THE PRODUCTION AND DEPOSITION OF THE THAMES COOLUS HELMET

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SUMMARY

In 1934 a 1st-century AD copper-alloy infantry helmet was dredged from the River Thames or its Walbrook tributary. The helmet soon found its way into the possession of Father John Ward, an antiquarian, who exhibited it at his museum at the Abbey Folk Park, New Barnet. Here the helmet remained on display until 1940 when the London Blitz forced the museum's closure. After his death in July 1949 much of Ward's collection of antiquities was sold. The helmet was purchased by Gerald Gardner from Ward's widow; he then sold it on to the British Museum in 1950, where it has been displayed ever since.

The helmet has been examined in detail for remnant tool marks and other evidence of how it was produced. This has allowed a tentative hypothesis to be forwarded regarding the production process. The helmet bowl was raised rather than spun. The dimensional conformity shown on some parts of the helmet reveals that the maker of the bowl was an artisan of some skill. However, the helmet furniture was attached in a haphazard manner with few items aligned correctly. It is possible that the various components of the helmet were manufactured by skilled craftsmen but their attachment was left to semi-skilled labour. The helmet was utilitarian and was produced quickly. Sufficient resources were devoted to the task to make the helmet functional but it was not a finely executed and finished piece.

The helmet saw long service, as indicated by four different punctim *ownership marks on the neck-guard, and at the end of its period of use it finally ended up in the Walbrook or Thames, where it may have been ritually deposited.*

INTRODUCTION

In July 1950 the British Museum purchased a 1st-century AD Roman infantry helmet from Gerald Gardner of New Barnet, Herts. The museum's accession register records that 'Mr. Gardner purchased this helmet from Mrs. Ward, widow of "Father" Ward of Abbey Folk Park, New Barnet'.

Father John Sebastian Marlow Ward (1885–1949) was an avid collector of antiquities. In 1934 he established the Abbey Folk Park as an open-air museum at Hadley Hall, 89 Park Road, New Barnet, Herts.[1] It was here that the helmet was first displayed to the public. A catalogue of the Abbey Folk Park collection produced by Ward in the 1940s describes the helmet as a: 'Fine bronze legionary's helmet. On the tail piece is the name of the original owner "Marcus" pricked on with a nail. Found in the Thames at London.'[2] The photograph seen in Fig 1 is reproduced in the catalogue with a further comment that the helmet was 'recovered in 1934'. It is not entirely clear how quickly the helmet came into the possession of Father Ward after its discovery or who sold it to him. However, a hand-written note, dated 22 May 1937, sent from the Abbey Folk Park on a postcard reveals that the helmet was 'pronounced genuine by Sir Geo Hill, head of the British Museum & by Prof. Ashmole'. This reference to authentication is instructive. If it was Ward who instigated the authentication then the helmet was in his possession in 1936 or earlier, before Sir George Hill retired as director of the British Museum.[3]

Fig 1. The earliest known photograph of the Thames Coolus from a postcard dated 1937. Ward extensively used postcard stock for producing hundreds of photos of his collection (Courtesy of the Abbey Museum of Art and Archaeology, Queensland, Australia)

The helmet remained on display at the Abbey Folk Park until 1940 when the London Blitz forced the museum's closure. In 1945 Ward left England for Cyprus. Some of the collection was sold to cover debts in 1948–49, while further items were reluctantly sold by Ward's second wife, Jessie (1890–1965), after his death in July 1949. Because Mr Gardner stated that he purchased the helmet from 'Mrs. Ward, widow of "Father" Ward', it is probable that the helmet was sold to Gardner between July 1949 and early 1950. Within a year Gardner had sold the helmet to the British Museum, where it was displayed in the King Edward VII gallery (Anon 1950).[4]

As is the case with many water finds, the exact findspot is unclear. Ward's 'Mirror of the Passing World' catalogue refers to its being recovered from the Thames, but the British Museum's accession register records that although Gardner was aware of the Thames label, he understood that the helmet 'had been found in the Walbrook'. This information can only have come from Mrs Ward, who would have been in a better position than most to know the origin of the helmet. In view of the lack of clarity over the findspot the more general appellation of the 'Thames' Coolus has been used.[5]

DESCRIPTION

The helmet (Accession no.: 1950,0706.1) is a well preserved example of a copper-alloy Coolus of Robinson's Type E (Robinson 1977, 32–3). Only the body of the helmet remains; unsurprisingly for a river find the cheek-pieces, helmet finial and riveted ring for attaching the securing laces were not recovered.[6] The helmet has a hemispherical bowl with a circumference at the rim of 647mm, a broad neck-guard and it weighs 1052.3gm.[7] Its overall dimensions are 295mm long by 231mm wide (at the widest point of the neck-guard) with a 120mm high helmet bowl (see Fig 2). It has a separate brow-guard, which was attached by a rivet at either side and additionally secured to the helmet dome with soft solder. Two tubular plume-holders are soldered at each temple and an attachment for cheek-pieces can be found below these. There is a hole for carrying a rivet in the neck-guard. The neck-guard also has at least four different punched (*punctim*)

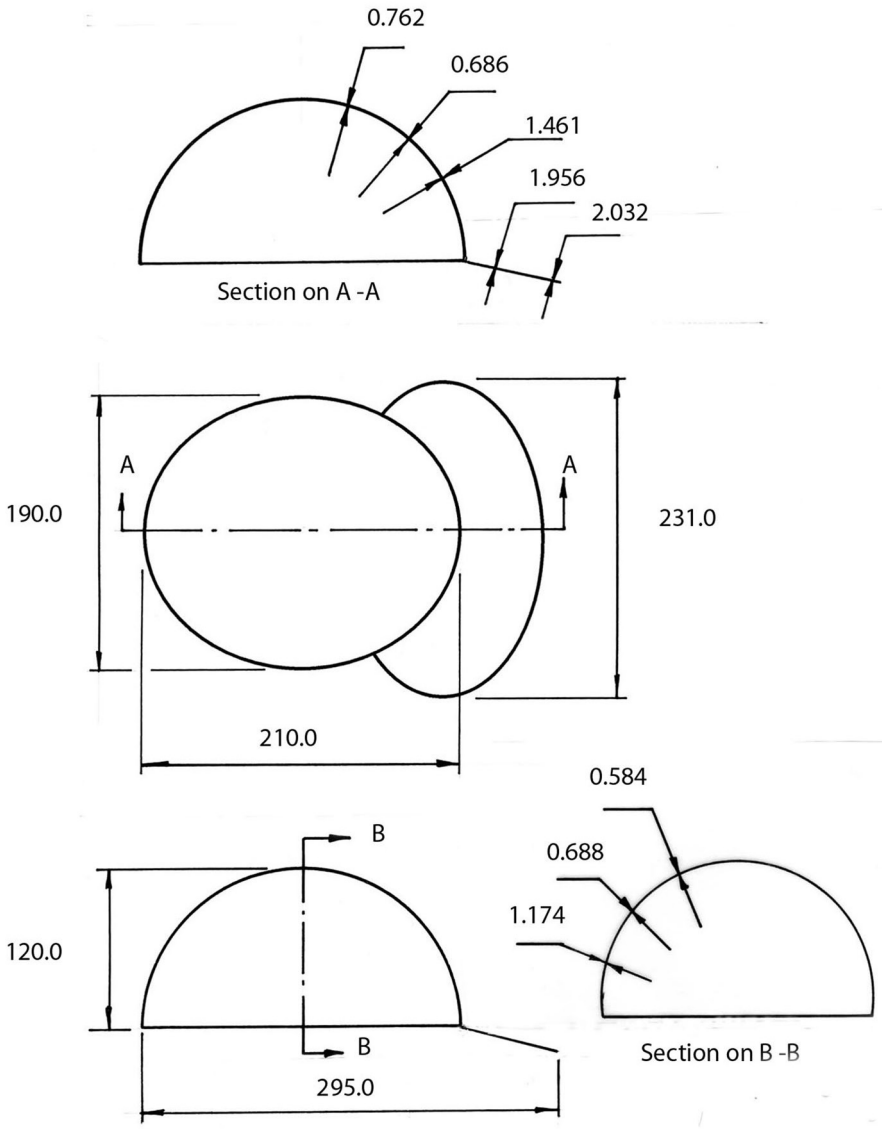

Fig 2. The principal dimensions of the Thames Coolus (dimensions in mm; drawing not to scale)

ownership marks (Brailsford 1951, 18; *RIB* 2425.2).

THE HELMET BOWL

The helmet bowl is elliptical with a major axis of 212mm and a minor axis of 189mm.[8] The internal surface of the helmet reveals characteristic hammer marks in the form of hemispherical depressions in roughly concentric circles. This indicates that the helmet bowl was formed by raising rather than spinning (Sim & Kaminski 2011, 34–5).[9] Raising involves hammering the copper-alloy sheet into a wooden 'doming' block with a hemispherical depression in it. Raising is further confirmed by the variation in thickness across the helmet. For example, the crown is 0.762mm thick, while the rim is 4.1mm at its thickest (see Figs 2–3). This variation is in part caused when the 'development' is formed into the bowl. The

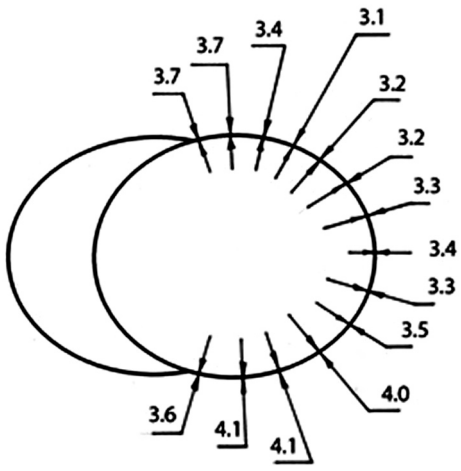

Fig 3. The thickness of the rim of the Thames Coolus (dimensions in mm; drawing not to scale)

metal that is formed into the apex of the bowl is subjected to the most stretching, which results in the thinning observed. However, the helmet rim, which averages 3.5mm, may have been deliberately hammered and manipulated to increase its thickness and so strengthen the circumference of the bowl.

Interestingly the helmet bowl is asymmetrical, suggesting rapid production that was functional rather than elegant. Although poor workmanship cannot be ruled out, there are indications that the artisan had a sound knowledge of the metal and its properties. For example, the helmet rim exhibits a variation of only 1.0mm between its thickest and thinnest points. This is quite an achievement considering it was produced by hand.

A lens-shaped inclusion of material of different colour and texture is evident on the front of the helmet dome (Fig 4). The

Fig 4. The so-called repaired gash in the helmet may be a flaw in the metal

accession register describes this as a 'gash' that has been 'repaired'. The elliptical shape of the inclusion has been interpreted as being the result of a puncture made by either a spear or the point of a sword. Moreover, the different colour of the inclusion has been interpreted as a repair that has been made by running molten bronze into the hole and then filing it smooth (Brailsford 1951, 18). However, considering the average quality of the helmet, it seems strange that such a difficult and sophisticated repair would have been contemplated. Often such repairs were made with simple repair patches.[10] Moreover, there is no evidence of micro-abrasion or other evidence for filing around the inclusion.

A more mundane explanation of the feature can be found to the right of the ellipse where flaws in the metal can be seen. Close examination of the affected area shows that the metal has both a different colour and a different surface texture from the body of the helmet. An alternative explanation is that this feature is a flaw that was caused by a small amount of the metal not becoming completely liquefied during the melting of the metal prior to casting. This area will have similar working properties to the rest of the helmet and would probably not have been apparent during the raising of the helmet. It is quite possible that the elliptical shape of the inclusion has been caused by the process of raising the helmet dome. The different texture and colour of the metal in the inclusion in conjunction with the rough interface with the body of the helmet dome seem to imply a flaw in the metal rather than a repair.

THE NECK-GUARD

The neck-guard is 65.3mm long at its centre, 231mm at its widest, and has been formed at an angle of 13 degrees below the horizontal. It has an average thickness of 2mm. There is a punched hole in the neck-guard centred 18.5mm from the rear edge that would have been for a riveted ring for attachment of a securing lace.[11] The hole was not punched on the central axis.[12] The depression surrounding the punched hole indicates that a fitting with a rivet head 7.45mm across was used. The hole on the neck-guard is 2.7mm in diameter. It was punched and then the burr was hammered flat.

Next to the rivet hole there is a smaller punch mark where the smith has miss-hit the punch, possibly after realising that a punch that was too small had been used. This has left a perfect impression of the tip of the punch tool that was used to punch the neck-guard hole (see Fig 5). The tool was a cutting punch with a hollow centre that was designed to remove a core of metal. This tool mark is the only evidence for this type of

Fig 5. Detail of the 2.7mm diameter rivet hole and miss-punched depression on the upper surface of the neck-guard; despite the cleaning in 1966 remnants of the black Thames patina can still be seen trapped in the miss-punched hole

cutting punch existing in the Roman period as no examples have been identified in the archaeological record.

As with the rest of the helmet bowl the upper surface of the neck-guard has had all hammer marks removed. This clearly demonstrates that the surfaces that were visible in use were cleaned and any marks of working were removed but the areas that were hidden were left as hammered.

HELMET FURNITURE

The following items of helmet furniture have been preserved on the helmet.

Brow-guard

The brow-guard is formed from a single bar of metal that has been riveted at each terminal to the body of the helmet dome. The thickest part of the brow-guard at the centre is 3.7mm thinning to approximately 2.0mm at the terminals. The average thickness is 2.74mm. The rivets holding the brow-guard have facets on them showing that they have been struck with a hammer rather than being held in a rivet snap. This differs from the rivets holding the cheek-pieces, which were attached with a rivet snap.

However, it may be that the brow-guard was originally attached with rivets that had been rivet snapped. However, because the two points of attachment are formed by cylindrical rivets, it is possible for the brow-guard to rotate around those cylinders, and it would work loose over time. A loose brow-guard can be tightened by further hammering of the rivets but there is a limit as to how many times this can be done before the rivets stretch and shear. A third fixing point to stop movement has been added using a soft soldered joint in the middle of the brow-guard firmly attaching it to the helmet body. It is entirely possible that this soldered joint was applied at some time after manufacture when the helmet had been in service causing the brow-guard to work loose. Soft solder was used because it only requires a low temperature process and will not cause oxidisation of the surface, which a hard soldered joint would have done.

The brow-guard shows evidence of working marks on the underside; the upper surface that would have been visible during general use was finished with abrasives to remove all marks of working. The working marks reveal the use of a variety of tools.

The brow-guard, like the helmet body, is attached asymmetrically. This suggests that it was attached rapidly with little time devoted to ensuring that the rivet holes on each temple were in the same relative position. As a result, the guard is at an angle of 10 degrees to the horizontal.

Plume-holders

A tubular plume-holder is preserved on each temple (Fig 6).[13] The cylinders are approximately 28mm tall. Each is aligned at a slightly different angle; the wearer's left is at 5 degrees to the horizontal and the right is vertical.

The plume-holders are made of sheet copper alloy only 0.4mm thick. The right-hand plume-holder exhibits numerous small hammer marks. When recovered, the delicate material of both of the holders was

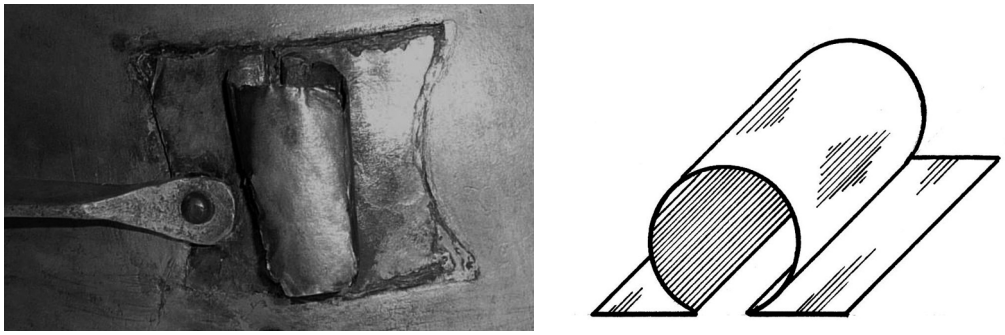

Fig 6. Detail of the plume-holder and a schematic plan view of its construction

flattened to the helmet body (see Fig 1).[14] This remarkably thin material emphasises that the plumes would have been lightweight (such as feathers or horsehair).[15]

The combination of both side plume-holders and a central finial is comparatively rare on Coolus helmets. Of the 39 examples of 1st-century AD Coolus helmets shown in Table 2 only seven (18%), including the Thames example, have a finial and side plume-holders.[16] Although it is tempting to hypothesise that this comparative rarity could imply an officer's helmet, this is by no means certain considering the average quality of the workmanship of the piece.

Cheek-piece attachment points

Although the cheek-pieces (*bucculae*) are missing, the remnants of the iron fastening points are still attached. These are secured with copper-alloy rivets that have been fixed using a rivet snap rather than by hammering. The left cheek-piece rivet hole is 3.0mm in diameter, while the left cheek-piece rivet head is 5.5mm in diameter. The right rivet heads for the cheek-piece are 5.8mm and 4.0mm.

Helmet finial

The former presence of a finial or plume-holder is disclosed by the outline of solder at the apex of the dome. The original holder has not been preserved and the holder at present fixed to the helmet is an unprovenanced example which has been attached to the helmet for display purposes. Nevertheless, it is likely that this was the type of finial originally fixed to the helmet. At some point pressure was applied vertically downwards onto the original finial causing the helmet bowl to buckle slightly at the apex (see Fig 1).[17]

THE PRODUCTION PROCESS (Fig 7)

Tools used for the production of the helmet include a variety of ball-pein hammers, a flat headed hammer, a wooden doming block, a heavy wooden mallet, rasps and files of various grades and a considerable number of punches of different sizes, and there is evidence of the use of tapered punches and plug-cutting punches (2.7mm, 3.0mm). All of these tools have left evidence in the form of tool marks on various surfaces of the helmet.

The bowl and neck-guard

The tool marks left on the underside of the neck-guard provide an indication of the types of tool that were used to form the bowl and neck-guard and the approximate sequence of operations. The starting point for this helmet would have been a sheet of copper alloy. A blank slightly larger than the flat shape of the helmet (known as the development) would have been cut into shape. This would then have been raised (hammered into a hemispherical bowl form or 'doming block') to create the helmet bowl. From the hammer marks, it seems likely that the blank was hammered into a wooden block with an internal dome in it using a heavy wooden mallet with an external domed head. The hammering leaves a series of small but noticeable hemispherical depressions on the surface. These would have been reduced by putting the blank over a ball stake and hammering the surface using a hammer with a slightly curved striking face. This process is called planishing. When the hemisphere was completed, it would have been hammered into an elliptical shape.

Finally, the neck-guard would have been formed. The sequence of operations would have been dictated by the properties of the metal. The smith would have folded the edge of the copper-alloy sheet over the edge of an anvil or other 'form' using a metal hammer. The neck-guard would have been hammered in a series of blows radiating outwards from the fold. Hammering radially outwards from the fold would have prevented the metal creasing and forming a lap. If the smith were to have randomly hammered the neck-guard to flatten it after folding, the metal could split. The guard was hammered down to an angle of 13 degrees below the horizontal.

Folding the unturned copper alloy after spinning the bowl to form the neck-guard would have served to strengthen the entire helmet, especially increasing the rigidity of the helmet rim. The result is a much stronger product than could have been achieved through welding on a separate piece of metal.

When complete the outer surfaces of the

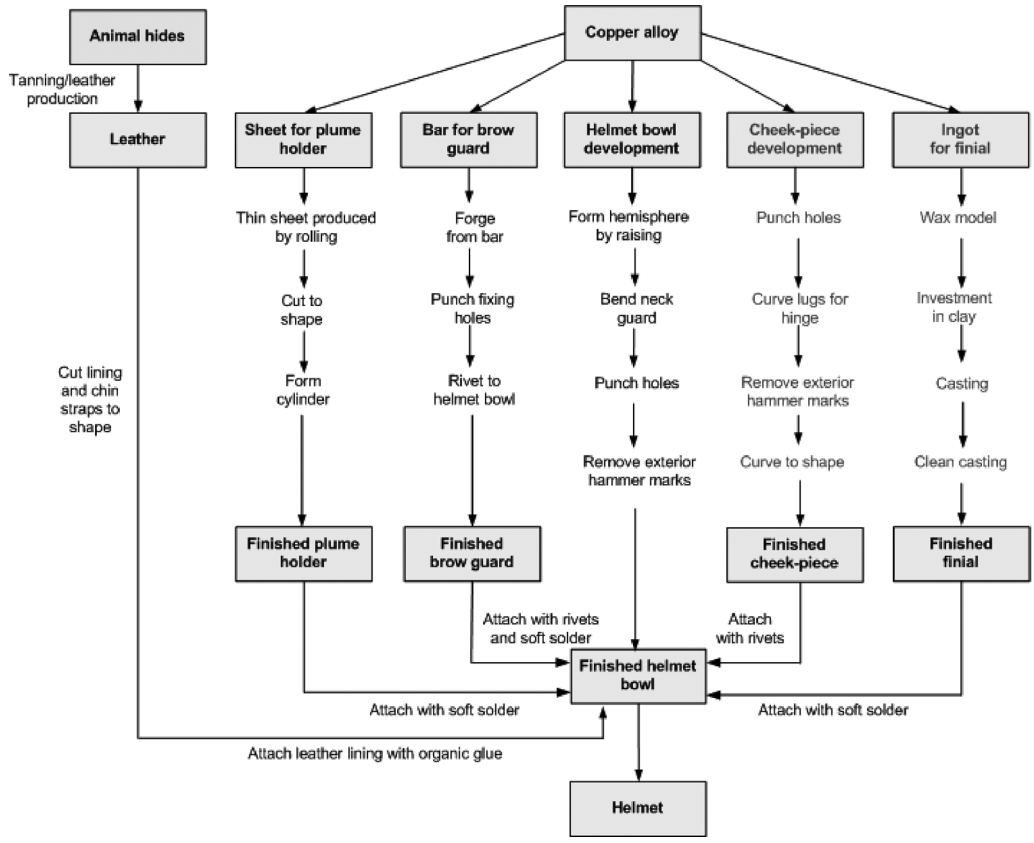

Fig 7. A possible production sequence for the Thames Coolus. Because the cheek-pieces and finial were not recovered with the helmet the production sequences are hypothetical. Also because no trace of the helmet lining was recovered then the reference to leather is also hypothetical. The leather could be supplemented with textile for the helmet lining.

helmet would have been polished in order to remove the working marks on the exterior. Initially a rasp file has been used to remove the major imperfections, as evidenced by the remains of the rasp marks, especially following the circumference of the rim.[18] The rough filing/rasping was followed by the use of successive grades of finer abrasives, which removed most but not all of the evidence of the rough filing.[19]

Furthermore, a number of the rivets have been attached using a rivet snap, as evidenced by the lack of hammer marks on the exterior face of the rivet heads (*eg* the two upper rivets of the cheek-piece holder) but not the brow-guard.

Plume-holders

The plume-holder would have been constructed from a single strip of copper alloy. This may have been formed around a cylindrical form and then soldered to the helmet dome with soft solder.

The brow-guard

The brow-guard relied on simple forge work for production. A copper-alloy bar with a starting thickness of approximately 4mm has been hammer forged into a regular rectangular strip. Lugs would have been formed on each end and holes punched through the centre of the lugs. The strip would have been bent into a curve to follow the contour of the front of the helmet. Finally, it would have been attached to the helmet with copper-alloy rivets. The brow-guard was attached after the plume-holders; this is known because the rivet holes pierced

the edge of the plume-holder attachments (see Fig 6).

Helmet finial

The helmet finial has not survived on this helmet so it is not possible to state how it was constructed; however, most were cast copper alloy. This example was soft soldered into place at the crown of the helmet.

Cheek-pieces

Similarly, the cheek-pieces (*bucculae*) have not survived, but the remnants of their iron attachment hinges have. These were riveted into place on the inside of the helmet using a rivet snap. Such fine finishing is, unsurprisingly, not seen on the inside of the helmet. The rivets of the cheek-piece holder are crudely bent on the inside; their rough projections would have required a helmet lining to protect the wearer. The helmet lining would also have covered the hammer marks on the inside of the helmet. There is no evidence for any mechanism to attach the helmet lining, implying that it was glued into place.[20]

RAPIDITY OF PRODUCTION

A number of factors suggest that this helmet was produced quickly:

Little effort was devoted to ensuring that the helmet was symmetrical. The rim, neck-guard, plume-holders and brow-guard were all asymmetrical or poorly aligned.

Only the visible surfaces were smoothed with abrasives to remove hammer marks, the underside of the neck-guard and brow-guard were left unfinished.

In common with many Roman helmets the rivet holes on the helmet have been punched, suggesting time was an important factor in the production of this helmet.

Of course, it is probable that more than one craftsperson contributed to the manufacture of this helmet.[21] The relative skill involved in producing the helmet bowl by raising is contrasted to the apparently haphazard way in which the helmet furniture is applied. It may be that the helmet was produced as one of a batch of units made at the same time. A system that is properly called production on mass rather than mass-production. The assembly of the components could have been undertaken by semi-skilled labour.

OWNERSHIP GRAFFITI (Fig 8)

Ownership graffiti are a relatively common feature on Coolus helmets. Seventeen (44%) of the known corpus of 39 1st-century AD Coolus helmets (Types B-I) have ownership

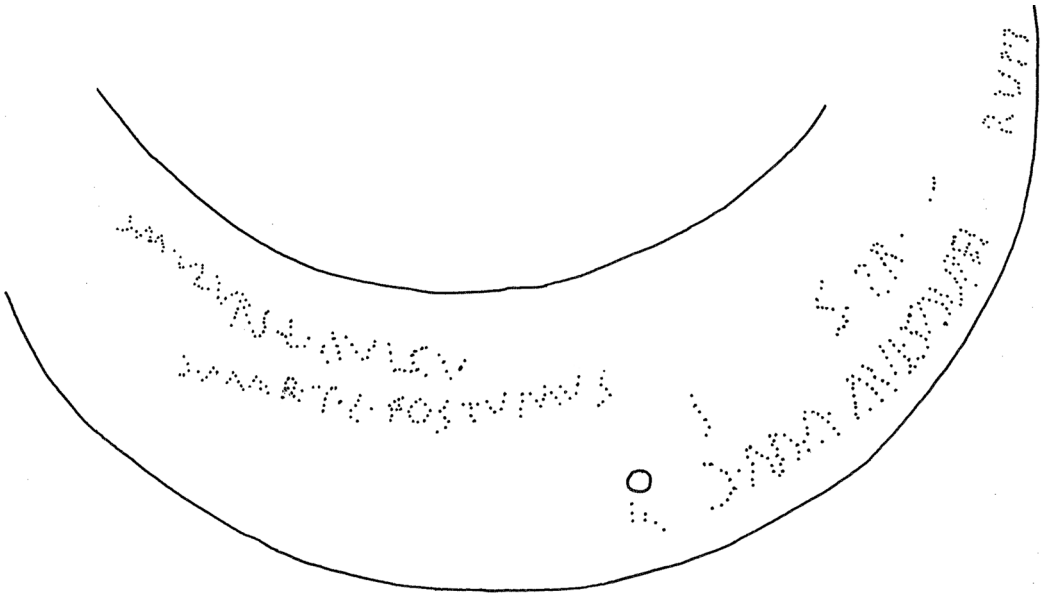

Fig 8. The punctim *ownership graffiti on the neck-guard of the Thames Coolus*

Table 1. The interpretation of the punctim *ownership marks on the Thames Coolus (after RIB 2425.2)*

Inscription	Interpretation
>·M·VAL·VRS·L·DVLCI	(centuria) M(arci) VAL(erii) URS(i) L(uci) DULCI *Lucius Dulcius in the century of Marcus Valerius Ursus*
Ↄ·MART·L·POSTVMVS	(centuria) MART(ialis?), L(ucius) POSTUMUS *In the century of Martialis, Lucius Postumus*
> SCR RVFI	(centuria) SCR(iboni) RUFI *Rufus in the century of Scribonius*
Ↄ·MA·AVL·SAVFEI	(centuria) MART(ialis?) AUL(i) SAUFEI *Aulus Saufei in the century of Martialis*

inscriptions (see Table 2). The Thames Coolus is, however, a rare example of a helmet with four (possibly more) *punctim* ownership marks on the neck-guard.

The provisional interpretation provided by Brailsford (1951, 18) has been superseded by *RIB* 2425.2 (see Table 1). The probability that the helmet has changed hands at least four times and has passed through at least two different military centuries is suggestive of longevity of service. Furthermore, the possibility has to be addressed that some of the ownership marks have been erased or partially erased (Wright 1951, 142–3). Not only could this change the meaning of some of the inscriptions but it may indicate that there were additional owners of the helmet.

CONTEXT

The Type E Coolus infantry[22] helmet form can be dated to the mid-1st century AD. As with many water finds of helmets the exact findspot of the Thames Coolus remains enigmatic. Despite the uncertainties as to the exact findspot, the helmet does appear to have come from the London river system as indicated by the characteristic black patina seen before the helmet was cleaned in 1966.[23] This depositionary context is instructive.

Roman military helmets and watery contexts

Considerable quantities of Roman armour and equipment have been recovered from watery contexts in Northern Europe (*eg* Bonnamour & Dumont 1996; Schalles 1996). Moreover, Coolus helmets specifically have a strong association with deposition in rivers and watery places. Of the corpus of 39 examples of 1st-century AD Roman Coolus helmets shown in Table 2, 20 are river finds (51%), two (5%) are possibly from watery contexts (the beach at Texel, The Netherlands[24] and possibly the banks of the Rhine near Flüren, Germany), five are from unknown findspots (13%), while the remaining 12 (31%) come from dry land contexts.

Table 2. A comparison of Coolus helmets from the 1st century AD

Coolus type[25]	Findspot	Present location	Material	Brow guard	Finial	Plume holders (side)	Ownership marks	Water find	References
B	Düsseldorf, Germany	Rheinisches Landesmuseum Bonn, Germany	Cu	×	×	×	×	×	Robinson 1975, 28, no.40
C	Schaan, Lichtenstein	Landes Museum, Vadutz, Lichtenstein	Cu	✓	×	×	✓	×	Robinson 1975, 28, nos 41-42, Coutil 1914, 31

Coolus type [25]	Findspot	Present location	Material	Brow guard	Finial	Plume holders (side)	Ownership marks	Water find	References
C	Schaan, Lichtenstein	Unknown, a copy is in the Landes Museum, Lichtenstein	Cu	✓	×	×	×	×	Robinson 1975, 28-9, no.43, Coutil 1914, 31
C	Podsusjeda, Croatia	Zagreb Museum, Croatia	Cu	✓	×	×	×	×	Robinson 1975, 28-9, no.44
C	Oberaden, Germany	Destroyed in World War II[26]	Fe	✓	×	×	?[27]	U	Robinson 1975, 28-9, no.45
D	River Wissel, Germany	Rheinisches Landesmuseum Bonn, Germany	Cu	✓	?[28]	✓	✓	✓	Klumbach 1974:,29-30[29]
D	Mass-Roeloffs, Hönnepel, near Kleve, Germany	Rheinisches Landesmuseum Bonn, Germany	Cu	✓	✓	✓	✓	✓	Robinson 1975, 30, no.49, Klumbach 1974, 28-29
D	Wardt-Lüttingen, near Moers, Germany	Rheinisches Landesmuseum Bonn, Germany	Cu	✓	✓	×	×	✓	Robinson 1975: 30, no.50, Klumbach 1974, 28
D	River Waal, Nijmegen, The Netherlands	Rijksmuseum van Oudheden, Leiden	Cu	✓	✓	×	✓	✓	Robinson 1975, 30, no.51
D	The Rhine at Lobith, Gelderland, The Netherlands	Museum het Valkhof, Nijmegen, The Netherlands	Cu	✓	✓	×	✓	✓	Robinson 1975, 32-3, nos 59-61, Klumbach 1974, 30
D	Haltern, Germany	Westfälisches Römermuseum Haltern, Germany	Cu	✓	✓	×	×	×	Robinson 1975, 30, nos 46-7, Klumbach 1974, 27-8
E	The Thames (or Walbrook), London, UK	The British Museum, London, UK	Cu	✓	✓	✓	✓	✓	Robinson 1975, 32, no.54, Brailsford 1950, 1951
E	Northcott Hill, Northchurch, UK[30]	The British Museum, London, UK	Cu	✓	✓	×	×	×	Robinson 1975, 32, no.55
E	Colchester, UK	St Albans (Verulamium) Museum, UK	Cu	✓	✓	×	✓	×	Robinson 1975, 32-33, no.58, Webster 1958
E	River Sava at Rugvica, Croatia	Zagreb Museum, Croatia	Cu	✓	✓	×	×	✓	Robinson 1975, 34, no.62
E	Unknown findspot in the old Yugoslavia	Narodni Museum, Belgrade, Serbia	Cu	✓	✓	×	×	U	Robinson 1975, 34, no.63
E	The Rhine at Köln, Germany	Rheinisches Landesmuseum Bonn, Germany	Cu	✓	?[31]	×	✓	✓	Robinson 1975, 34, no.65, Klumbach 1974, 23-4
E	The beach at Texel, The Netherlands	Rijksmuseum van Oudheden, Leiden, The Netherlands	Cu	✓	✓	×	✓	?	Robinson 1975, 34, nos 66-8, Klumbach 1974, 34
E	Mitrovice, Serbia	Zagreb Museum, Croatia	Cu	✓	✓	×	×	✓	Robinson 1975, 34, no.72

Coolus type [25]	Findspot	Present location	Material	Brow guard	Finial	Plume holders (side)	Ownership marks	Water find	References
E	The Rhine near Xanten, Germany	Rijksmuseum van Oudheden, Leiden, The Netherlands	Cu	✓	✓	✓	✓	✓	Robinson 1975, 34, nos 69-71, Klumbach 1974, 27
E	The Rhine near Xanten, Germany	Xanten Museum, Germany	Cu	✓	✓	×	✓	✓	Schalles & Schreiter 1993
E	The Rhine near Xanten, Germany	Xanten Museum, Germany	Cu	✓	✓	✓	×	✓	Schalles & Schreiter 1993
E	The Rhine near Xanten, Germany	Xanten Museum, Germany	Cu	✓	✓	×	×	✓	Schalles & Schreiter 1993
E	The Rhine near Xanten, Germany	Xanten Museum, Germany	Cu	✓	✓	×	×	✓	Schalles & Schreiter 1993
E	The Rhine near Xanten, Germany	Xanten Museum, Germany	Cu	✓	✓	×	×	✓	Schalles & Schreiter 1993
E	The Rhine near Xanten, Germany	Xanten Museum, Germany	Cu	✓	✓	×	×	✓	Schalles & Schreiter 1993
E	Xanten, Germany	Xanten Museum, Germany	Cu	✓	✓	×	✓	U	Klumbach 1974, 26
E	Unknown	Private collection[32]	Cu	✓	✓	✓	✓	U	Hermann Historika 2004
E	Eich, Germany	Private collection	Cu	✓	✓	✓	✓	×	Oldenstein 1990, 27-37
E	Unknown	The Hague, The Netherlands	Cu	✓	✓	×	?	U	Private collection
E	Unknown findspot in the Lower Rhine region	Private collection	Cu	×	✓	×	×	U	Humer 2006
F	Chichester harbour, UK	Barbican House Museum, Lewes, UK	Cu	✓	✓	×	×	✓	Robinson 1975, 36, nos 73-6, Kaminski & Sim 2007
G	The Danube near Burlafingen, Germany	Prähistorische Staatssammlung, Munich, Germany	Cu	✓	✓	×	×	✓	Robinson 1975, 36, nos 77-80
G	The River Waal at Nijmegen	Rijksmuseum van Oudheden, Leiden, The Netherlands	Cu	✓	✓	×	✓	✓	Robinson 1975, 38, nos 81-3, Klumbach 1974, 32
G	Drusenheim, near Hagenau, Germany	Hagenau Museum, Germany	Cu	✓	✓	✓	✓	×	Robinson 1975, 38, nos 84-5
H	Nidda, near Heddernheim, Germany	Museum für Vor- und Frühegesschichte, Frankfurt am Main, Germany	Cu	✓	✓	×	×	×	Robinson 1975, 38, no.88
I	Rheinbett, Mülheim am Rhein, Germany	Rheinisches Landesmuseum Bonn, Germany	Cu	✓	✓	✓	×	✓	Robinson 1975, 38, no.89

Coolus type [25]	Findspot	Present location	Material	Brow guard	Finial	Plume holders (side)	Ownership marks	Water find	References
I	Flüren, between Bislich and Wesel, Germany	Rheinisches Landesmuseum Bonn, Germany	Cu	✓	×	×	×	?[33]	Klumbach 1974, 25
I	Oude Maas by Alem, Noord-Brabant, The Netherlands	Private collection	Cu	✓	✓	✓	✓	✓	Klumbach 1974, 33

Cu – Copper alloy Fe – Iron U – Unknown findspot

Clearly there may be factors, such as dredging, that favour the recovery of river artefacts in preference to dry land finds. However, there does appear to be an above average number of Coolus helmets ending up in river systems especially in the 'Celtic' heartlands of northern Europe (Germany, The Netherlands, Belgium, France and Britain). Moreover, two outlying river finds in Croatia and Serbia may hint at an as yet undiscovered depositional group.[34]

Such finds of metalwork and equipment from watery contexts were originally interpreted as accidental losses, or losses in battle. Although this is possible and some helmets may end up in rivers because of erosion of archaeological contexts, it now appears that many such finds are the result of ritual deposition. As Bradley (1990, 101) ironically notes, 'metalwork which took a long time to make can hardly have come to us through the incompetence of so many boatmen'.

The deposition of metalwork and human remains in the Thames

The Thames in London has been the focus for ritual deposition of metalwork since the Bronze Age (Ehrenberg 1980; Needham & Burgess 1980; Bradley 1990, 104). However, the type of metalwork that was being deposited in the river changed over time and by the Iron Age the weapons-oriented deposition seen in the Bronze Age began to be complemented by an increase in armour and helmets. Prestige metalwork such as the Waterloo Helmet and the Battersea, Wandsworth[35] and Chertsey Shields are dated on stylistic grounds to the Middle to Late Iron Age (Brailsford 1975, 26, 32).[36] By the Roman period deposition of helmets in watery places becomes especially prevalent across northern Europe. In the Thames at Kew a Roman cheek-piece from another, as yet undiscovered, helmet indicates that the deposition of the Thames Coolus was not an isolated incident.[37]

Furthermore, it was not only metalwork that ended up in the river. Both the Thames and, especially, the Walbrook tributary have yielded hundreds of human crania, both during dredging and from excavations since the early 19th century (Lane Fox 1867; Marsh & West 1981; Bradley & Gordon 1988; Lees & Woodger 1990, 14–15).[38] Early investigators such as Mortimer Wheeler saw these skulls as evidence of the Boudiccan sack of the city (RCHM 1928, 16); however, the lack of ante-mortem injuries on the majority of the crania recovered has reduced the efficacy of this argument. More recently some have favoured more pragmatic mechanisms for explaining the skulls throughout the river system, such as accidental drowning, suicide and murder (Knüsel & Carr 1995), the erosion of riverside burial sites (Powers 2005; Edwards *et al* 2010), or the remains of rebels executed after the Boudiccan revolt (Perring 2012, 19).

In some cases the apparent selection of the individuals recovered and their association with contemporary metalwork, especially in the Bronze Age, has led some authors to argue for the ritual deposition of human

bones (Bradley 1990; Cotton 1996; Allen & Cox 2000), although the evidence is far from clear on the matter (Edwards *et al* 2010).

The skulls have been dated to every period from the Neolithic to the recent past. However, analysis of the cranial indices of the skulls by Edwards *et al* (2010) has shown that the make-up of the skulls from the Thames and the Walbrook tributary differed. The Thames skulls were dominated by Bronze Age and later medieval head shapes, while the Walbrook assemblages were dominated by head shapes characteristic of Iron Age and Romano-British populations. The interpretation of the cranial indices of the Walbrook skulls corroborates previous studies, including radiocarbon dating (Bradley & Gordon 1988, 507; Bradley 1990, 180–1), which suggest that a significant proportion derive from an Iron Age/Romano-British population (Marsh & West 1981; Bradley & Gordon 1988). Moreover, the Walbrook crania are predominantly from young males. Furthermore, many come from securely stratified early Roman levels in the Walbrook (Lees & Woodger 1990, 14–15).

Excavations of the Roman levels at Moor House revealed that many human bones showed signs of excarnation and ritual deposition of specific body parts. Evidence for dog gnawing and post-mortem knife marks on some of the bones are suggestive of the exposure of bodies prior to preparation for deposition (Armitage 2006; Dodwell 2006; Perring 2012, 19).

From the 1st century AD onwards the Walbrook valley was dominated by industrial activity. It is at this time that many artefacts and skulls entered the river (Maloney & de Moulins 1990; Merrifield 1995; Seeley & Drummond-Murray 2006).

Cotton (1996, 89–91) also notes a relationship between the deposition of skulls and of ceramic face-pots in the Thames. Here a transition is evident, with the deposition of actual skulls occurring predominantly prior to the 2nd century AD, while the deposition of face-pots began from the later part of the 1st century onwards. It seems highly unlikely that such a sequence would be observed if the deposition of crania was entirely the result of random chance events such as accidental traumatic death and erosion of archaeological contexts. The Thames Coolus would have been deposited some time in the later part of the 1st century AD, which corresponds to the time when proxy offerings such as face-pots were beginning to be made in the Thames and Walbrook.

The close association between the helmet and the site of the votive deposition of metalwork and of human crania invites comment. Across northern Europe during the 1st century AD Roman military helmets were finding their way into river systems and watery places. It could very well be that the helmet was ritually deposited as part of the same form of religious practice as led to the deposition of the crania, representing a continuation of practices that began millennia previously in the Bronze Age.

CONCLUSIONS

The Thames Coolus is a well-preserved example of a mid-1st-century AD copper-alloy Roman infantry helmet. The helmet was utilitarian and was produced rapidly. Sufficient resources were devoted to the task to make the helmet functional but it was not a finely executed and finished piece. The finishing was simply the minimum required and is only evident on visible exterior surfaces, the underside of the neck-guard and brow-guard exhibiting no finishing of any kind.

The preservation of tool marks on the helmet allows a tentative hypothesis to be put forward regarding the production process. The helmet bowl was raised. The dimensional conformity shown on some parts of the helmet reveals that the maker of the bowl was an artificer of some skill. However, the helmet furniture was attached in a haphazard, hurried manner with few items aligned correctly. This disconnect between the relative quality of the components and their attachment could suggest that the various components of the helmet were manufactured by skilled artisans but their attachment was left to semi-skilled labour.

The helmet appears to have had a long history of service, indicated by the presence of at least four different *punctim* ownership marks on the neck-guard. The helmet ended its period of use in the waters of the Walbrook or Thames sometime after the mid-1st century AD.

It is impossible to determine why this helmet ended up in the river system. While it is conceivable that the helmet could be debris from the Boudiccan revolt, or the result of erosion of archaeological contexts, or an accidental loss, many elements point towards its being a ritual deposition. Half of the known examples of Roman Coolus helmets from northern Europe have been recovered from rivers and watery places. The Thames itself has been a focus for ritual deposition of metalwork and possibly human remains since the Bronze Age. There is increasing emphasis on the deposition of armour in the Thames in the Later Iron Age, compared with the weapons-dominated assemblages of the Bronze Age. In the Thames the deposition of human crania appears to be replaced from the late 1st century AD onwards with proxy offerings such as face-pots. The helmet could, therefore, be an example of a proxy or other votive offering.

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NOTES

[1] The attraction included, amongst other things, a replica prehistoric village and a 13th-century tithe barn transported from Kent. By 1940 Ward had acquired more than 90,000 artefacts and antiquities and salvaged 30 historic buildings from demolition. From 1927 onwards he also ran a religious community alongside the museum, called the 'Confraternity of the Kingdom of Christ'. The London Blitz forced the closure of the Abbey Folk Park in 1940. Public suspicion of Ward's religious activities led to a court case in 1945, which was further compounded by near bankruptcy and illness. He left the country shortly afterwards. The Abbey Folk Park became an arts centre and the ethnographic collection was moved to Cyprus in 1945, where Ward died, near Limassol, on 2 July 1949 (Ginn 2012). It was after Ward's death that his widow, Jessie, had to reluctantly sell parts of the collection, including the Thames Coolus. Since 1986 the remainder of the collection has formed part of the Abbey Museum of Art and Archaeology in Caboolture, Queensland, Australia.

[2] This entry can be found as accession W.42 on p 109 of the 'Mirror of the Passing World' catalogue. This is thought to be the last catalogue written by Ward before he was forced to sell much of the collection and emigrated to Cyprus in 1949. This is now held in the archives of the Abbey Museum of Art and Archaeology, Caboolture, Queensland, Australia (Accession no. MPW-A19).

[3] Sir George Francis Hill (1867–1948) was director and principal librarian of the British Museum between 1931 and his retirement in 1936. Professor Bernard Ashmole (1894–1988) was the Yates Professor of Classical Archaeology at the University of London, between 1929 and 1948. George Hill certainly visited the Abbey Folk Park. This is recorded in Ward's 1930–1946, Book of the Centuries, Volumes 1 and 2. Cuttings from newspapers and magazines, now held in the archives of the Abbey Museum of Art and Archaeology, Caboolture, Queensland, Australia.

[4] Gerald Brousseau Gardner (1884–1964) was an amateur anthropologist, archaeologist, writer and occultist. He was most famous for bringing the neopagan religion of Wicca to wider public attention in the UK. He was also a leading figure in the Folklore Society, where he met Ward. Gardner donated land in Cyprus for Ward's community once they left England, but it was such poor land that it had to be sold to acquire a more productive estate.

[5] The Coolus is an infantry helmet of a 'jockey cap' construction which has its origins with 3rd- to 1st-century BC Celtic helmets. The type site is in the Coolus region of the Marne Valley in France (see Robinson 1975, 28, nos 37, 38). This design was subsequently adopted and adapted by the Roman military. For a detailed review of the typology of Roman legionary helmets of Coolus Type see Robinson (1975, 26–41).

[6] Such river finds can be well preserved. The anaerobic conditions in the river silts often prevent much of the degradation seen in helmets and equipment found in dry land contexts. This is especially the case with copper-alloy helmets. However, as is often the case with river finds, much of the helmet furniture is missing. The cheek-pieces were attached with an iron hinge threaded with heavy gauge wire, so would have been particularly vulnerable to loss after the corrosion of this hinge and wire. Furthermore, it is evident that some helmets had leather cheek-pieces (see D'Amato & Sumner 2009, 109, fig 125).

[7] This weight includes a finial from another helmet that has been attached with adhesive for display purposes. Excluding this finial would give a weight of approximately 1.0kg. This weight corresponds closely to the body of the Chichester Coolus Helmet (1052gm) which retains its finial (Kaminski & Sim 2007, 217).

[8] These measurements are to the inside of the bowl rim.

[9] Spinning is a production system where a thin sheet of metal is rotated and pressure is applied to the sheet to force it against a wooden former. The finished article will take on the shape of the former. With this system it is possible to produce large quantities of identical objects whereas items produced by raising will be unique.

[10] For example, a Type E Coolus from Xanten has two oval repair patches (Schalles & Schreiter 1993).

[11] For example, a Type E Coolus from Xanten has a complete example of the securing ring. The ring is located on the underside of the neck-guard and is attached with a bronze rivet. This would have been used to attach the securing laces of the helmet (Schalles & Schreiter 1993). About half of the known corpus of 1st-century AD Coolus helmets have evidence for the provision of a riveted ring on the neck-guard.

[12] It is not uncommon for these riveted rings to be offset from the central axis.

[13] The use of lateral helmet plumes (*geminae pinnae*) was a continuation of an ancient tradition of dedication to Mars. Polybius (*Histories* 6.23), writing in the mid-1st century BC, describes how the *hastati* wear a 'circle of feathers with three upright purple or black feathers about a cubit in height, the addition of which on the head surmounting their other arms is to make every man look twice his real height, and to give him a fine appearance, such as will strike terror into the enemy'.

[14] These have since been conserved, as seen in Fig 6.

[15] See, for example, the plumed helmet of Flavius at Hexham Abbey and the tombstone of Insus at Lancaster City Museum or plumed helmets in a cavalry context (Bull 2007).

[16] The other examples are a Type E Coolus from the Rhine near Xanten (Schalles & Schreiter 1993, 90–2), a Type D dredged from Mass-Roeloffs, Hönnepel, near Kleve, Germany (Robinson 1975, 30), a Type G Coolus that was discovered in Drusenheim, near Hagenau, Germany (Robinson 1975, 38), a Type I from Rheinbett, Mülheim am Rhein (Robinson 1975, 38), and another Type I from Oude Maas by Alem, Noord-Brabant, The Netherlands (Klumbach 1974, 33). An unprovenanced Type E is also known to exist in a private collection (Hermann Historika 2004).

[17] This pressure may have caused the loss of the finial.

[18] It is probably these rasp marks that have led some authors to incorrectly suggest that the Thames Coolus helmet was spun (*eg* Paddock 1985).

[19] It could be that in the case of mass produced items, jobs such as polishing were left to unskilled labour, because the use of highly skilled craftsmen for unskilled jobs would be an inefficient use of resources.

[20] Because helmet linings would have been made of organic materials only a limited number of examples have survived. A fragment of leather was preserved under a rivet on the inside of the Newstead parade helmet; furthermore, the iron helmet from Newstead also retained a thick woollen padded lining on the inside of the helmet bowl and mask (Curle 1911, 166, 170; Robinson 1975, 144). An Imperial Gallic helmet from Hod Hill, Dorset, retains fragments of a coarse fabric lining (Brailsford 1962, 5, B1). The presence of both leather and fabric suggests that both materials were used for helmet linings.

[21] For example, specialist cheek-piece makers (*bucularii*) are attested.

[22] Although widely seen as an infantry helmet some authors have interpreted Coolus forms as being used by cavalry as well. For example, D'Amato & Sumner (2009, 180, pl VII) interpret the Lancaster Reiter tombstone as showing a cavalry trooper wearing a Coolus, although there is insufficient detail shown to determine this. However, Bull (2007, 23–4) interprets this as an Auxiliary Cavalry 'Type A' helmet. Similarly, D'Amato & Sumner (2009, 180) interpret some cavalry representations on the Arc d'Orange as

wearing Coolus helmets although these are far from clear. The protruding neck-guard of the Coolus E form seems to indicate a helmet more suited to infantry use.

[23] This is why early photographs of the helmet show it with a black surface (see Fig 1; Brailsford 1952, pl VIIIa; Robinson 1977, pl 54). In addition to the cleaning in 1966, at an unknown date, the plume-holders were conserved, and a finial was attached with adhesive.

[24] The beach find at Texel could be an example of an accidental loss. The punched ownership inscription on the neck-guard has been interpreted as belonging to a marine on a warship.

[25] Based on Robinson's (1975) typology.

[26] This heavily corroded iron Coolus helmet was housed in Dortmund Museum, Germany, before it was destroyed in World War II. It was the only known example of a Coolus produced in iron.

[27] Because this helmet was so heavily corroded and subsequently destroyed in World War II it is unclear if any inscriptions were originally present.

[28] Although now restored, much of the helmet bowl has been lost so it is not possible to determine if the helmet once had a finial.

[29] Much of the helmet bowl has been lost so it is not possible to determine if the helmet once had a finial.

[30] This helmet was discovered during the digging of the Grand Junction Canal between Tring and Berkhampstead. It is sometimes referred to as the Tring or Berkhampstead helmet.

[31] Much of the helmet bowl has been lost so it is not possible to determine if the helmet once had a finial.

[32] This damaged Coolus was sold to a private buyer in the Hermann Historika auctions of October 2004. The helmet is now in a private collection so only the auction catalogue photographs can be used to provide an indication of the structure.

[33] Possibly recovered during the restoration of the right bank of the Rhine between Bislich and Wesel, Germany, but this cannot be confirmed.

[34] The Sava River in Croatia has also yielded other Roman military helmets and a Roman military diploma issued during the reign of Vespasian found during dredging at Slavonski Brod.

[35] Two shields were dredged from the Thames at Wandsworth before 1849: the round Wandsworth Shield and the partially preserved Wandsworth Mask Shield.

[36] The Waterloo Helmet is dated to the 1st century BC based on the typology of the enamelled studs, which are characteristic of the continental La Tène III (Brailsford 1975, 32). The stylistic evidence from the Battersea Shield leads Brailsford (1975, 26) to suggest that it comes 'very late in the sequence of Early Celtic art in Britain'. He even goes so far as to suggest that 'Roman influence may be discerned'. The Wandsworth Shield is dated to the 2nd century BC, and the Wandsworth Mask Shield is dated to the later 3rd century BC (Green 1996, 378, 398). The wooden handle of the Chertsey Shield has been radiocarbon dated to 400–250 BC.

[37] The cheek-piece was purchased by the British Museum in 1910.

[38] In addition to the stream beds crania have been recovered from other 'wet places' such as wells, ponds and ditches.

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