winter quarters for the army. Given this fact, it is hard to see how the fabricae known at these sites from the Notitia could have been operating in the last quarter of the fourth century. Ammianus is supported by the archaeological evidence, which suggests that Aquincum was declining from the mid-fourth century, part of a general trend among cities along this part of the Danube at the time. All this suggests that these fabricae had already ceased to function at a date half a century before the supposed closing date of the Western Notitia lists, around AD 425. By that time the frontier zone had long been vulnerable to attack, and it was suggested above that at least one fabrica was evacuated to a more secure rear area (p.266).

Claudian gives the latest reference to the Lower Danubian factories. He puts into the mouth of Alaric a speech in which the Gothic king reveals that he drew on the fabricae of Thrace to equip his troops. This causes no surprise as Alaric was made magister militum by the Eastern government in AD 397, and may therefore have been given access to the factories.

It is unknown whether the fabricae of the Eastern Balkans survived
up to or after the Hunnic invasions of the 440s. The disruption caused by the depredations of Attila, involving widespread destruction and wholesale evacuation of Roman territory, could have resulted in withdrawal of the fabricenses to the safety of the capital, providing an explanation for the reference to a hitherto unattested factory at Constantinople in Justinian's Novel LXXXV.

It appears that the fabricae continued to equip the army throughout the sixth century, and indeed the latest relevant textual reference known to the writer dates as late as AD 612, consisting of a mention of three fabricenses from one of the Nicomedian factories. In the absence of other evidence, we may for the present conclude that state production remained the norm. By the late sixth century, and perhaps much earlier, it was standard practice to give soldiers cash allowances for arms rather than to issue them in kind, money which, of course, often went on other things. Maurice issued arms in kind to troops on the Danube, an action which contributed to the growth of dissaffection in the ranks and, ultimately, to the usurpation of Phocas. If soldiers were free to buy their own arms, was production still limited to the state factories? There is no way of deciding the question at present.

In many ways, the early seventh century marked the watershed in the development of the Eastern Roman empire into the Byzantine empire. The first three decades of the century saw almost the entire empire overrun by foreign enemies. Bulgars and Persians reaching the gates of Constantinople. No sooner had Heraclius liberated Egypt and Syria-Palestine than the Islamic armies swept out of the desert, driving Roman power out of these areas forever. The loss of Syria gives an effective terminus ante quem for the end of the fabrica system as such, even if the craftsmen themselves lived on to serve new masters. Indeed, it may be doubted whether the complex system of supply which maintained the factories had survived the Persian invasions.

In any case, it is probable that from the reign of Heraclius there was no longer any need for a comprehensive system of state arms production centres. The Persian invasions precipitated a series of far-reaching reforms, which encompassed a total reorganisation of the armed forces. The old army consisted of standing units of regulars, the maintenance of which required the complex system for levying supplies run by the civil service and provincial administrations. The fabricae were an integral part of the system. However, the new army was very different, being organised on a largely territorial basis. Soldiers were maintained by giving them land, and in return were expected to equip themselves and be available for service. This new organisation eliminated much of the need for a large-scale military supply system, and may have made the network of big arms factories largely obsolete. This is not to say that state arms factories were not maintained to supply the small field army which was quartered around Constantinople. Indeed, there seems to be some evidence that individuals called fabricenses still existed in the Byzantine Empire as late as the eleventh century.

The vestiges of the comprehensive network of state arms factories probably disappeared along with the bulk of the army it had been designed to equip, the regular army as reconstructed by Diocletian and
Constantine, which, during the crises of the early seventh century was replaced by the Thematic army of the Byzantine Empire.

SUMMARY AND CONCLUSION

The fabricenses occupied a unique position in the imperial service. Although artisans they were not slaves like the workers in the state clothing factories or the mints, but, like civil servants as well as regular soldiers they ranked as milites. This anomalous situation probably arose from the fact that when the state took over arms production, apparently late in the third century, many of the craftsmen drafted into the new factories were drawn from the ranks of the army and so were milites already. Nevertheless, the relatively privileged position which fabricenses continued to enjoy in succeeding centuries reflects the importance and prestige of their work.

It is argued that the state arsenals did not appear piecemeal in the later third and fourth centuries, but were, probably from the start, created as the elements of a well-conceived and highly organised state production system, perhaps partly developed from the old fabricae of the legionary bases and other military production capacity, but built mainly on the ruins of the earlier, supposedly free-enterprise, industry which had supplied weapons during the Principate.

The earlier industry is believed to have collapsed as a result of the military and economic upheavals of the third century (especially the collapse of the coinage). However, the continued demand for weapons precipitated direct state action to keep production going. The little evidence we have suggests that the ambitious new system of state factories was the work of Diocletian as part of his great restructuring of the empire in the decades around AD 300. Yet, state interference in the arms industry was nothing new. The formal government take-over was just the culmination of a long process of increasing official control and domination of an industry in the almost unique position of having the state as its sole legal customer.

If the rarity of their appearance in the sources suggests that fabricenses seldom impinged on the mainstream of historical events, the large numbers of them living in many major cities across the empire cannot have failed to have had a profound economic and social effect on local life. At the same time, their strategically vital work led them to become an integral part of the services of the imperial regime. Over the centuries, the fabricae became as much an inseparable part of the fabric of the empire as the standing army they served. They were such a fact of life in the empire that the Ostrogoths, whose government faithfully preserved so many imperial institutions, apparently went so far as to revive state arms factories in Italy, long after the last Western emperor had been deposed.
APPENDIX 1: THE DATES OF THE FABRICA LISTS IN THE NOTITIA

Hoffmann’s analysis of the army lists in the Notitia Dignitatum (1969) has done much to elucidate their structure, development and dating. The lists are revealed as palimpsests, consisting of information becoming progressively modified as the order of battle of the army changed during the fourth and earlier fifth centuries, when the lists reached their final form. The lists of regiments are organised by type of unit (i.e. infantry or cavalry) and within each list, at least for the field army, the units are arranged in order or precedence.

The fabrica registers, like other Notitia lists of installations, are organised on an entirely different basis, in which order of notation was determined by geographical location (cf. p.258). It seems likely that the lists of factories remained open to amendments for some time after their original compilation, as is suggested by the cases of Ambianum and Salona discussed on p.266.

The main clue to the date of the registers comes from the Eastern list, specifically the entries for East Illyricum:

NDOr. XI,36. Thessalonicensis
   37. Naissatensis
   38. Ratiarensis
   39. Scutaria Horreomargensis

Unlike other entries, the first three of these contain no mention of the arms made in the factory concerned. Seeck thought that this was because they were general arms works. This is not an acceptable explanation, since general arms works are elsewhere designated as such (e.g. armorum omnium at Argentomagus. The various factories categorised as scutaria et armorum also seem to be general arms works). An analogous case is to be found in the Western lists, where the entry for Soissons also lacks a production category. Seeck inconsistently regarded this as a lacuna.

It seems unlikely that the omission of categories from three successive entries in the Illyrican lists could be a simple accident. The抄写ist either did not bother to note the categories or did not know them. It is significant that the fabricae under scrutiny were in an area which was subject to a boundary change between the Eastern and Western empires at the end of the fourth century. In AD 395, the Praetorian Prefect of the East, Rufinus, demanded that Stilicho permanently relinquish Western sovereignty over the dioceses of Dacia and Macedonia to the Eastern government. Stilicho conceded.

If, as is likely, the fabrica lists already existed in AD 395, amendments would have been deleted from the Western list and added to the Eastern. Such amendments would provide the opportunity for the omissions to occur. After all, the Notitia as it survives, is agreed to be primarily a Western document and indeed, the fabrica lists are unusual in bothering to itemise the locations of the Eastern installations at all. For other classes of government production centres, notably the analogous gynaeceae, the Notitia lists only the Western textile factories. It might be that the alterations were
made by a Western scribe, who deleted the fabricae from the Western list and rather carelessly scribbled them on the end of the Eastern list. Since they then ceased to be a concern of the Western government, accuracy and completeness may not have been important. But why then, did the scribe bother to note that Horreum Margi, the last of the entries, had a fabrica scutaria?

An alternative explanation is that in AD 395 the Eastern and Western lists had not yet been brought together. The amendments were made by the separate governments to their own lists, and it may be that the Eastern scribe did not have full information on what the newly adopted factories were producing, except for Horreum Margi.

This would imply separate origins for the lists, and indeed, they are put together in different ways. For example, the Oriental register specifies how many fabricae are in each diocese, while the Western list does not. More fundamentally, in the Western list, the city comes before the production category in each entry. The Eastern entries are arranged the other way round.

If the two lists were separately compiled in the two halves of the Empire, there is a terminus post quem for their compilation of AD 364, when the Empire was divided by Valentinian and Valens and the offices of state, including the post of magister officiorum became formally and permanently duplicated. From that time fabrica direction must have been territorially divided between the two magistri. The independently compiled lists would therefore date to AD 364 or later. The anomaly of the East Illyrican entries suggests that they existed in AD 395. Unfortunately, no greater degree of certainty is possible.
APPENDIX 2: THE CONTROL OF THE FABRICAe IN THE PALATINE MINISTRIES

The Notitia Dignitatum shows that in the early fifth century the fabricae were under the control of the magister officiorum of each half of the empire. This cannot always have been so. It has been shown above (p.266) that the fabrica system was almost certainly a Tetrarchic innovation, but the post of Master of the Offices was not created until somewhat later, during the reign of Constantine the Great. During the intervening years at least, the fabricae must have been the responsibility of some other official.

The reform of the government during the Tetrarchy made the Praetorian Prefect more powerful than ever before, effectively chief minister and commander of the armed forces. He also bore responsibility for raising recruits and supplying the army, and it is the latter function which makes it reasonable to suggest that he was also given charge of the new arms factories, for this would have constituted a natural adjunct to his jurisdiction in the area of military supply. However, it should be emphasised that there is no proof that this was actually the case. It is often stated as a proven fact, but is no more than a reasonable inference. The problem of identifying the department controlling the fabricae at this early date is somewhat complicated by the existence of a career inscription, dating to the last years of the reign of Diocletian, of a certain Tertullus, who held the post of praepositus fabricae [...]. The individual concerned was probably not a plain praepositus fabricae, because he held the highest posts of state and the title under discussion is very prominent in his career inscription. It was placed second only to the Urban Prefecture and a final title which may have been the Proconsulate of Africa. The proposed reconstruction of the title in CIL is praepositus fabricarum, since it was supposed, then and since, that the office was too important to have been confined to the control of a single fabrica. This has resulted in a number of unsubstantiated statements about the relationship of this official to the fabrica system and to the Praetorian Prefecture. Boak flatly stated that the alleged praepositus fabricarum was a subordinate of the Prefect with responsibility for all or some of the fabricae, while Seeck believed that the official was independent of the Prefect, and represented the latter's loss of control of the fabricae before the reign of Constantine. MacMullen speculated that this praepositus fabricae [...] was commander of one fabrica when they were still few and relatively important. It is also possible that Tertullus held a special post, created as a temporary expedient to deal with the enormous administrative task of setting up the new factories. However, in the absence of other evidence, it is most likely that the fabricae were in the charge of the Praetorian Prefecture at the accession of Constantine.

A crucial question is at what date did the magister officiorum acquire control over the fabricae, probably out of the hands of the Prefecture? Did this occur when the post was created by Constantine, or later, closer to the time of the Notitia? Seeck seems to have believed that the Master took over the factories almost as soon as his ministry was established. Most other authorities opt for later dates; e.g. by AD 390, and probably between 388 and 390; 'unknown but after 369'. Boak was more reticent, observing that the first clear proof...
of the Master's control dates to AD 390, while noting the inactivity of the Prefect in this sphere beforehand.\textsuperscript{321} Waltzing opts for the latest date, AD 396, linking the changeover with the fall of the prefect Rufinus,\textsuperscript{322} an event of great importance to the question in hand.

Waltzing chose the fall of Rufinus as the moment on the basis of two similarly worded passages in John Lydus,\textsuperscript{323} which record that the emperor Arcadius took away (among other things) Rufinus' control over the arms factories. The latter was Praetorian Prefect at the time. This is not as conclusive as it appears, because of the evidence on which the slightly earlier dates mooted by Boak, MacMullen and Jones are based. These were derived from an examination of the addressees of various dated laws relating to fabricae in the Codes of Theodosius and Justinian.\textsuperscript{324} MacMullen's relatively early terminus ante quem of AD 388 is apparently based on the belief that the text CTh. X.xxii.2 of that year was addressed to the Master, whereas in fact it was addressed to Tatianus, the Praetorian Prefect.

There are three possibilities to consider:

1. That the fabricae were given over to the magister by Constantine (Seeck).

2. That the changeover came about in AD 388-390 because laws related to fabricae begin to be addressed to the Master from that time (Jones).

3. That the changeover occurred in AD 396, when the fall of Rufinus precipitated the diminution of the Prefecture (Waltzing based on John Lydus).

In an attempt to choose between these alternatives, the last may be considered first. According to John Lydus,

'...a man called Rufinus, insatiable in greed, whom Arcadius employed as Praetorian Prefect, decided upon a tyranny departing from purposes good to the state, and hurled the magistracy into an appalling abyss, for the Emperor immediately took away from his magistracy his power over the arms, and then that over the fabricae as they call them, that is the factories making arms... and the cursus publicus, ...from all of which his magistracy is composed...'.\textsuperscript{325}

It seems clear enough from this that the changeover occurred in AD 396, the date of Rufinus' fall, and that up to this date 'the oversight of fabricae regularly belonged to the Praetorian Prefect'.\textsuperscript{326} But MacMullen draws attention to the fact that a law related to fabricae of AD 390\textsuperscript{327} was addressed to the Master of the Offices. He explains this by suggesting that the prefect Rufinus had poached the fabricae from the Master after 390. Boak\textsuperscript{328} took a similar view, i.e. that the Prefecture was temporarily usurping something which was already a function of the magister officiorum by 390.

All this directly contradicts Lydus, but the latter was writing long after the events he was describing, so he may not have been entirely clear about the relationship of the fabricae to the palatine ministries at the end of the fourth century. It is noticeable, for
that while loss of the fabricae is mentioned as part of the damage to the Prefecture caused by the fall of Rufinus, Lydus does not elaborate. He is much more forthcoming on the consequences of the loss of the cursus publicus, about which he clearly knows much more. If laws on the fabricae were being addressed to the Master in AD 390, then Lydus was simply wrong in thinking that the fabricae were still an integral part of the Prefect's jurisdiction in 396. The changeover must have happened at some earlier time. The evidence for Jones' proposed changeover bracket of AD 388-90 must now be examined. This proposal is derived from the identity of the addressees of various laws related to fabricae in the Codes. The dates and addressees of all such laws are presented in Table V. It is at once clear that up to AD 388, all laws were addressed to the Praetorian Prefect. From AD 390, virtually all were addressed to the Master of the Offices. (The two texts addressed to the comes rerum privatarum were instructing him not to interfere in the fabricae cf. p.279). This seems to lend strong support to Jones.

Jones also observed that the Master of the Offices in AD388-90 was none other than Rufinus, the same man who became Prefect in 392 and whose bloody end in 396 damaged the Prefecture as Lydus records. Jones proposed that Rufinus, as magister officiorum, usurped control of the fabricae from the Prefecture in 388-90, but held onto them when he himself became prefect in 392, thus taking them back again. They were then transferred back to the Master in 396. If Jones is right, then the complexity of these events helps to explain the confusion over the dates.

However, if in addition to the addressees, the contents of the legal texts are considered, a significantly different picture emerges. All texts addressed to the magister, which are dated after 390, deal with issues pertinent to the running of the arms factories and the administration of the staff. The topics covered include the promoting of foremen, the primicerii fabricarum, branding of armourers, their immunity from billeting, and punishment for dereliction of duty. Others concerned the despatch of arms shipments, and the absorption of private armourers into the fabricae.

If the Praetorian Prefect had been in charge of the fabricae prior to AD 388, it might be expected that the laws relating to fabricae promulgated before that date and all addressed to him should also be concerned with such internal matters. This is not the case. Two of them concern the apprehension of decurions hiding in the fabricae or other branches of the imperial service, several of which were certainly not under the Prefect's control, e.g. the army and the argentarii. Another pertains to measures to be taken against palatines for neglect of duty. Again, praepositi fabricarum are included as part of a much broader list of officials from a variety of departments. Finally, the law of AD 388 is concerned with the quality of metal delivered to the fabricae, and not what happens afterwards.

None of these shows the Prefect in charge of the fabricae. In fact, all are explicable in terms of other known functions of the prefecture. For instance, as head of the civil administration it was the Prefect's responsibility to keep the decurions in the city councils, and to pursue deserters in all branches of the imperial service, including fabricae. As chief legal officer, he was concerned
with prosecution of crime (including dereliction of duty) in all
government departments. His involvement with quality control of
materials being supplied to the fabricae may be seen simply as part of
his wider responsibility for supplying all government needs for
material, not only for the army, civil service and fabricae, but for
the imperial mints too. The latter were not under the Prefect, but
under the comes sacrarum largitionum.

The supposed changeover in the addressing of fabrica legislation
in 388-390 is also more apparent than real, for there is one final law
addressed to the Praetorian Prefect, dated as late as 412. Like the
others, this one is explicable in terms of the Prefect's other
functions, for it covers the question of deserting decurions and
scrutiny of recruits, in this case with reference to arms factories.

It is suggested that Jones and others have misinterpreted the
evidence in the Codes, and that the changeover of AD 388-390 will not
bear close scrutiny. The true situation is that the codes contain two
groups of laws. The first consists of texts addressed to the Prefect on
matters where his activities impinged on the 'foreign territory' of the
fabricae. None shows the Prefect in charge of the factories, and they
range in date throughout the fourth century and into the fifth. The
second group is concerned with the internal affairs of the fabricae and
all the rescripts are addressed to the Master. The fact that the
earliest of these texts dates to 390, probably relates more to the
sources of compilation of the codes than the history of palatine
administration over the factories. The two groups of laws do overlap in
time, but not in content. They are complimentary, and together provide
the kind of coherent body of law on the subject which was the entire
purpose of the writing of the Codes.

What, then, are the implications of this? The Codes contain a
selection of legislation. Presumably there was at least some bias
towards later laws where these superceded older legislation, and this
may well be the reason for the lack of texts addressed to the magister
dated before AD 390. The fact that the Codes are a selection and not a
complete catalogue of legislation makes them in any case a dubious
basis for dating the changeover, and as has been seen, they cannot be
held to do so. In fact, there is no real evidence for the date in
question, although there are indicators. If it is assumed that the
Master had achieved control of the fabricae well before 388, Jones'
complex sequence of events surrounding the end of Rufinus can be
disposed of (p.291), and also the curious fact can be explained that
the fabricae went to the magister again in 396 when, according to
Jones, they had been usurped from the prefecture to that office only
four to eight years previously. What probably happened was that
Rufinus, appointed Master in 388, simply inherited the fabricae from
his predecessor. He then refused to relinquish control of them when he
became Prefect in 392. As an established part of the officium of the
Master, the factories reverted to the latter when Rufinus was
assassinated in 396.

One further piece of evidence is to be found in Ammianus, who
records the unwitting involvement of the Cremona fabrica director in a
political intrigue. The plot misfired, and the treasonable
correspondence ended up at the imperial court. The letter was handed
over to one Florentinus, who is described as agens of the Master of the Offices. The inference must be that the Master's officium was already responsible for the fabricae at the time, so that all matters relating to the factories or their staffs were handed over to its jurisdiction. The date is AD 355, thirty-five years before the date suggested by Jones.

The evidence, such as it is, does not allow the date at which the Master acquired control of the state arms production system to be fixed. However, the undermining of the late fourth century dates leaves the way open for the simpler hypothesis that the magister officiorum held them from the start, when Constantine created his post as part of the wider reorganisation of the government. The most significant part of that reorganisation was the reduction of the monolithic Praetorian Prefecture, which is known to have lost its power over the army and other areas at this time. The deliberate partial dismemberment of the prefecture by Constantine provides both the obvious motive and the opportunity for the transfer of the fabricae to the newly-created magister officiorum.
NOTES

1. This paper was written in 1980-81 and was intended to appear in Roman Military Studies I which was to have been published by VORDA. However, as the volume was never published, this and all the other papers were withdrawn. I would like to thank Ralph Jackson and Fiona Cameron for the editorial work they undertook for the abortive publication, and Jon Coulston for including it in the present volume. I have taken the opportunity to update and rethink it somewhat, although not as much as I would have wished.

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3. MACMULLEN, 1960, 32 note 82.

4. JULLIAN, 1896; SEECK, 1909.

5. A number of writers have discussed the fabricae as part of the larger subjects, e.g. WALTZING, 1896; BOAK, 1919; JONES, 1964; MACMULLEN, 1960.

6. See especially CTh. X,xxii, 'de fabricensibus', and below, index.

7. The following takes as its basis the printed edition of SEECK, 1876.

8. The complex problem of the date of the Notitia is not relevant here. What is clear is that some or all of the lists were altered and amended for some time after their original composition. Hoffmann, studying the army lists, argues for a closing date between AD 396 and 410 for the Oriental lists (1969, 52), and concludes that the Western lists cannot have closed later than AD 425 (1969, 58).


10. NDOc. IX,16-39.

11. NDOc. XI,44.

12. NDOc. IX,43.
13. The exceptions are Argentomagus (NDOcc. IX,31) which is in Septem Provinciae and not Galliae; Lucca (NDOcc. IX,29) which is in Suburbicaria and not Italiae; and the list of East Illyrican fabricae, which is simply headed 'Illyricum', not distinguishing between the dioceses of Macedonia and Dacia (NDOcc. XI,35-39).


15. SEECK, 1909, 1927.

16. NDOcc. IX,84.

17. NDOcc. IX,35; SEECK, 1909, 1927.

18. NDOrc. XI,30.

19. NDOrc. XI,32.

20. SEECK, 1876, 32; note 2, following Ghelen's editio princeps of 1552.

21. Especially in the Western lists, where the regional headings do not specify the number of entries following.

22. JULLIAN, 1896, 960.


25. NDOcc. XI,45-60. The gynaecae have been studied by WILD, 1976.

26. In common with almost all other lists of installations, such as thesaurii (NDOcc. XI,21-37 as opposed to NDOrc. XIII,10), monetae (NDOcc. XI,38-44 as opposed to NDOrc. XIII,18) or bafii (NDOcc. XI,65-73 as opposed to NDOrc. XIII,17). The fact that only for the fabricae is the Eastern empire covered in detail, underlines the importance of these establishments.

27. And indeed the shorter ones, for example the Western racionales summarum (NDOcc. XI,9-20) and comites rei militaris (NDOcc. I,30-36).

28. I.e. between NDOcc. IX,29 and 30.

29. NDOcc. IX,31. Note that the entries for Galliae and Septem Provinciae are grouped together, as are those for Italia and Suburbicaria, just as in the lists of praesides.

30. Lactantius, de mort. pers. 7, which seems to imply more than one fabrica. NDOrc. XI,27-28 record two at Nicomedia.


34. Athanasius, *Hist. Ar.* 18; Amm. XXXI,6,2.

35. Amm. XV,5,9.


38. *CTh.* X,xxi,l.

39. *CTh.* X,xxi,l relates specifically to *barbaricarii,* but in the Theodosian Code is the first law in the chapter *de fabricensibus.*

40. *Occidens XI:* Sub dispositione viri illustri comitis sacrarum largitionum:

74. *Praepositi branbaricariorum* sive argentariorum:

75. *Praepositus branbaricariorum* sive argentariorum Arelatensium:

76. *Praepositus branbaricariorum* sive argentariorum Remensium:

77. *Praepositus branbaricariorum* sive argentariorum Triberorum:


In the oriental section appear the following entries: (under the Master of the Offices) *NDOr.* XI,

45. *(Subadiuvae) Barbariorum* (sic) *tres* (sic).

46. *Orientis unus.*

47. *Asianae unus.*


49. *Thraciarum et Illyrici unus.*

Seeck identified these as *subadiuvae barbari(cari)orum,* resulting in the widespread belief that by the time of the Notitia the Eastern *barbaricarii* were in the hands of the *magister officiorum.* However, in his unpublished doctoral thesis, J.P.C. Kent has demonstrated that this was not the case, and that the officers referred to here were indeed *subadiuvae barbarorum,* for that title is attested in the Eastern empire twice in the fifth century (KENT, unpub., 206).

41. Amm. XXIX,3,4. It is not explicitly stated that the incident occurred at Trier. In any case, the reference is concerned with embellished armour, apparently for the Emperor himself; such pieces were almost certainly made by the *barbaricarii,* of whom there was a body at Trier, (NDOcc. XI,77). It is likely that the *praepositus* mentioned by Ammianus was commander of these, and that the *fabricae* were not involved at all.

42. *CTh.* X,xxi,l.

43. Nov.J. LXXXV seems to imply the existence of such a centre by AD 539.

44. P. Beatty Panopolis I, especially lines 213-6, and 314-46;
MACMULLEN, 1976, 156 note 23.

45. WILLIAMS, 1985, 82.

46. Just. Nov. LXXXV; see p.888.

47. CIL III, 2043.

48. MIHAILOV, 1965, 150-3, no.3; ROBERT & ROBERT, 1966, 395 no.257. This stone was not found at Marcianopolis, but in the region of Pautalia, near Kiustendil, Bulgaria (thanks to Dr Andrew Poulter for assistance with this find).

49. FOSS, 1976, 106, inscription IN64.3; FOSS, 1979, 279; GREENWALT, 1979, 4, tomb 76.1.

50. CIL V, 8742; Diehl 503, 508; CIL V, 8745, 8757; Diehl 538a+b = CIL V, 8662+8697+8721.

51. ILS 5508 = CIL IX, 1590.

52. SEECK, 1909, 1927.

53. CIL XI, 9 = ILS 699.

54. NDOcc. XLII, 7, Praefectus classis Ravennatium cum curis eiusdem civitatis, Ravenae. If the Ravenna fabrica was serving the fleet and not making weapons it would not come under the control of the magister officiorum. Hence its omission from NDOcc. IX.


56. ENSSLIN, 1942, 65.

57. SEECK, 1909, 1926-7.

58. SEECK, 1909, 1927.

59. The idea that leather armour was extensively used in the late army is firmly entrenched, and of obscure origins. No unambiguous literary evidence for such armour is known to the present writer, and of its nature leather is unlikely to survive in the archaeological record. Two cuisses of leather scales were preserved in the dry conditions of Dura Europos (ROSTOVZTEFF et al, 1936, 450 and pl.XXIII; ROBINSON, 1975, 163), but the extensive collections of leather from waterlogged sites in the Western empire have produced no comparable finds. In my opinion there is no reason to think leather was ever very widely used for armour under the empire.

60. Augustodunum, NDOcc. IX, 33.

62. Units of catafractarii and clibanarii in the West:

- equites catafractarii, Morbio (Britain; NDOcc. XL,21)
- equites catafractarii iuniores (vex. com. in Britain; NDOcc. VII,200)
- equites sagittarii clibanarii (vex. com. in Africa; NDOcc. VI,24 + 67 = Oc. VII,185).

63. Units of catafractarii in the East (total six):

- equites catafractarii, Arubio (Scythia; NDOr. XXXIX,16)
- equites catafractarii (vex. com. praesental army; NDOr. VI,35)
- equites catafractarii Albigenses (vex. com. in Thrace; NDOr. VIII,29)
- equites catafractarii Ambianenses (vex. com. in praesental army; NDOr. VI,36)
- equites catafractarii Biturigenses (vex. com.; NDOr. V,34)
- comites catafractarii Bucellarii Iuniores (vex. com. in Oriens; NDOr. VII,25).

Units of clibanarii in the East (total eight):

- comites clibanarii (palatine vexillation in praesental army; NDOr. V,29)
- equites secundi clibanarii Palmyreni (vex. com. in Oriens; NDOr. VII,34)
- equites primi clibanarii Parthi (vex. com. in praesental army; NDOr. V,40)
- equites secundi clibanarii Parthi (ditto; NDOr. VI,40)
- equites quarti clibanarii Parthi (vex. com. in Oriens; NDOr. VII,32)
- equites Persae clibanarii (vex. pal. in praesental army; NDOr. VI,32)
- equites promoti clibanarii (vex. com. in Oriens; NDOr. VII,31)
- schola scutariorum clibanariorum; (NDOr. XI,8).

64. Mantua, NDOcc. IX,26; Augustodunum, IX,33.

65. Lucca, NDOcc. IX,29; Remi, IX,36; Ambianum, IX,39.

66. They also figure prominently in the illustrations heading the chapters in the Notitia on the Masters of the Offices (NDOr. XI. Oc. IX). For the archaeological evidence relating to late Roman helmets cf. KLUMBACH, 1973; JOHNSON, 1980; JAMES, 1986.

67. Helmets are depicted in the illustrations heading the sections of the magistri officiorum of East and West, but this is hardly firm evidence that the factories produced helmets. The barbaricarii were also involved in helmet production, although the indications are that they only plated existing components with precious metal (CTh. X,xxi,1).

68. NDOr. XI,23.

69. SEECK, 1909, 1926.

70. VIERECK, 1975, 258.

72. CIL V, 8742; Diehl 508, 538A.

73. NDOcc. IX, 24. The modern town is known as Concordia Sagitaria. Is this a survival from the fourth century, or a piece of modern antiquarianism?

74. Fabricae scutariae; in the East (NDOr. XI); Damascus (20), Antioch (21), Edessa (23), Nicomedia (27), Sardis (30), Hadrianopolis (32), Marcianopolis (34), and Horreum Margi (39), a total of eight centres. It is probable that there was another one at Ratiaria (NDOr. XI, 38. Cf. p. 269). In the West (NDOcc. IX); Sirmium (18), Aquincum (19), Carnuntum (20), Lauriacum (21), Verona (25), Cremona (27), Augustodunum (34), Treveri (37), and Ambianum (39), a total of nine.

75. Fabricae armorum: in the East (NDOr. XI); Damascus (20), Antioch (21), Nicomedia (27), Sardis (30), Hadrianopolis (32), and Marcianopolis (34), a total of six. It is probable that Naissus (37) and Thessalonica (36) can be added to the list (cf. note 30). In the West (NDOcc. IX); Sirmium (18), Salona (22), Verona (25), Mantua (loricaria, 26), Argentomagus (31), and Augustodunum (loricaria, 33), a total of six.

76. NDOcc. IX, 28.

77. NDOcc. IX, 24 and 32.

78. NDOcc. IX, 33 and 38.

79. SEECK, 1909, 1926.

80. That of Carausius and Allectus in Britain (AD 287-296) and two in Egypt, one in AD 292, followed by another shortly afterwards, under Domitianus Domitianus.

81. WILLIAMS, 1985, 82.

82. JAMES, 1984, 162-172.

83. Seeck also thought that the Western fabricae were more specialised than the Eastern ones (1909, 1926). He believed that the fabricae were moving towards greater specialisation in the later fourth and early fifth centuries AD, so the Western list, which he regarded as later, shows the process taken further than is the case in the Eastern register. This idea seems to stem mainly from the fact that there is a tendency towards separation of production of swords and armour in the Western centres. There is no reason to think that this division is a new phenomenon of the fifth century. It is more likely due to differences in the organisation of the arms industry in East and West, perhaps going back to pre-Tetrarchic times.

84. Argentomagus (NDOcc. IX, 31) actually lies outside Galliae, and Sardis Lydiae is outside Pontica (NDOr. XI, 30).
85. NDOr. XI,36-8.

86. Augustodunum (NDOcc. IX,34, probably serving Maxima Sequanorum), Treveri (37, serving Germania Prima), Ambianum (39, serving Germania Secunda), Verona (25, serving Raetia Secunda?), Cremona (27, serving Raetia Prima?), Hadrianopolis (NDOr. XI,32, serving Moesia Secunda), Marcianopolis (34, serving Scythia) and Nicomedia (27) and Sardis (30) serving the Eastern frontier.

87. The correlations are reliable enough to reconstruct with some confidence what the East Illyrican fabricae were producing. Dacia Ripensis should have had a fabrica scutaria. There are known fabricae at two cities in that province, Ratiaria and Naissus, so the shield factory was probably at one or the other. Ratiaria is the more likely, since it is an old legionary base on the Danube like Aquincum, Lauriacum and Carnuntum, all of which had fabricae scutariae. This would leave the factories at Naissus and Thessalonica to be the two armour factories which may be expected for the diocese of Dacia.

88. The Notitia lists fifty units of sagittarii, thirty-seven mounted, thirteen of foot. Twenty-four regiments of horse archers are listed in the East, thirteen in the West. This approximately two-to-one Eastern bias is also seen for foot archers, with nine regiments in the East and four in the West. Despite the Eastern bias, it is clear that archery was regarded as important in the West, units of sagittarii far outnumbering, for example, units of heavy cavalry (cf. notes 21 and 23).

89. John Lydus, de mag. 3,5.

90. There is evidence that bows were widely available in the East in the late empire. Synesius, a bishop in Cyrenaica in the early fifth century AD wrote to his brother in Syria to procure weapons to defend his flock against nomadic raiders. He complains that Egyptian arrows will not fly straight, so he wants some good Syrian ones complete with points. Bows are not too much of a problem; he knows where he can buy them (epistulae 133, AD 405?). Private manufacture and trafficking in arms led to a crack-down under Justinian (Nov. LXXXV, which places bows high on the list of proscribed items). Von Petrikovits (1981, 303) also claims reference to a shield-wright in a fourth century Egyptian papyrus (from Hermopolis; P. Cair. Preis. 39,4), but this is erroneous. The individual concerned was certainly a soldier, in a cavalry unit called Mauri scutarii, which is known to have been in Egypt from the Notitia (NDOr. XXXI,23; Cuneus equitum Maurorum scutariorum at Lykopolis. Note also XXXI,24, Cuneus equitum scutariorum at Hermopolis itself.

91. Horn composite bow ear laths in all stages of manufacture have been found in late levels at Intercisa (SALAMON & BARKOCZI, 1982, 171).

92. COULSTON, 1985, 259.

93. COULSTON, 1985, 259.
94. Nov. J. LXXXV.

95. Malalas 13.

96. Lactantius, de mort. pers. 7.

97. MacMullen thought that the bulk of the fabricae had possibly been established by the end of the reign of Constantine; MacMullen, 1979, 156-7.

98. For example Hadrianopolis is first attested in a context dating to AD 375 (Amm. XXXI,6,2), Cremona in AD 355 (Amm. XV,5,9). The Concordia tombstones date to the very end of the fourth century (Hoffmann, 1969, 83-107).

99. Definite evidence for the existence of specific fabricae before the date of the Notitia is available for only the ten centres mentioned on p.265. Even among these, one of the Sardis inscriptions may post-date the Notitia.

100. NDOcc. IX,19-21.

101. For example the fabrica at Carnuntum (Von Petrikovits, 1975, 90-1; Von Groller, 1909, 35-43).

102. Lactantius, de mort. pers. 7.

103. Lactantius, de mort. pers. 7, makes clear the scale of the building programme. 'The emperor himself attended the dedication of the hippodrome at Nicomedia in 304, which suggests that the palace and the hippodrome there had been put up together' (Vickers, 1972, 31, note 49).

104. Malalas 13. Mattingly suggested that they may have been established when Diocletian arrived at Antioch to support Galerius in AD 296 (1939, 336).


106. NDOOr. XI,36.

107. Galerius arrived about AD 300. This event seems to have precipitated a wide-ranging construction scheme including not only a palace but the hippodrome (Vickers, 1972) and the triumphal arch which still stands. The fabrica was probably built as part of this programme.

108. Thessalonica is far to the rear of the frontier line and did not even have a proper harbour until AD 314 (Zosimus, II,22).


110. There was a Tetrarchic building programme at Sirmium (Mocsy, 1974,
111. Possibly Trier and Salona although the latter is less likely because Diocletian's energies there went into the erection of the great palace at nearby Split. In any case it is possible that the Salona fabrica may have been sited elsewhere until the late fourth century (see p.266).

112. The changes involved here are that Raetia was divided into Raetia Prima and Raetia Secunda, Pannonia Inferior became Valeria and Pannonia Secunda, and Moesia Superior became Moesia Secunda and Scythia.

113. MANN, 1977, 12.

114. The dioceses were controlled by vicarii, who are not usually thought of as military officers. However, their subordinate provincial governors were often also commanders of the provincial garrisons. Since their superior, the Praetorian Prefect, was commander-in-chief of the army, it would be surprising if the intermediate vicarii had no military functions at all. There is at least evidence that they were involved in fort building (JONES, 1964, 47).

115. MANN, 1977, 12.


117. Lactantius, de mort. pers. 7.

118. Malalas 13.

119. Scutaria et armorum, Nicomediae (NDOc. XI,27)
    scutaria et armamentaria, Edessa (23)
    scutaria et armorum, Antiochae (21).

120. Clibanaria, Nicomediae (NDOc. XI,28)
    clibanaria, Antiochae (NDOr. XI,22).

121. For example, the fabricae of Italia are in strict East-West order (NDOcc. IX,24-28).

122. NDOcc. IX,35-39.

123. NDOcc. IX,18-22.

124. Ambianum was the shield factory serving Germania Secunda (NDOcc. IX,39 and cf. figs. 6 and 10). Salona was one of two armament factories serving Illyricum. Despite its association with Diocletian, Salona does not seem to have undergone a major rebuilding during the Tetrarchy; local resources went into the palace at Split. There is, therefore, no reason for the fabrica to be there as early as Diocletian's reign.

125. For example, the gynaecuem at Matisco was originally sited at Augustodunum (NDOcc. XI,59).
126. NDOcc. XI, 46.

127. The probable date of the two amendments of the Notitia (NDOcc. XI, 22; 46), which must have been made between the original compilation of the lists and the date when they were no longer available for modification. See also note 125.

128. See also note 125.

129. JULLIAN, 1896, 960.

130. WEST suggested that the Argentomagus fabrica was based on the iron working of the Bituriges (1935, 81 note 67).

131. HEALEY, 1978, 63.

132. FORBES, 1972, 278.

133. DAVIES, 1935, 170.

134. As an analogy, it has been shown that the state textile and clothing factories were distributed in wool-producing areas (WILD, 1976, 53).

135. Iron production in Italy had effectively ceased centuries before (HEALEY, 1978, 63-4).

136. This is especially so in Italy, and the fabricae of western Anatolia; see Fig.1.

137. JONES, 1966, 35.

138. Even the imperial household was not exempt from providing charcoal for the fabricae (CTh. X, xxii, 2, AD 388; XI, xvi, 15, AD 382; XI, xvi, 18, AD 390).

139. CJ. XI, ix, 7, dating to the late fifth or early sixth centuries, which lays down procedure for procurement of wagons or ships to move consignments of arms to the troops. Responsibility for providing these vehicles is shown to lie in the hands of the Praetorian Prefect, who is known to have been in ultimate control of the maintenance of these communications.

140. The trans-Balkan road which passed through Naissus, Horreum Margi, Hadrianopolis, etc.; MOCSY, 1974, 212, 214 and 246.

141. Of the two great roads crossing Anatolia from west to east, the northern route runs through the fabrica cities of Nicomedia and Caesarea Cappadociae. Sardis Lydiae is astride the southern route. Zosimus records the use of the southern road for major troops movements between the Danube and the East (IV, 30).

142. The sparse evidence for the arms industry of the Principate is considered in MACMULLEN, 1960; OLDENSTEIN, 1976, 1985; and BISHOP, 1985.
143. NDOr. XI, 21 and 22.

144. NDOcc. IX, 33; Augustodunensis loricaria, balistaria et clibanaria.

145. CIL III, 2828 = ILS 7047, recording lorica production in the territory of the Aedui.

146. A pre-Roman arsenal has been claimed at Come Chaudron (BULLIOT, 1870).

147. NDOcc. IX, 31, armorum omnium, therefore presumably a major centre: fabricae possess this description in the Notitia lists.

148. NDOr. XI, 30.

149. For example, Lydian steel was valued for swords (FORBES, 1972, 278). This process may also explain ROBINSON's 'Imperial-Gallic' industry of the early empire (1975, 8), apparently a native industry taken over by the Romans as a going concern to serve the imperial army. It may well have been based on Augustodunum and Argentomagus, for these were later important fabrica centres (see note 64).

150. NDOcc. IX, 19-21.

151. There is some archaeological evidence for the army making its own weapons, but this may have been limited to manufacture of such simple items as projectile heads (as at Corbridge; FORSTER & KNOWLES, 1912, 250; RICHMOND & BIRLEY, 1940, 106, 112-3).

152. NDOr. XI, 38.

153. VON PETRIKOVITS, 1975. The structures he identifies as legionary fabricae are heterogenous, and there is very little good archaeological evidence for their individual functions, largely due to inadequate excavation. For the most recent discussion of early military fabricae, see BISHOP, 1985.

154. VON GROLLER, 1909, 43; VETTERS suggests the same for Lauriacum (1977, 365).

155. Such a change would have been in harmony with the centrifugal tendencies at work in the legions in the late third century, as they lost their specialist troops such as ballistarii (apparently formed into separate units) and their bodies of cavalry (upgraded to independent status as regiments of equites promoti). Loss of their fabricae might have been a logical extension of the process.

156. MACMULLEN, 1960, 39.

157. SEECK, 1909, 1926.

158. ENSSLIN, 1942, 65.

159. See, for example, MACMULLEN, 1980.
161. MACMULLEN, 1960, 29.
162. SEECK, 1909, 1926.
163. MACMULLEN, 1960, 29.
164. MACMULLEN, 1960, 23.
166. BISHOP, 1985.
168. For example, the Aeduan loricarii, CIL XIII,2828 = ILS 7047.

169. The lex iulia de vi publica forbade arms to citizens other than soldiers, a ban which was reiterated in the late empire (e.g. CTh. XV, xv, l. For the banning of arms exports, CJ. IV, xli, 2).

170. As the Aeduan inscription makes clear, mentioning an army officer supervising production in central Gaul (CIL XIII, 2828 = ILS 7047).

171. Large establishments had existed in Greece centuries before. Some of them employed up to 120 slaves (MOSSE, 1969, 89).

172. Roman arms are far from rare beyond the northern frontiers, being found all over Free Germany (e.g. HUNDT, 1971) and in the Jutland bog deposits (TODD, 1975, 174–6). See also the law banning arms exports (CJ. IV, xli, 2).

173. Cf. CTh. XV, xv, l: 'No person whatever, without our knowledge and advice, shall be granted the right to employ any arms whatsoever,' AD 364 (trans. Pharr). This law must have been impossible to enforce as the army became increasingly powerless to prevent barbarian incursions and civilians looked to their own defence (see note 90).


176. A number of examples from Europe are now known, from Berkasovo, Budapest, Intercisa, Augst-Pfersee, Worms, Augst, Deurne and elsewhere (KLUMBACH, 1973). One has recently been identified from Burgh Castle (JOHNSON, 1980).

177. CTh. X, xxii, l. AD 374. This law is often said to refer to fabricenses but in fact, refers specifically to the closely related barbaricarii, precious metal smiths under the control of the comes sacrarum largitionum. Nevertheless, in this case the barbaricarii are making arms so the text provides a very good analogy for the fabricae.

179. NDOr. XI,44; NDOcc. IX,43.

180. NDOr. XI,44.

181. NDOcc. IX,43, subadiuvae fabricarum diversarum. BOAK (1919, 102) interpreted this to mean that there were more than three under the eastern magister. This seems to be because he translates subadiuvae fabricarum diversarum as 'various subadiuvae with responsibility for arms factories' rather than 'subadiuvae with responsibility for the various arms factories'. The latter sense is surely the correct one, and has no implication as to the actual number of subadiuvae.

182. As CJ. XII,xx,5, dating to the reign of Leo, would seem to indicate.

183. CJ. XII,xx,5; BOAK, 1919, 102.

184. JONES, 1964, 579 note 35.

185. CJ. XII,xx,5.

186. CJ. XII,xx,5; BOAK, 1919, 102.

187. Scrinium memoriae (NDOr. XI,13; NDOcc. IX,10), scrinium dispositionum (NDOr. XI,16; NDOcc. IX,11), scrinium epistolarum (NDOr. XI,14; NDOcc. IX,12), scrinium libellarum (NDOr. XI,15; NDOcc. IX,13).


189. JONES, 1964, 579.

190. JONES, 1964, 628, based on CTh. VII,iv,24 and VIII,i,14 (both dated to AD 398).


192. De mag. III,5. Translated by Dr Robert Ireland. The same scrinium is apparently referred to in the Code of Justinian, in a law which survives only as an untitled and undated Greek summary (CJ. XII-xlilx,13), but which nevertheless appears to have been directed at the prefecture.

193. Were the comitatenses armed through the same long-winded bureaucratic process? They may have spent sufficient time in winter quarters for this to be feasible, but how could they re-arm quickly on campaign? Field army units were provided with warrants authorising them to draw victuals from the provinces through which they passed, so it may well be that when on the march they could draw on any of the fabricae dotted along the main strategic roads as they came to them.
194. An interesting passage in Ammianus records the sending of a forged treasonable letter to the 'tribune' of the Cremona fabrica as part of a court intrigue. The letter fell into the hands of the government, and was handed to Florentinus, who is described as 'agens... pro magistro officiorum' (XV,v,12). That the letter should go to the department of the Master of the Offices makes sense; the 'tribune' concerned was a subordinate of that minister. Was the agens Florentius one of the subadiuvae fabricarum? Unfortunately there is the objection that the same Florentius went on to become magister officiorum himself (Amm. XXII,iii,6), advancement otherwise unknown for agentes in rebus.

195. The fabrica of Lauriacum legionary base has been identified with the later fabrica scutaria at the same place (VETTERS, 1977, 365), but this is an unsubstantiated assumption. A rather better case for the legionary fabrica developing directly into one of the Notitia centres can be made for Carnuntum, where the structure in question produced substantial numbers of fourth century coins and evidence of metalworking (STIGLITZ et al, 1977, 585-7 and 642-3). This is still a far cry from proof that full scale arms production was undertaken in the building, let alone proof that it is the fabrica scutaria of the Notitia. At Sards 'about 500m East of the Gymnasium stands the long wall of an extensive Roman construction [Building A] built in a style similar to that of the city wall... Its central location and fortress-like appearance suggest the possibility that it may have been the weapons factory of Sards, but there is no evidence to support my identification' (FOSS, 1976, 36-7). Thanks to Jon Coulston for drawing my attention to this reference, which I had overlooked. Identifying a state factory as opposed to any other kind of factory is a problem not readily approachable via archaeological evidence; it is really an historical problem soluble only by discovery of an inscription or other document.

196. Based on the illustrations in VON PETRIKOVITS, 1975, Bild. 25-6.


198. Some examples of areas of cities where fabricae were sited: Antioch, 400+ha; Augustodunum, 200ha; Remi, c.100ha; Sards, c.250ha; Salona, 94.4ha. (Figures drawn from the Princeton Classical Site index, except Salona, which is from WILKES, 1969, 358). Even if by chance an excavation should hit upon a fabrica, conclusive proof of identification would depend on the discovery of epigraphic material.


200. Arms were certainly stockpiled in cities (e.g. Zosimus, III,3) perhaps on a large scale at Edessa (armamentaria, see p.262). Since the fabricae probably worked to fixed quotas, in peacetime, large stocks might build up at the factories, requiring secure storage facilities.

201. FOSS, 1979, 279-83; 1981. The term is used in the context of the painting of the tomb of the fabricenses: it is ambiguous since it...
is impossible to tell if it refers to his painting of the tomb himself, or only his responsibility for the work, or whether he was a zographos or painter (of shields?) in the fabrica itself. Medieval armourers' workshops were often highly specialised, some men being wholly engaged on making hinges, or polishing (BLAIR, 1958, 188).

202. By analogy with the barbaricarii of Constantinople and Antioch, who according to CTh. X,xxii,1 had fixed monthly production quotas for helmets (see note 75).

203. MACMULLEN, 1960, 39, note 93.

204. Amm. XVI,ii,5.

205. CTh. XII,i,37; CJ XI,ix,6; see also CIL V,8742. WALTZING (1895, 242) suggested the use of slaves in the fabricae, but the law from which he drew this conclusion (CJ. VI,1,8) is addressed to the prefect of the city of Rome. No arms factories in his territory are known, and if there were any, he would have had no jurisdiction over them. Some other kind of fabrica must be intended.

206. CIL V,8742.

207. JONES, 1964, 835.

208. NDOr. XI; NDOcc. IX.

209. Amm. XXXI,vi,2.


211. JONES, 1964, 835.

212. CTh. X,xxii,6.

213. Nov. Th. VI.


215. CTh. X,xxii,6.

216. 'Finally, if any one of them should commit a wrong, such a delinquency is at the risk of the entire number, so that they are constrained by their own nominations [i.e. to positions of responsibility] and they maintain a certain watchfulness over the actions of their associates' (Nov. Th. VI,2, trans. Pharr, with the writer's bracketed note).


218. CIL III,2043.
219. CIL V, 8742 and Diehl 530.

220. CIL V, 8754, 8757.

221. Diehl 508.


223. FOSS, 1976; 1979. In publishing these inscriptions, Foss has inclined to the view that the title ducenarius held by these individuals denoted membership of that degree of the equestrian order. It seems more likely that the army-style non-commissioned officer rank is intended here, for these were commonly used among the fabricenses. Nevertheless, it is not impossible that from the later fourth century, junior officers of the fabricae could hold equestrian rank, for the order became greatly inflated in numbers, debasing the prestige of the lower grades. Some junior army officers came to hold the perfectissimate (JONES, 1966, 270). Consequently, even if Foss is correct and the Sardis ducenarii are equestrians, this need not suggest that they were particularly influential or wealthy men.

224. GROSSE, 1918, 131; CIL III, 14188.

225. MACMULLEN also rejects Grösse's identification on the grounds that 'industrial serfs surely did not hold (the rank of senator)' (1960, 32, note 82). MacMullen seems to have thought that membership of the senatorial order was intended. However, senator is a well attested army non-commissioned officer rank and it is surely this which is intended here.

226. CTh. X, xxii, 3.

227. SEECK favoured seniority as the principle of promotion, but adduced no evidence (1909, 1929). On his model the primicerius would have been the longest-serving fabricensis in each factory.

228. 'Having served in Legio XI Claudia, [Zenis] enrolled in the fabrica at Marcianopolis for 20 years service as a centenarius' (translated by R. Loverance); MIHAIOV, 1965, 150 no.3.

229. This was the procedure from AD 390, if not before (CTh. X, xxii, 3). MACMULLEN states that this was later changed to lifelong service (1960, 32), but this is based on a passage in Nov. Th. VI which in epic language describes the hardships faced by the fabricenses who, when they have been exhausted by their labours... shall die in the profession to which they were born' (trans. Pharr). Even at a two-year rate of turnover, most fabricenses would never have become primicerius with the subsequent promotion to the protectores, so Theodosius' statement is substantially true without suggesting that the post of primicerius became a lifelong one.

230. CTh. VII, xx, 10.

231. Diehl 538A + B = CIL V, 8662 + 8697 + 8721.
232. CIL VI,9 = ILS 699.
233. Amm. XXIX,iii,4.
234. Amm. XV,v,9.

236. Seeck speculated that some may have been styled tribunus as a personal rank, or because they were in charge of particularly important factories (SEECK, 1909, 1928). Jones dodged the question: '...each factory was... commanded by a tribune or praepositus' (JONES, 1964, 835).

237. Ammianus regularly utilises terms no longer in current usage but demanded by literary convention. For example, he uses 'legions and cohorts' in contexts where these terms are anachronistic. However, Ammianus considered them stylistically preferable to the contemporary technical unit names, such as auxilia and vexillationes.

238. CIL XI,9.
239. A late fourth century date is suggested by HOFFMANN (1969, 83-107). For the decline of the perfectissimate, see JONES, 1964, 526; 1966, 270.

240. NOOcc. XI,38-44; 45-60.
241. BOAK (1919, 89) reaches this conclusion, probably for similar reasons.

242. Epigonius and Eusebius at Antioch around AD 354 (Amm. XIV,vii,20), Flavius Romulianus at Concordia c.AD 395 (?) (Diehl 538A) and perhaps Sertorius Silanus at Ravenna during the reign of Constantine the Great (CIL XI,9).

243. Amm. XV,5,10.
244. JONES, 1964, 634.
246. CJ. XI,xi,7; c.AD 470.
247. See note 228.
248. CIL V,8742.
249. See note 228.

250. The state helped veterans take up a trade; CTh. VII,xx,3 (AD 325). See JONES, 1964, 635. Old soldiers are known to have entered the arms trade in earlier times (CIL XIII,6677 = ILS 2472, a veteranus who became a negotiator gladiarius in the reign of Commodus).
251. Nov. Th. VI,1.

252. JONES, 1964, 634. See notes 228 and 250.

253. See note 250.

254. CTh. X,xxi,6.

255. CJ. XI,ix,6.

256. CTh. VII,viii,8.

257. CJ. XI,ix,6.

258. JONES, 1964, 488.

259. CTh. VII,viii,8. A further and most revealing example concerns a dispute over the right of the corpus fabricensium of a factory to jointly inherit the goods of any member who died intestate. Normally such estates would go into the coffers of the res privata, but the fabricenses and other privileged groups such as soldiers, civil servants, decurions and clerics were exempt (CJ. VI,lxii,2,3; CTh. V,ii,1; V,xxx1). During the reign of Theodosius II, the res privata tried to seize the goods of the intestate fabricenses, something which apparently resulted in a dispute between the magister officiorum and the comes rerum privatarum. The judgement found for the fabricenses, whose rights were affirmed or reaffirmed. (CJ. VI,lxii,5). Clearly Aurelianus, comes rerum privatarum, chose to ignore the emperor's decision, which prompted a reaction from Theodosius. The emperor delivered a chilling rebuke and threatened the res privata with dire consequences if that department should 'even attempt to draw up a petition [against the fabricenses] after they have received a divine Imperial response of this kind' (Nov. Th. VI; AD 438, trans Pharr).

260. CTh. X,xxi,4; AD 398. Those caught harbouring fugitive fabricenses were suitably punished by relegation to an arms factory themselves.

261. The situation was probably worse in the West than the East, especially from the later fourth century onwards as the Western empire started to disintegrate and shortages of men and materials made themselves felt.

262. CTh. X,xxi,5, AD 404; CJ XI,ix,7, late fifth to early sixth century.

263. E.g. CTh. XII,i,37; AD 344 concerning decurions in any branch of the imperial service. Significantly, fabricae are mentioned specifically.

264. CTh. X,xxi,6, AD 412.

265. CTh. XII,i,37; X,xxi,6.
266. CTh. VII, viii, 8, AD 400-5.

267. MACMULLEN, 1960, 32, note 82.


270. After similar trouble at Hadrianopolis, one side struck back at the other by arranging that 'from the fabrica there (as it is called), the heads of ten laymen should be cut off' (Athenasius, hist. Ar. XVIII, 57, trans. Dr Robert Ireland). Presumably the fabricenses had been prominent in the preceding disturbances for them to be singled out in this way.


272. CJ. XI, ix, 6 of the reign of Leo and Anthemi; CJ XI, ix, 7 of those emperors or of Anastasius.

273. Nov. J. LXXV.


275. The edict does mention spearshafts (XIV, 5; FRANK, 1940, 360). It is not possible to explain the absence of other weapons from the Edict in terms of the illegality of arms sales on the open market, for the Edict does include other items which only members of the imperial service could buy, such as military uniforms, which it was illegal for civilians to wear.

276. Implied by Nov. J. LXXXV, 3, 1. Private arms production in Egypt has already been discussed (p.282).

277. Nov. Th. LXXXV, 3.

278. A twelfth century Byzantine writer records that Constantine the Great built a depot for storing artillery in part of the city of Constantinople which became known as the quarter of the Mangana after the catapults and other machines stored there. There is no indication that it was actually a factory for making as well as storing equipment. (Michael Glycas, CSHB, 1836, 468, line 6ff, dating to AD 1118, cf. also Banduri Anon. II, 69, a text of unknown date which records the Mangana storage depot where '...the war-engines of the whole city and the mechanical stores were preserved... and the apparatus for besieging walls'. This source also attributes the depot to Constantine. His description suggests that this is a strategic store of siege equipment as well as the depot for the city's defensive artillery. Again, mention of production of machines is conspicuously absent). Excavations in the quarter of the Mangana found no trace of the depot (DEMANGEL & MAMBOURY, 1932, 7). Constantinople is also known to have had an armamentarium, or city armoury (such seems to be the conclusion from Nov. J. LXXXV, and is, of course, no surprise). The
armamentarium was rebuilt by Maurice or Phocas (DU CANGE, 1729).

279. SEECK, 1909, 1929, trans. writer.

280. MACMULLEN, 1960, 32.

281. Thanks are due to Dr Robert Ireland for assistance with the precise interpretation of this passage.

282. CJ. XI,ix,6, AD 467-72.

283. MACMULLEN concluded that the factories were taken over as going concerns and 'that soldiers from legions [!] were detached to the fabricae' (1960, 32). JONES drew similar conclusions, i.e. that arms 'were apparently, as in Roman days, issued from the state factories...' (1964,256). Seeck (followed by GROSSE, 1920, 104) concluded that 'under the Gothic kings in Italy the manufacture of arms was once more under the control of the Praetorian Prefect...it seems that this was no longer carried on in special fabricae, but in the army, where the same officers commanded both soldiers and armourers together...' (SEECK, 1909, 1928).


286. Cassiodorus was himself both magister officiorum (AD 523-527) and later Praetorian Prefect (AD 533-537) (O'DONNEL, 1979, 57).

287. JONES, 1964, 275.

288. Translated by Dr Robert Ireland.

289. E.g. Variae VII,xxvi to xxviii.

290. JONES, 1964, 257. Besides the formulae, letters to such comites appear in other books of the variae (e.g. III,xxxiv to the comes of Massilia).

291. Variae VI,xxii-xxv.


293. Variae IV,xxv and X,xxix.

294. The other candidate cities would be Lucca, Cremona, Verona, Concordia and Mantua (NDOcc. IX,24-27,29).

295. Amm. XXX,v,2 and 14.

296. NDOcc. IX,19-20.

297. MOCSY, 1974, 310.

298. It may be asked why the Notitia includes establishments defunct before the text reached its final form. But the Notitia seems to
be a handbook of what should, in theory, exist at the time the lists ceased to be amended. It includes, for example, details of the British garrison (NDOcc. XXVIII and XL) which was defunct before the lists were closed about AD 425.


300. Vita S. Theodori 159, 45-7, concerning three fabrikesioi, Theodorus, Anthimos and Protasios, brothers-in-law of one of the soldiers of the imperial guard (a scholarios). This underlines the continued social prestige of these artisans. For discussion of the passage, see KAEGI, 1975, 62.

301. JONES, 1964, 314.
303. BROWNING, 1980, 49.
304. BROWNING, 1980, 49; HALDON, 1979, 72 note 127.

305. 'Das Kollegium der fabricenses und andere Handwerkerkollegien erfüllten in Byzanz mindestens bis ins 11. Jahrhunderts staatlich festgesetzten Aufgaben' (VON PETRIKOVITS, 1981, 291). Von Petrikovits refers the reader to his comments in BECK et al., 1981, but the present writer has been unable to locate them and so is not aware of the evidence on which von Petrikovits bases the above statement.

306. SEECK, 1909, 1927.
307. NDOR. IX, 35.
308. SEECK, 1909, 1927.
309. JONES, 1966, 75; 1964, 183, 986.
310. NDOR. XIII, 16; NDOcc. XI, 45-60 and see also XII, 26-7.

311. It was the general practice in the fourth century for the administration of the empire to be divided between a number of emperors, each with his own ministers, a system formalised for a while in the Tetrarchy. The sole rule of Constantine or Constantius II was exceptional, and the former delegated power to, and finally divided the empire between his various sons. Constantius II likewise found that he could not cope without a deputy, appointing first Gallus, then Julian as Caesar. The territories of these duplicate administrations changed repeatedly, and only became fixed along the lines reflected in the Notitia in the joint reign of Valentinian and Valens.

312. NDOR. XI; NDOcc. IX.

313. E.g. MACMULLEN, 1960, 31: 'Under Diocletian [the fabricae] were supervised by the praefectus praetorii...'.
314. CIL VI, 1696.

315. BOAK, 1919, 86.

316. SEECK, 1909, 1928, followed by GROSSE, 1920, 104.


318. SEECK, 1909, 1928.


320. MACMULLEN, 1960, 32.

321. BOAK, 1919, 85.

322. WALTZING, 1895, 241.

323. De mag. 2, 10 and 3, 40.

324. BOAK's 'earliest recorded date' of AD 390 is clearly based on the fact that CTh. X, xxii, 3, promulgated in the year, was addressed to the magister officiorum (1919, 87, note 6). JONES arrived at his dates on the same basis (1964, 161).

325. John Lydus, de mag. 3, 40, literal translation by Dr R. Ireland.

326. MACMULLEN, 1960, 32.

327. CTh. X, xxii, 3.

328. BOAK, 1919, 87.

329. CTh. X, xxii, 3, AD 390.

330. CTh. X, xxii, 5, AD 398.

331. CTh. VII, viii, 8, AD 400-5.

332. CTh. X, xxii, 5, AD 404.

333. CJ XI, ix, 6, AD 467-72.


335. CTh. XII, i, 81, AD 344.

336. CTh. VII, xx, 10 AD 369. Officers of the fleet, laeti, largesses and cohort commanders are included. None of these was under the control of the prefect.

337. CTh. XI, xvi, 15 and 18.

338. CTh. X, xxii, 6, AD 412.

339. Amm. XV, v, 12.
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Banduri anonymus; Venice Byzantine Corpus, Javarina, 1729, Vol.XX, pp.3-56 of 2nd pagination series

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CTh = Codex Theodosianus (Mommsen, Berlin 1905; trans. Pharr. C, Princeton 1952)

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NDOcc. = Notitia Dignitatum Occidentalis

NDOr. = Notitia Dignitatum Orientalis

Nov. J. = Justinian Novellae

317
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### Table I

<table>
<thead>
<tr>
<th>NDOR. IX</th>
<th>NDOc. XI</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Sub dispositione viri illustri magistri officiorum:</td>
<td>3. Sub dispositione viri illustri magistri officiorum:</td>
</tr>
<tr>
<td>18. Fabricae infrascriptae:</td>
<td>16. Fabricae infrascriptae:</td>
</tr>
<tr>
<td>19. Orientis V:</td>
<td>17. In Illyrico:</td>
</tr>
<tr>
<td>21. Scutaria et armorum, Antiochiae.</td>
<td>19. Acincensis scutaria</td>
</tr>
<tr>
<td>22. Clibanaria, Antiochiae.</td>
<td>20. Carnuntensis scutaria</td>
</tr>
<tr>
<td>23. Scutaria et armamentaria, Edesa.</td>
<td>21. Lauriacensis scutaria</td>
</tr>
<tr>
<td>32. Scutaria et armorum, Hadrianopoly Haemimonti.</td>
<td>30. In Gallis:</td>
</tr>
<tr>
<td>34. Scutaria et armorum, Marcianopoli.</td>
<td>32. Matisconensis sigittaria.</td>
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<tr>
<td>36. Thebassalonicensis.</td>
<td>34. Augustodunensis scutaria.</td>
</tr>
<tr>
<td>37. Naissemontia.</td>
<td>35. Suessionensis.</td>
</tr>
<tr>
<td>38. Ratiarensis.</td>
<td>36. Remensis spatharia.</td>
</tr>
<tr>
<td>40. Officiorum autem suprascripti viri illustri magistri officiorum de scola agentum in rebus est ita:</td>
<td>38. Triberorum balistaria.</td>
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<tr>
<td></td>
<td>39. Ambianensis spatharia et scutaria.</td>
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<tr>
<td></td>
<td>40. Officiium autem suprascripti viri illustri magistri officiorum de scola agentum in rebus habetur hoc modo:</td>
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<td>41. Subadiuvae.</td>
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<td>42. Subadiuvae.</td>
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<td></td>
<td>43. Fabricarum tres.</td>
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</tbody>
</table>

Nota. Oriens line 25 is Ponticae quatuor in the MSS but only three entries are listed. Also, lines 29-33, brackets show actual positions of headings in the MSS, underlining the correct positions.

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Table II

NDOr. XI, 25-34

<table>
<thead>
<tr>
<th>TEXT</th>
<th>PROPOSED RESTORATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ponticae Quatuor;</td>
<td>Ponticae Quatuor;</td>
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<tr>
<td>Clibanaria, Caesarea Cappadociae</td>
<td>Clibanaria, Caesarea Cappadociae</td>
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<tr>
<td>Scutaria et armorum, Nicomediae</td>
<td>(...?missing entry here?...)</td>
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<tr>
<td>Clibanaria, Nicomediae</td>
<td>Scutaria et armorum, Nicomediae</td>
</tr>
<tr>
<td>Scutaria et armorum, Sardis Lydiae</td>
<td>Clibanaria, Nicomediae</td>
</tr>
<tr>
<td>Asianae Una;</td>
<td>Asianae Una;</td>
</tr>
<tr>
<td>Scutaria et armorum, Hadrianopolis Haemimonti</td>
<td>Scutaria et armorum, Sardis Lydiae</td>
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<tr>
<td>Thraciarum Duae;</td>
<td>Thraciarum Duae;</td>
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<tr>
<td>Scutaria et armorum, Marcianopolis.</td>
<td>Scutaria et armorum, Hadrianopolis Haemimonti</td>
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</table>

Scutaria et armorum, Marcianopolis.
Table III: Diocesan order of praesides

(Based on NDOr.I and Oc.)

<table>
<thead>
<tr>
<th>The East</th>
<th>The West</th>
</tr>
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<tbody>
<tr>
<td>Egypt</td>
<td>Illyricum (W)</td>
</tr>
<tr>
<td>Oriens</td>
<td>Italiae²</td>
</tr>
<tr>
<td>Asiana</td>
<td>Africa</td>
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<tr>
<td>Pontica</td>
<td>Hispaniae</td>
</tr>
<tr>
<td>Thraciae</td>
<td>Galliae³</td>
</tr>
<tr>
<td>Illyricum (E)¹</td>
<td>Britanniae</td>
</tr>
</tbody>
</table>

Notes:
1. Equals Macedonia and Dacia together.
2. Includes Suburbicaria.
3. Includes Septem Provinciae.

Table IV: armour factory doublets in frontier zones

Syria: Damascus and Antioch
Anatolia: Sardis Lydiae and Nicomedia
Thrace: Marcianopolis and Hadrianopolis
Illyricum: Sirmium and Salona
Italy: Verona and Mantua*
Gaul: Argentomagus and Augustodunum*

(All listed as fabricae armorum except * indicates loricariae)
<table>
<thead>
<tr>
<th>ADDRSEE</th>
<th>Praetorian Prefect</th>
<th>Master of the Offices</th>
<th>Count of the res privata</th>
<th>DATE AD</th>
<th>REFERENCE</th>
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<td>CJ.VI.Ixii.5</td>
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<td>CJ.XI.ix.6</td>
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</table>

Table V
LOCATIONS OF FABRICE
ACCORDING TO THE NOTITIA

Fig. 1

ORDER OF NOTATION OF
REGIOVIRES GYNÆCÆORUM
Notig DigDig XLI 06-09
NB Broken arrows denote changes of location recorded in the Notitia

Fig. 2
THE ORDER OF NOTATION BY DIocese
COMMONLY USED IN THE NOTITIA LISTS

Fig. 3

THE FRONTER DIoceseS AND THE
CENTRES PRODUCING SWORDS AND ARMOUR

Fig. 4
FABRICA SCUTARUM IN RELATION TO FRONTIER PROVINCES

Fig. 5

SPECIALIST FABRICA

- Ballista

- Gladius armour

- Bows

- Spears

- Arrows

- Arms stores

Fig. 6
THE ORDER OF NOTATION OF FABRICEAE IN THE NOTITIA

Fig. 7

Fig. 8: Fabricae and principal roads of Gaul.
Fig. 9: Fabricae and communications in Italy.

Fig. 10: Early imperial (left) and late imperial (right) helmet types.
THE ARMS AND ARMOUR
FROM DURA-EUROPOS, SYRIA

Weaponry recovered from
the Roman garrison town and
the Sassanid siegeworks
during the excavations, 1922-37

Simon Timothy James

Volume 2:
Plates

Thesis submitted for the Degree of Doctor of Philosophy
University College Institute of Archaeology
December 1990
Frontispiece

A possible reconstruction of the appearance of a Roman cavalryman of the mid-third century AD based on evidence from Dura-Europos and elsewhere.
Plate captions

Plate 1.A  Plan of Dura-Europos, showing the location system employed by the Yale/French Academy expeditions, and the locations of major monuments. Shading indicates excavated areas, although this is incompletely shown as, for example, the entire length of Wall Street (behind the straight desert wall) was cleared (After Kiefer and Matheson 1982)


Plate 1.C  Details of the tower 19 mine assemblage. Top, plan of the so-called Persian skeleton, with helmet 1 and the sword with jade pommel (hilt fitting 9). Bottom, a cross-section through the tangled mass of Roman bodies and weapons in the countermine. From Rep. VI, figs 16 and 17.

Plate 1.D  Plans of the mass of bodies and arms in the countermine at tower 19. The left and right plans can be related by the position of skull T3, but how they relate to the middle plan is obscure. From Rep. VI, fig 18.

Plate 1.E  The so-called Terentius mural from the Temple of Bel, showing Terentius, tribune of cohors XX Palmyrenorum sacrificing. Other officers and men of the regiment are assembled behind him. From Cumont 1926 Plate 1.

Plate 1.F  Details from the synagogue murals. Top, the Israelites crossing the Red Sea. Bottom, Mordecai depicted as a mounted noble in the Partho-Iranian tradition. (After Bellinger et al. 1956).

Plate 1.G  Details from the synagogue murals showing the battle of Eben-ezer. Top, combat scene, centring on horsemen charging at each other with long lances, a Partho-Sassanian motif. Note also the bare heads of the warriors, and the long-sleeved, thigh length scale or (more probably) mail shirts. Bottom, the Ark of the Covenant. Again note the mail shirts, bare heads and hexagonal shields. Several figures wear extraordinary hoods, also apparently of scale or mail. (After Bellinger 1956 plates LIV and LV).

Plate 1.H  The famous graffito depicting a heavy cavalryman on an armoured horse. Normally described as a clibanarius, it is unknown whether it is intended to depict a Persian or Roman soldier.
Plates 2.1.A to H; Helmets

Plate 2.1.A  Drawing of helmet 1, the iron “Persian” helmet from the countermine at Tower 19, as reconstructed at Yale. It is somewhat crushed laterally. The areas shown white are missing, now filled with plaster.

Plate 2.1.B  Helmet 1. Left, front view, showing the damaged brow region and the mass of corroded mail around the right temple. Note the “eyebrow” plate, the tall profile, and the fore-and-aft ridge strip. Right, The heavily restored left side. Note the parabolic profile.

Plate 2.1.C  Helmet 1; top, details of the apical spike and its rivetted attachment, and the front reinforcing plate running from its fixing rivet at the top, down the fore-and-aft strip towards the brow region. Below, detail of the forehead region, showing the oxidised camail (left) and the “eyebrow” plate, complete with the base of the postulated broken nasal defence.

Plate 2.1.D  A reconstruction of the appearance of helmet 1. The form of the camail is conjectural, based on broadly contemporaneous Sassanian reliefs.

Plate 2.1.E  The iron cheekpiece representing helmet 2; earguard top left, chinguard bottom right.

Plate 2.1.F  The fragmentary helmet 3. This is the left temple area of a helmet bowl. For its overall form and the location of the fragment, see plate 2.1.G

Plate 2.1.G  Helmet fragments 2 to 6, with a sketch showing the location of fragment 3. No.6 is drawn from a photograph in Yale archives (number unknown).

Plate 2.1.H  Helmet no.7, bronze fragments possibly from a parade helmet.
Plates 2.2.A to AQ; Armour

Plate 2.2.A  
Mail shirt no.1, in situ on the “Persian” skeleton showing the raised front edge and the sleeves reaching to below the elbow (left). (Yale archive photograph; no. unknown)

Plate 2.2.B  
Mail shirt no.1; back of the shirt (top), and the trident pattern in bronze rings in the front of the shirt (below, seen inverted, neck aperture at the bottom).

Plate 2.2.C  
Mail shirt no.2, in a crumpled mass; it was evidently not worn when deposited.

Plate 2.2.D  
Sleeve of mail shirt no.3.

Plate 2.2.E  
Fragment of mail shirt no.4 (top) and detail showing repair, centre (below). Note the finger-rings (complete with fragments of finger bones) adhering to the mail.

Plate 2.2.F  
Mail shirt 5; a sleeve, reaching to the forearm, the bones of which are still inside.

Plate 2.2.G  
Mail shirt 6 (top) and fragments representing shirt 7 (bottom).

Plate 2.2.H  
Mail shirt fragments 8 (top) and 9 (bottom, with iron arrowhead 32).

Plate 2.2.I  
Mail shirt fragments 10 (top) and 11 (bottom).

Plate 2.2.J  
Scale cuirasses, nos. 1 to 16, represented by plates form the upper chest area (nos 1 to 5) and metal twist-keys used for fastening such plates together (the keys, which swivelled in apertures in one plate, were passed through the rectangular apertures like those in no.1 in the other, and twisted to lock the two together). (No.1 is from a drawing in Yale archives).

Plate 2.2.K  
Scale cuirasse no.1 (from a photograph in Yale Archives; the piece is now in very poor condition).

Plate 2.2.L  
Examples of scales from cuirasses; nos. 17, 18, 19, 20, 21, 24.

Plate 2.2.M  
Scale cuirasse no.17. Note the cord running across the front of the scale rows (lower centre). Below, full-size drawing of a typical scale row, showing stitching arrangement.
Scale cuirasses nos 22 (top) and 23 (bottom), of extraordinarily fine bronze scales, still adhering to largely mineralised fabric. No.22 seems to preserve an upper edge. No.23 seems to be doubled back on itself, folded inwards. Such garments were evidently highly flexible, although in this case probably some what crushed beyond the intended degree of curvature.

Limb defence 1, leather cuisse, the unpublished front view showing its fundamentally scale-like appearance, despite its lamellar-style laced construction.

Limb defence 1, leather cuisse; schematic drawings of the construction of the upper edge and main body of the piece (top), and the assembly of the bottom most scale row (below).

Limb defence 2, leather cuisse, rear view. The scales have mostly curled up due to dessication.

Limb defence 2, leather cuisse, schematic drawing of its construction, seen from the front or outer side, showing the lacing system and the downward overlapping of the scales.

Limb defences 3 (above) and 4 (below), bronze scale armour, probably a pair of cuisses of scale rows sewn onto fabric. The identification rests on the re-entrant angle preserved by the edge lacing of no.4, which seems to be mirrored by the shape of the surviving fabric backing of no.3. Compare the resulting inverted L shape with leather cuisse, no.2.

Limb defence 3, probable bronze scale cuisse. Below, an example scale (actual size) and sketch of the two-thread stitching arrangement.

Limb defence 5, probable iron scale cuisse.

Limb defence 6, iron laminated cuisse. The only piece of laminated armour from the site, it probably antedates the siege, perhaps by centuries.

Limb defence 7, a fragmentary bronze greave.

Horse armour 1, trapper I, of bronze scales, shown as displayed in Damascus museum (top); note the crupper protector and the strong loop on the rear edge of the shabrack-hole, almost certainly for hooking over a saddle pommel. Below, the armour on a pony immediately after discovery. (After Rep. VI Plate XXII).
Plate 2.2.Y  Horse armours 1 (left) and 2 (right), trappers I and II. The drawing of no.2 is incorrect in shape, as the published photograph of the piece laid flat demonstrates (plate 2.2.AC). However, it does show the leather flaps along the rear edges, an important detail inexplicably cropped from the photograph (plate 2.2.AC). (After Rep. VI Plate XXI).

Plate 2.2.Z  Horse armour 1, accessories to trapper I, 1934.467a. Note the coarse fabric beneath the scales (better able to resist the chafing of metal edges) and the finer fabric next to the horse's skin (below).

Plate 2.2.AA  Horse armour 1, trapper I accessories, 1934.467a. Top, some surviving scales with evidence of repair. The central scale overlaps both its neighbours; it also has an extra, larger hole which probably suggests it was once an edge scale with a rawhide edging lace passing through it. This is probably a rough field repair. Below, another possible area of repair with inconsistent direction of overlap and possible reuse of scales. Here the difference in fineness of the two layers of fabric may clearly be seen.

Plate 2.2.AB  Horse armour 1, trapper I accessories, 1934.465. Example scale drawn actual size, showing degree of overlap with neighbouring scales.

Plate 2.2.AC  Horse armour 2, trapper II, shown laid out flat. The leather strips along the rear edge, shown in the published drawing (plate 2.2.Y) and visible today, are inexplicably cropped here. (After Rep. VI Plate XXII.

Plate 2.2.AD  Horse armour 2, trapper II as displayed in the Higgins Armory Museum on a poorly-shaped former designed to fit in the case; the shoulder area should be higher and narrower. Below, detail of the right shoulder area, showing some in consistency in overlap; over most of the garment the scales overlap consistently backwards. Perhaps this area was repaired in antiquity with existing scale-rows which came to hand, some overlapping the wrong way.

Plate 2.2.AE  Possible accessory to horse armour 2, 1933.713, a lower edge and corner probably from a neck defence.

Plate 2.2.AF  Horse armour 3, trapper III. Most of the scales have a single upper aperture, suggesting attachment with coarse lacing, perhaps the ubiquitous rawhide. Example scales drawn actual size.

Plate 2.2.AG  Horse armour 4; fragment probably from a horse armour, a lower corner perhaps from a neck-defence. The short, loose laces appear to decorative tassles with no practical function.
Plate 2.2.AH  Miscellaneous scale armour, nos.1 to 31. Nos. 1 to 21 are bronze, 22 to 31 iron. Nos.1 to 15 are probably from cuirasses, nos.22 to 31 most likely from horse armours, or perhaps cuisses.

Plate 2.2.AI  Miscellaneous scale armour, nos.32 to 56, all bronze.

Plate 2.2.AJ  Miscellaneous scale; top, part of no.30 (left), and no.1 (right). Bottom, no.3.

Plate 2.2.AK  Miscellaneous scale, and cuirasse no.18; top: no.39 (top left), no.4 (lower left), cuirasse no.18 (centre). Bottom, no.9.

Plate 2.2.AL  Miscellaneous scale armour no.7; top, front view; bottom, illustration of curvature permitted by the form.

Plate 2.2.AM  Miscellaneous scale armour; top, from left to right; nos 10 to 13. Bottom; left, no.56. Top row, left to right; 40, 44, 39, 41. Lower row, left to right, 50, 20, 38, 14, 15, 5.

Plate 2.2.AN  Miscellaneous scale armour; top, no. 24. Bottom, no 28 (top row), and no. 27 (lower row).

Plate 2.2.AO  Miscellaneous scale armour; top, no.29. Bottom, no.30.

Plate 2.2.AP  Miscellaneous scale; top, upper row, left to right; 35, 36, 34; lower row, scales no.33 Bottom, left to right; unidentified, 6, 55, 55.

Plate 2.2.AQ  Miscellaneous scale armour, no.37, fragments probably from a cuirasse; top, front view; bottom, rear view.
Plates 2.3.A to T; Edged weapons

Plate 2.3.A  Blade 1 (Top; after *Rep.* VI, plate xxvi, 2. Bottom, Yale records).

Plate 2.3.B  Blade 2, a complete spatha blade. Left, photomosaic. Note mineralised wood of hilt and scabbard. Right, reconstruction of its original appearance. The chape and slide are based on others from Dura. The method of attachment to the baldric is derived from Oldenstein 1976, with modifications.

Plate 2.3.C  Fragments of longswords representing blades 3 to 7, and 10 and 11. All are probably or certainly from spathae, except no.10, apparently from a pugio; and no.11, a Hellenistic kôpis or machaira.

Plate 2.3.D  Details of Blade 2; wood-grain on the hilt (top); remains of textile and wood-grain from the scabbard (bottom).

Plate 2.3.E  Blade 3, fragments; top, the broken hilt and blade. Bottom, the heavy blade tip with parabolic outline.

Plate 2.3.F  Blades 4 and 6 (top) and blade 11 (bottom).

Plate 2.3.G  Hilt fittings 1 to 9. 1 to 6 are guards, 7 a bone grip and 8 and 9 stone pommels.

Plate 2.3.H  Top, hilt fitting 7, a bone sword grip, and bottom no.8, the rock crystal pommel.

Plate 2.3.I  Scabbard slides 1 to 19. 1 to 16 are bronze, 17 to 19 bone.

Plate 2.3.J  Bronze scabbard slides; top, front views left to right, 13, 16, 15, 1, 2, and 3; bottom, rear views of the same.

Plate 2.3.K  Bronze scabbard slides 3 (left) and 1 (right), rear view, showing positions of inserted iron securing pins.

Plate 2.3.L  Bronze scabbard slides; top, front views, left to right, 10, 6, 5, 7, 4, 8, and 9; bottom, rear views of the same.

Plate 2.3.M  Front view of bone scabbard slides 19 (top left), 17 (centre) and 18 (right), and below, side view of 19 and rear of 17 and 18.
THE ARMS AND ARMOUR FROM DURA-EUROPOS

Plate 2.3.N  Scabbard chapes 1 to 13, all bronze.
Plate 2.3.O  Scabbard chapes 14 to 22. 14 to 17 are iron; 18 is bronze; 19 to 22 bone or ivory.
Plate 2.3.P  Scabbard chapes 23 to 31. All bronze except no.29, which is iron and bronze.
Plate 2.3.Q  Chapes nos. 19 (top left), 1 (top right), 9 (bottom left), 26 (bottom centre) and 2 (bottom right).
Plate 2.3.R  Chapes nos. 20 (top left), 13 (centre), 22 (right) and 14 (bottom).
Plate 2.3.S  Chapes nos. 24 (top left), 18 (centre), 27 (right) and 29 (bottom).
Plate 2.3.T  Baldric fasteners, (left to right) 1938.3427 (rear view); 1938.3433 (front); 1939.3425 (rear).
Plates 2.4.A to AS; Shields

Plate 2.4.A  Bosses 1 (top) and 2 (bottom); bronze. Note the iron grip which was originally rivetted to the back of boss 2 by the two prominent rivets still visible on the flange.

Plate 2.4.B  Bosses 1 and 2; bronze, with an iron grip attached to no.2.

Plate 2.4.C  Bosses 3 (top) and 4 (bottom); bronze.

Plate 2.4.D  Bosses 3 and 4; bronze.

Plate 2.4.E  Bosses 5 (top) and 6 (bottom); bronze.

Plate 2.4.F  Bosses 5 and 6; bronze.

Plate 2.4.G  Bosses 7 (top) and 8 (bottom); bronze.

Plate 2.4.H  Bosses 7 and 8; bronze.

Plate 2.4.I  Boss 9; bronze.

Plate 2.4.J  Bosses 9 (bronze), and 10 and 11 (both iron).

Plate 2.4.K  Bosses 12, 13 and 14 (all iron).

Plate 2.4.L  Assembled boss 11 (top), and boss 13 (bottom); both iron.

Plate 2.4.M  Bosses 15 (top) and 16 (bottom); bronze.

Plate 2.4.N  Bosses 15 and 16; bronze.

Plate 2.4.O  Bosses 18 (top, a fragment of a bronze example) and 19 (bottom, left; iron), with part of boss 11 (centre) and unidentified iron fragments.

Plate 2.4.P  Bosses 17, 18 (both bronze) and 19 (iron).

Plate 2.4.Q  Bosses 20 and 21 (apparently both iron).

Plate 2.4.R  Boss 3, showing inscribed rings (top) and interior planishing marks (bottom)
| Plate 2.4.S | Shield reinforcing bars/grips; top, nos 1 (upper) and 4 (lower); centre and below, no.2. On the latter, note the mineralised wood, and apparent leather grip. Both iron. |
| Plate 2.4.T | Shield reinforcing bars/grips 1 to 4. All iron. |
| Plate 2.4.U | Reconstruction of method of affixing the boss, and assembling the grip, on oval shields. NB only some bosses had the short iron grip attached, although the big transverse iron bar on the back of the shieldboard seems to have been universal (see plate 2.4.AR). |
| Plate 2.4.V | Shield board 1, as it appears today. Below, the associated bronze hanging loop, shown actual size. |
| Plate 2.4.W | Shield board 1, as reconstructed in *Rep. VII*, plate XLII. |
| Plate 2.4.X | Shield board 2, as reconstructed in *Rep. VII*, plate XLV. |
| Plate 2.4.Y | Shield board 2; photomosaic of the underside, showing hitherto undescribed decoration. |
| Plate 2.4.Z | Shield board 2; Author's reconstruction of the appearance of the rear of the board, as it would have appeared prior to removal of the iron reinforcing bar. Note also the suspension loop, the attachment for which survives; the loop is based on that found with shield 1. |
| Plate 2.4.AA | Shield board 3 (after *Rep. VII*, plate XLVI). |
| Plate 2.4.AB | Shield board 4 as it is today. |
| Plate 2.4.AC | Shield board 5 (from *Rep. VII* fig.84). |
| Plate 2.4.AD | Shield board 9 (after Cumont, 1926, plate CIX). |
| Plate 2.4.AE | Shield board 10; top, in order away from the scale, fragments A, B, C and D/E. Bottom, tool marks on fragment B. |
| Plate 2.4.AF | Shield board 11, comprising most of one side of a broad oval board of plank construction. Part of the edge of the board has broken away, leaving the two lines of stitching which once held a leather edging strip hanging free in places (right). |
Plate 2.4.AG  Shield board 12; Fragment 1982.28.89 (top) and fragments 1982.28.92 and 93 (bottom). Note shrivelled traces of leather facings.

Plate 2.4.AH  Shield board 12; detail of edge, showing stitching holes and leather facing. (the bubbles are a fault on the negative).

Plate 2.4.AI  Shield boards 13 (top) and 14 (bottom).

Plate 2.4.AJ  Shield board 14 showing edge stitching and (?modern) sawcut (top) and surface detail (bottom).

Plate 2.4.AK  Shield board 15, the scutum, as reconstructed at Yale (after Rep. VI plate XXVA).

Plate 2.4.AL  Shield board 15, the scutum; colour reconstruction (after Rep. VI, frontispiece).

Plate 2.4.AM  Shield board 15, the scutum as found (top; after Rep. VI plate XXV), and the site card bearing the only surviving record of the applied strips on the back of the board (bottom; Yale archive).

Plate 2.4.AN  Shield board 17, scutum fragment; front (top) and back (bottom). The vertical axis of the shield is here shown horizontally.

Plate 2.4.AO  Shield boards 19 (top) and 20 (bottom), from Yalerecords.

Plate 2.4.AP  Shield boards 21 (left; after Rep. II plate XXVI) and 22 (right).

Plate 2.4.AQ  Shield boards 23 (left, from Yale records) and fragments representing no.24 (right).

Plate 2.4.AR  Diagrams showing two variant methods of constructing and finishing oval plank shields at Dura. The poplar planks are prepared and glued (1), then planed and the grip apertures cut (2). The fibrous glue layer is applied (3), then the skin facing and the sewn edging (4). After painting both sides, a reinforcing bar is rivetted to the back (5) and a boss to the front (6), completing the shield (7). Some of the possible variants are shown in 8-14, where there is a different grip aperture shape (9), and the edging is added before the facing (10). Instead of skin, the shield is prepared with gesso (11) and painted prior to fixing the bar and perhaps a hanging loop (12), and boss (13). The resulting shield looks much the same (14).

Plate 2.4.AS  Shield designs from Trajan's Column (compiled from Florescu, 1969).
Plates 2.5.A and B; Shafted weapons

Plate 2.5.A  Shafted weapons; spear/javelin heads and ferrules or groundspikes.

Plate 2.5.B  Shafted weapon no.5, probable groundspike.
Plates 2.6.A to M; Archery

Plate 2.6.A The Yrzi bow; left, drawing by Gute; right, the bow at Yale.

Plate 2.6.B The structure of the Yrzi bow (by Gute); below, a generalised reflex bow, based on recent examples, with the type of sharply angled tips seen on some of the Dura depictions; others are more sinuous like the Yrzi piece (see plate 2.6.M). This shows the radically different shapes taken up by the bow unstrung (right), strung (centre) and drawn (left) drawing with angled ears.

Plate 2.6.C Top, Mr E. McEwen demonstrating the use of the thumbring for the "Mongolian release" with a replica of the Yrzi bow. Below, Mr McEwen shooting with a short reflex bow on horseback.

Plate 2.6.D Bronze arrowheads, known or thought to be residual.

Plate 2.6.E Iron arrowheads (no.7 drawn from a record card at Yale).

Plate 2.6.F Top, bronze arrowheads; upper row, left to right, nos 12, 17, 14, 7, 4, 8, and 2. Lower row left to right, nos 11, 18, 16, 15, 10, 3, and 9. Bottom, iron arrowheads; upper row, left to right, nos. 20, 9, 26, 30, 25, 11, 6, 10, 31. Right centre, no.23. Bottom row, left to right, nos. 14, 12, 15, 24, 3, 4, 27, 17, 13, and 33.

Plate 2.6.G Arrowshafts 1 to 13, wooden footings some with fragments of the reed stele.

Plate 2.6.H Top, arrowshafts, left, top to bottom, nos 13, 6 and 10; diagonally, no 1; right, top no 8 and bottom, no 15. All are footings except no 15 which is a shaftment. Bottom, bone laths from composite bows; top left, no 1; top right, no 2; lower left, no 3; lower right, no 4.

Plate 2.6.I Top, arrowshafts 14 to 19, shaftments. Bottom, Bow fragments and archery tackle; bow laths 1 to 4, and the broken thumbring (no.5).

Plate 2.6.J Arrowshafts nos 14 (with intact fletching) and 16, showing (below) details of fletching and nocks.

Plate 2.6.K Top, reconstructed arrows, one with a tanged three-bladed head, the other wooden-tipped. Bottom left, sizes and proportions of arrowheads. Bottom right, fletching orientations.
Plate 2.6.L Archery tackle, no 5, the broken thumbring

Plate 2.6.M Depictions of bows and quivers at Dura; 1, from the mithraeum (Rep. VII/VIII plate XIV; 2 and 3, graffiti (Cumont 1926 plate XCVIII); 4, graffito (Rep. II plate XLI); 5 to 7, graffiti (Rep. IV plate XXI); 8, detail of a relief (Rep. VI plate XXX); 9, graffito (Rep. V, plate XXXV); 10, detail from a mural in the Temple of the Palmyrene Gods (Cumont 1926 plate XVI).
Plates 2.7.A to AE; Torsion artillery

Plate 2.7.A  Catapult quarrel heads nos 1 to 15; socketed bodkins; iron.
Plate 2.7.B  Catapult quarrel heads nos 16 to 33; socketed bodkins; iron.
Plate 2.7.C  Catapult quarrel heads nos 34 to 40; probable socketed bodkins; 41 to 48 tanged bodkins; iron.
Plate 2.7.D  Catapult quarrel heads nos 49 to 51; tanged bodkins; nos 52 to 60 leaf-shaped heads; no. 61 an incendiary head; all iron.
Plate 2.7.E  Iron quarrel heads (left to right) nos. 29, 16, 12, 30, 42, 43, and 45.
Plate 2.7.F  Iron quarrel heads (left to right) nos. 40, 11, 10, 18, 14, and 1.
Plate 2.7.G  Iron quarrel heads (left to right) nos. 21, 20, 27, 15, 19, and 3.
Plate 2.7.H  Iron quarrel heads (left to right) nos. 24, 38, 7, 2, 8, and 26.
Plate 2.7.I  Iron quarrel heads (left to right) nos. 25, 6, 13, 17, 23, and 35.
Plate 2.7.J  Iron quarrel heads (left to right) nos. 37, 33, 9, 34, 31, and 32.
Plate 2.7.K  Iron leaf-shaped quarrel heads; top row (left to right) nos 59, 60, 52; middle row nos. 56, 53, 55; bottom row nos 57, 54, 58.
Plate 2.7.L  Iron incendiary bolt head, no. 61.
Plate 2.7.M  Wooden quarrel shafts 1 and 2.
Plate 2.7.N  Wooden quarrel shafts 3, 4 and 5.
Plate 2.7.O  Wooden quarrel shafts 6 and 7.
Plate 2.7.P  Wooden quarrel shafts 8 and 9.
Plate 2.7.Q  Wooden quarrel shafts 10 and 11.
Plate 2.7.R  Wooden quarrel shafts 12 and 13.
| Plate 2.7.S | Wooden quarrel shafts 14 and 15. |
| Plate 2.7.T | Wooden quarrel shafts 16 and 17. |
| Plate 2.7.U | Wooden quarrel shafts 18 and 19. |
| Plate 2.7.V | Wooden quarrel shafts 20 and 21. |
| Plate 2.7.W | Wooden quarrel shafts 22, 23, 24 and 25. |
| Plate 2.7.X | Quarrel shaft no.6, apparently as found with an iron bodkin head still attached. This head is now lost (after Rep VI plate XXIV, 2) |
| Plate 2.7.Y | Wooden quarrel shafts; top to bottom nos. 8, 6 (with one of the heads attached to give an idea of its original appearance) and 2. |
| Plate 2.7.Z | Wooden quarrel shafts nos. 17 (top) and 3 (bottom). |
| Plate 2.7.AA | Wooden quarrel shafts nos. 23 (upper) and 4 (lower); top, side views; bottom, top views. |
| Plate 2.7.AB | Wooden quarrel shafts 28 and 29 (after Cumont 1926) |
| Plate 2.7.AC | Method of manufacture of catapult quarrels, and reconstruction of a complete bolt. |
| Plate 2.7.AD | Metrology of wooden quarrel shafts. At the bottom is the basic data, of the bolt number and its measurement; the disk shows the type of bolt and the confidence of the measurement. Above this is plotted against a ruler. Distinct length clusters are apparent; the grey bars suggest the approximate regular increments which may be reflected in the data. For a full discussion, see part 2.7.14. |
| Plate 2.7.AE | Stone artillery balls. |
Religious Buildings

Temple of Adonis - Block L5
Temple of Aphlad - Block N8
Temple of Artemis Azzanathkona - Block E7
Temple of Artemis-Nanaia - Block H4
Temple of Atargatis - Block H2
Temple of the Gadde - Block H1
Temple of Jupiter Dolichenus (Dolicheuem) - Block X7
Temple of Zeus Kyrios - Blocks M8-N7
Temple of Zeus Megistos - Block C4
Temple of Zeus Theos - Block B3
Military Temple - Block A1
Christian Building - Block M8
Mithraeum - Block J7
Synagogue - Block L7

Military Buildings

Bath and Amphitheater - Block F3
House of the Scribes - Block L7
Palace of the Dux Ripae - Blocks X3-X5
Prætorium - Block E7

Civic Buildings

Baths - Blocks C3 and M7
Redoubt Palace - Block C9

Shops and Houses

Agora/Bazaar - Blocks G1-G6
House of the Frescoes - Block C7
House of the Large Atrium - Block D5
House of Lysias - Block D1
House of Nebuchelus - Block B8
Fig. 14.

A. Entrance to the Roman counter-mine. — B. Counter-mine at the point where the bodies were found. — C. Blocked section of the counter-mine. — D. Entrance gallery of the Persian mine. — E. Glacis of earth and mud brick inside the city. — F. Glacis of earth and mud brick outside the city. — G. Curtain Wall. — H. Curtain Wall.
PLATE 1.D

THE EXCAVATIONS AT DURA

Fig. 18.

A. Bronze ring
B. Post
Br. Fragment plywood
Cm. Coat of mail
Ch. Bronze chain
F. Iron blades or
Fm. Femur
I. Iliac bone
J. Sherd
M. Coins
Mx. Maxillary bone
P. Plank
R. Bronze disc
S. Foot with shoe
St. Sternum
T. Skull
Tc. Umbo
U. Vertebrae
V. Bronze plate, bent, grave(?)
W. Bronze fibula
PLATE 1.F

I. MORDECAI AND ESTHER, SCENE I

II. MORDECAI AND ESTHER, SCENE I
Panel 1g. The Battle of Isen-Arim, Scene 1

Panel 2h. The Battle of Isen-Arim, Scene 1
PLATE 2.1.G

Bowl fragment?

Rivets on inside

inferred

20cm

2

3

4

5

6

0

20cm

0

10cm
SCALE TRAPPERS
TOWER 19 DVARA-EVROPVVS
Diagram of shield structure

Section AA

Short iron grip directly attached to umbo.

Iron reinforcing bar rivetted to shield orb

Section BB

Reinforcing bar widened centrally to enclose wooden grip

Shield board of planks covered with hide or leather

Front

Back
Fig. 84, Shield V.
PAINTED SCUTUM FROM TOWER 19
HISTORED
RECONSTRUCTION OF THE ROMAN SCUTUM
FROM TOWER II
(PAINTED BY HENRIET J. QVITE)
RECONSTRUCTION OF THE YRZI BOW

Arm-Plan

Bone-Nock

Elevation

Grip-Plan

Grip-Plan & Elevation

Arm-Plan

Nock

Grip

Ear-Dissection

Hornt

Wood

Sinew-Fiber

Neck-Tendon

Covering

Arm-Dissection

Grip-Dissection

Perspective

Grip-Arm & Nock
Diagram of size and proportions of blades of three-blade arrowheads.
Size of catapult bolt shafts from Dura Europos
Comparing the preserved dimension from tail to the beginning of the tapered tip.