ANALYSIS OF THE LATE BRONZE AGE METALWORK DEPOSIT FROM CARNOUSTIE

PROJECT 4572

GUARD archaeology

Contents

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ANALYSIS OF THE LATE BRONZE AGE METALWORK DEPOSIT FROM CARNOUSTIE

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by

Alan Hunter Blair
Esther Cameron
Jane Evans
Susanna Harris
Will Murray
Peter Northover
Brendan O'Connor
Vanessa Pashley
Susan Ramsay
Alison Sheridan
Beth Spence
and
Lore Troalen

GUARD archaeology

Figure 1:
All Features

Introduction

Alan Hunter Blair

1.1 On 9 September 2016, a deposit of copper alloy objects was uncovered during topsoil stripping as part of the wider programme of strip, map and record works at the site. The items were found within a well defined pit which was located within an area enveloped by three fairly equally spaced possible late Bronze Age domestic structures (Figure1). The wider site investigations revealed two rectangular Neolithic structures, multiple ovoid and round Bronze Age structures and a series of pit groups of Neolithic and Bronze Age date.

1.2 The initial stripping by heavy machinery partially revealed, tilted, and slightly damaged, the blade of a bronze sword and spearhead. The proximal end of the spearhead was observed to have a socket decorated with a band of gold. Fragments of wood, identified as possible scabbard fragments, were also apparent when the objects were first uncovered.

1.3 Given the rarity and significance of the find, as well as the sensitivity of the observed organic material and the potential for other similar material to survive, it was decided that laboratory excavation of the deposit would be necessary. Accordingly, the objects, along with surrounding contextual material and the surrounding subsoil were lifted as an 80 kg block. This was secured and transported to the GUARD Archaeology Ltd facilities in Glasgow, so that the material could be stored within a secure and stable environment while arrangements were made for the appropriate investigative and excavation processes to be undertaken. Will Murray, of the Scottish Conservation Studio, was engaged in the first instance to ensure that any necessary measures were being taken ahead of a formal assessment.

Imaging, Laboratory-based Excavation, Conservation Assessment and Initial Assessment by Specialists

Beth Spence and Will Murray

2.1 Prior to the commencement of the laboratory-based excavation, the block was transported from the GUARD Archaeology facilities to the Small Animal Hospital at Garscube, Glasgow in order to carry out X-ray imaging and a CT-scan (Figure 1). This was with the aim of establishing the size, number and position of the objects that were visible, as well as establishing the presence of any unknown objects. Images were produced of the block from above, as well as through the block in section. The images were successful in identifying the extent and location of the metal objects and were subsequently used both in consulting the conservator and specialists prior to excavation, and as a useful tool during the excavation process in identifying sensitive areas prior to objects being fully revealed.

2.2 The block was also photographed from several angles prior to its excavation, including four fixed points which were used throughout the excavation process for photographing the overall block at various stages of excavation. A nominal system of compass points was utilised in order to locate the direction of photos, corresponding closely to the orientation of the feature on site. The block was then planned at a scale of 1:10. This plan also detailed the 0.1 m by 0.1 m grid which was utilised throughout excavation for the purposes of locating materials, objects and fragments, including environmental samples. The grid was used to allocate co-ordinates for all materials and samples recovered during the excavation.

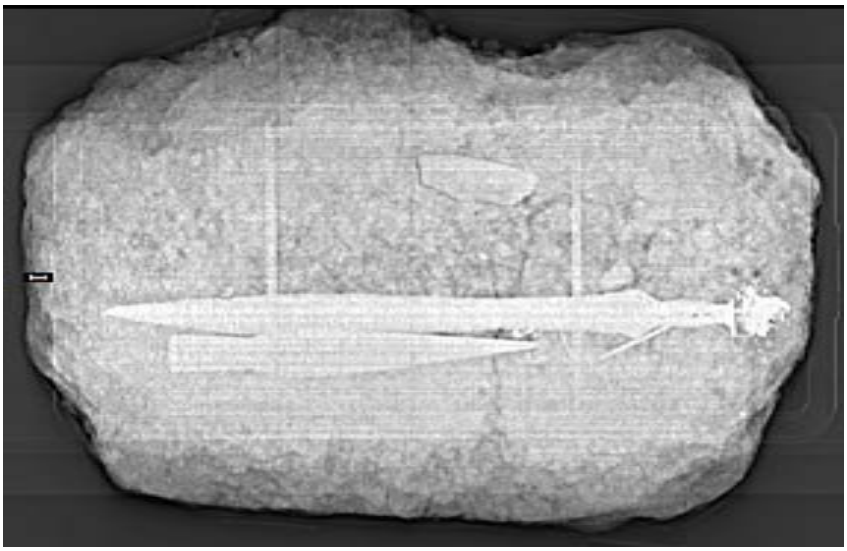


Figure 1: X-ray image of block showing positions of the metal objects. The pommel can be seen as a diffuse mass beyond the hilt tang, and the longest fragment of pin shaft can be seen beside the shoulder of the hilt. The grid-like lines are from the plastic tray in which the block was stored.

2.3 The laboratory excavation was undertaken by Beth Spence (Figure 2), under advice from Will Murray who carried out a conservation assessment; full details of both the excavation and the assessment can be found in reports held in the project archive. Various specialists, including Trevor Cowie, visited during the process of excavation to offer their thoughts on the find.

Figure 2: Beth Spence excavating the artefacts in the block. Photo: Will Murray.

2.4 The excavation revealed that the deposit consisted of the following:

- A leaf-shaped sword of copper alloy (bronze), with a metal pommel, buried in its wooden scabbard and with a bronze chape at the end of the scabbard (the last-mentioned having been partly destroyed by the digger bucket);
- A socketed bronze spearhead, wrapped in an animal skin, laid partly over the sword and with its tip pointing towards the sword hilt. Fragments of woven textile were found in the area of the socket end, where the gold foil encircled the socket;
- A swan's neck, sunflower-headed bronze dress pin, broken into five principal pieces (at some point before its discovery but after its deposition – possibly as a result of disturbance from tree

root growth). The remains were found overlying the hilt area of the sword, and traces of woven fabric were spotted in its immediate vicinity;

- A circular, half-cylindrical annular bronze mount with the remains of two loops on its concave side. This was found underneath the sword blade, roughly in line with the tip of the spearhead, and there were also traces of woven fabric in this area; and
- A mysterious circular organic object (dubbed 'the biscuit' during initial assessment). This was found close to the annular mount.

2.5 Also spotted was a strap-like item of organic material in the area of the hilt, and it was initially speculated that this could have been a strap. Subsequent microscopic investigation revealed, however, that this was a root of a small tree that had grown after the metalwork had been deposited.

2.6 No evidence for a box or other container was found; the objects were found in a shallow, roughly rectangular scoop up to 28 cm wide and 16 cm deep, extending for a length of at least 93 cm. The ends of the scoop were truncated when the block was lifted, but the scoop had not extended much beyond the ends of the block. In other words, it was clear that the scoop had not been sufficiently long to accommodate an entire spear, and so the spearhead must have been deposited in an nshifted state.

2.7 The conservation assessment not only established that the degree of organic preservation was far superior to what might be expected for a dryland site (thanks to the micro-climate of the surrounding sediment and the mineralisation of some organics through their proximity to metal objects), but also underlined the importance of undertaking specialist analysis and research rapidly, so as not to allow degradation of the remains before they could be consolidated. (Some of the metal was in a poor condition.) Accordingly, a team of specialists was assembled, under advice from Alison Sheridan of National Museums Scotland, and over the course of 2017 a series of studies and analyses was undertaken.

Specialist Study and Analysis

Esther Cameron, Jane Evans, Susanna Harris, Will Murray, Peter Northover, Brendan O'Connor, Vanessa Pashley, Susan Ramsey, Alison Sheridan and Lore Troalen

3.1 The following research questions were formulated and addressed by the team of specialists, working with Project Manager Warren Baillie:

- Of what material were the various artefacts made? In particular, what was the material of the pommel? And what was the animal whose skin had been used to wrap the spearhead? Was the textile woven from plant-based or animal-based material?
- From where did the raw materials for the artefacts come?
- How were the artefacts made?
- What was the annular mount? Was it a fitting for a scabbard or a baldric (sword-belt)?
- What had the woven textile been? Was it a garment, associated with the pin, or was it a wrapper of some kind? Is just one piece of textile present, or more?
- What was the so-called 'biscuit'?
- When were the objects deposited? And in what order were the objects placed in the container?
- Had the objects been used before they were deposited? (In other words, were they new or old?) Had the spearhead been mounted on a shaft at any point before its deposition? Did the weapons show signs of wear, particularly consistent with combat?

- What is the significance of this deposit – in terms of the (presumably contemporary) settlement and more broadly, within Late Bronze Age Scotland? Who owned these precious items, and why were they deposited here, at a (presumably contemporary) settlement site?

3.2 The suite of analytical studies included the micro-CT scanning of the spearhead, the pommel and the 'biscuit'; microscopic examination; compositional analysis using X-ray fluorescence spectrometry (both in portable form (Pxrf) at GUARD Archaeology and using the fixed equipment at the National Museums Collection Centre, Granton); lead isotope analysis at the NERC Isotope Geosciences Laboratory, Keyworth; and scanning electron microscopy and electron probe analysis. The individual detailed specialist reports are available in the project archive; what is presented here is a digest of the key findings (collated by Alison Sheridan). The results are presented as a narrative for each of the objects, followed by a discussion of their deposition and of the wider significance of the find. Outstanding research questions will be highlighted at the end.

The Sword and its Scabbard and Chape

The Sword

Figure 3: the sword, after conservation. Photo: Will Murray.

4.1 The sword (Figure 3) consists of a leaf-shaped bronze blade that ends in a T-ended hilt tang, with four rivets that would have secured the tang to an organic hilt, plus a pommel that would have been fixed in some way to the hilt. The overall length of the sword is 889 mm; that of the blade and hilt tang is 638 mm; and that of the tang, 103 mm. At its widest point, the blade measures 44 mm, and at the shoulder of the hilt tang the width is 49 mm, although it would originally have been a few millimetres wider as part of the shoulder on one side had broken off (Figures 4, 5). (This was on the opposite side of the sword from the side damaged by the heavy excavation equipment. Note, however, that the detached fragment, visible on the photograph, is still not as angular as the shoulder on the other side, and one wonders whether the shoulder on this side had ever been as angular.) The hilt rivets have diameters ranging from 3.1 mm to 4.1 mm, and to judge from their lengths, the hilt would have been around 12–13 mm thick.

Figure 4: lower part of hilt and upper part of blade, showing a detached fragment from the hilt shoulder towards the bottom of the photo. Note also the absence of a ricasso notch on this side. Photo: Will Murray.

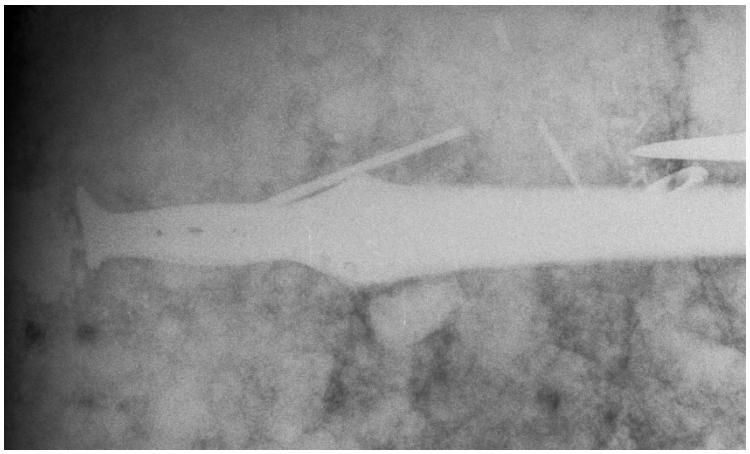


Figure 5: X-ray of the same area of the sword, showing that the hilt shoulder on the lower side of the image is less angular than the shoulder on the other side.

4.2 The blade has a gently rounded mid-section and a gently concave outer section, curving to slightly bevelled edges. Slight asymmetry of the blade edge towards the tip (Figure 1) suggests that the sword may have seen some action during its lifetime, being resharpened after combat. There are nicks in the blade some of which may relate to recent damage; with others on the undamaged edge possible being from use. As the blade approaches the hilt, on one side it kinks inwards, marking the junction between the blade and the hilt. (This feature is absent from the other side.) This is known as a ricasso notch; beyond that point, and leading to the shoulder of the hilt, is an unsharpened area called a ricasso.

4.3 The shape of the lower edge of the hilt is revealed by a broad, roughly omega-shaped area of dark brown compact organic material (Figure 6), which lies over part of the hilt tang and is still to be identified. Microscopic traces of a material that appears to be horn (Figure 7) were spotted by Will Murray during his conservation assessment; whether the organic material found around the base of the rivets (Figure 8) is wood or horn remains to be seen. It may well be that the hilt had been a composite of horn and another organic material.

Figure 6: remains of the organic hilt; at the left, the shape of the bottom edge of the hilt is shown by a roughly omega-shaped 'hollow'. Photo: Will Murray.

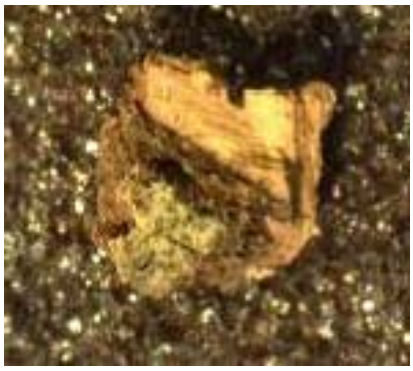


Figure 7: fragment of horn from hilt. Photo: Will Murray.

Figure 8: hilt tang with fragment of horn or wood attaching to a rivet. Photo: Will Murray.

4.4 The pommel is highly degraded and friable through being oxidised over time, and its original shape is hard to assess, although it may have been a flattish dome or cone (Figures 1, 9). Its lower edge is slightly broader than the T-end of the hilt tang, and this offers a hint as to the original width of the hilt at this point. The material was found to be an alloy of tin and lead, with surface compositional analysis by pXRF suggesting a ratio of 90% tin to 10% lead (although it is known that tin migrates to the surface, causing surface enrichment, over time, so the actual tin-to-lead ratio for the pommel overall was probably lower). The base of the pommel was located around 10 mm beyond the end of the hilt tang, suggesting that the organic hilt had extended beyond the end of the tang by this distance. Micro-CT scanning of the pommel (Figure 10) did not reveal any feature that would suggest exactly how it had originally been fixed to the hilt: had the hilt ended in a tenon that projected into a socket in the pommel? Had the pommel been heat-fused to the hilt in some way?

Left: Figure 9: the pommel *in situ*. Photo: Will Murray. Right: Figure 10: CT scan looking down from the top of the pommel.

4.5 Overall, the sword can be classified as being of Ewart Park type. This type of sword was current mostly between 900 BC and 800 BC, and numerous examples are known from northern Britain, although the distribution extends widely over Britain (Colquhoun & Burgess 1988, pls 127–32). The radiocarbon date obtained for the Carnoustie scabbard – detailed below – is slightly earlier than this, and this is discussed below.

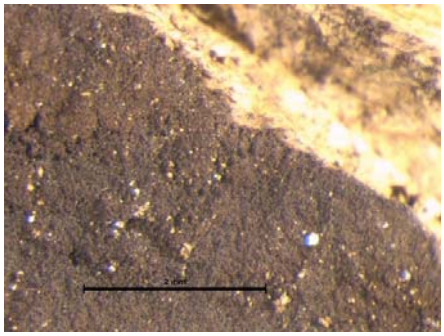
4.6 Compositional analysis of the sword blade by Peter Northover revealed it to have a mean composition of 89.86% copper, 8.08% tin and 1.04% lead, with traces of several other elements; the arsenic and antimony content are below 0.4% and the nickel content is below 0.2%. This composition is characteristic for Ewart Park swords (Northover 1988).

The Scabbard

Figure 11: Remains of the scabbard (top) from the underside of the sword.

4.7 This was found as a series of relatively well-preserved fragments of thin wood (Figure 11), preserved better on the underside of the sword (i.e. the side less vulnerable to disturbance by heavy excavation equipment) than on the upper side. Microscopic examination of the wood by Susan Ramsay revealed that it was hazel, cut into long strips a few millimetres thick; in some fragments it was observed that the wood had been cut at 45 degrees to the grain. How the two sides of the scabbard fitted together is still unclear, but traces of a black organic material were noted on both sides of each scabbard fragment (and on the blade of the sword). These were shown – by scanning electron microscopy, undertaken by Lore Troalen (NMS) – to consist of a starchy material, possibly some kind of glue (Figure 12). The scabbard may therefore have been of composite construction, with the starchy glue used to attach an organic liner and cover to the wood. Furthermore, a narrow strip of organic material running down the centre of the scabbard's internal surface (Figure 13) hints at some complexity in its construction.

4.8 That the scabbard had been attacked by boring insects, probably after its deposition, is shown by the presence of tiny holes and frass (insect excreta) near the hilt end of the scabbard (Figure 14). This was noted by Will Murray during his conservation work.



Left: Figure 12: conventional binocular microscope image of surface of scabbard; the dark material is the starchy substance that was identified as such in the scanning electron microscope. Photo: Alison Sheridan. Right: Figure13: inner surface of scabbard, showing a strip of some organic material running down its centre. Photo: Will Murray.

Figure 14: left: fragment of scabbard with insect boring holes; right: insect frass (excreta) beside the ricasso notch. Photos; Will Murray.

The Chape

4.9 Only a small portion of the chape – a metal protector for the blade tip end of the scabbard – survived the process of discovery using heavy equipment. Its constituent fragments were found under the tip of the sword. Sufficient survived to show that it is of tongue-shaped form (Figure 15). It is of copper alloy, and the refitted fragments amount to *c* 36 mm in length. How it had been fixed to the scabbard is unknown.

Figure 15: the surviving portion of the tongue-shaped chape. Photo: Will Murray.

The Annular Mount

5.1 This copper alloy object (Figure 16) was found resting mostly underneath the sword, close to the tip of the spearhead, with just a small part of its edge projecting from beneath the sword. It is a hollow ring-shaped object, with a diameter of 26.5 mm and a hoop width of 7 mm; part of its outer edge is missing, presumably corroded away. On the outer surface there are two low transverse ribs, and on the hollow side – the side facing the sword – there are the stumps left by two metal loops that will have served to affix the object to another object, by one or more strap. Beside one of these loops is what appears to be the remains of a casting core fragment (Figure 17), left from the manufacture of the object.

Left: Figure 16: exterior of the annular mount, showing the two ribs. Photo: Will Murray. Right: Figure 17: interior of the annular mount, with fragment of casting core *in situ* at lower left area of the hoop. Photo: Susanna Harris.

5.2 The item appears to be a decorative mount, perhaps for the scabbard or for a baldric (i.e. a sword belt – although no other sign of such a belt was spotted); it is not sufficiently robust to have been a load-bearing connector on a strap. A scabbard ornament seems to be the most likely interpretation.

5.3 Beneath this mount (i.e. in contact with its convex side), and within the hole in its centre, were found fragments of woven textile and fragments of animal hide (Figure 18). These are described and discussed below.

Figure 18: fragments of woven textile and animal skin found below the annular mount. Photo: Susanna Harris

The Spearhead

6.1 This is a long, leaf-shaped socketed spearhead, 378 mm long and *c* 65 mm at its widest, with a midrib, a socket *c* 27 mm in diameter at its end and extending up much of the midrib, and a peg-hole on either side of the socket for pegging it to a wooden shaft (Figures. 19–22).

Figure 19: the spearhead after consolidation. Note: the contrast in colour between the blade and the socket relates to the area covered by consolidant. Photo: Will Murray.

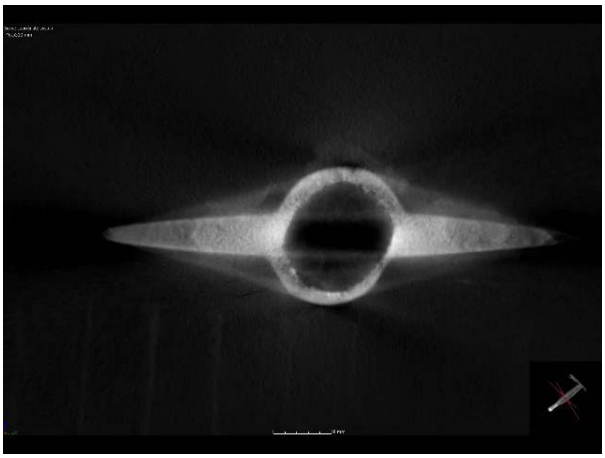


Figure 20: Micro-CT scan image across section of the spearhead.

6.2 Around the socket, but not extending over its end, is a band of applied gold foil, 21.6 mm wide, with a design of two sets of three lines and one set of two, each *c* 0.4 mm wide, framing a herringbone pattern (Figure 21). Micro-CT scanning revealed that the design was present on the copper alloy beneath the gold – probably incised into the metal, rather than cast-in (although this needs to be verified) – and indicated that the gold had been applied as a seamless foil band, pressed into the incised lines to take the design. The micro-CT scanning also revealed that the socket kinks slightly as it approaches its narrow end (Figure 22). This suggests that, during the casting of the spearhead, the core that had been used in the three-part mould may not have been wholly straight. There is some minor nicking to the blade, and Peter Northover has commented that the gold appears to be slightly worn (as well as being scuffed when the heavy excavation equipment unearthed the objects). The nicks on parts of the edge that had not been subjected to recent damage, along with wear on the gold band, does suggest that the spear had possibly seen active service. Whitish material found in the area of the gold band was found to be a corrosion product.

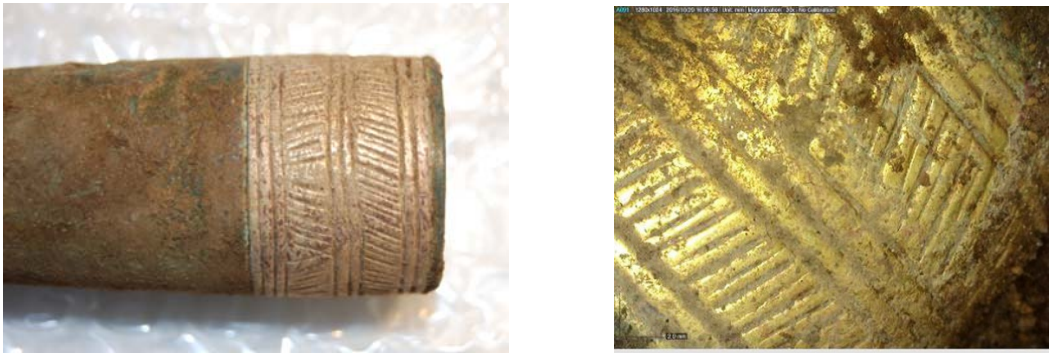


Figure 21: The gold binding on the end of the spearhead socket. Note the whitish corrosion product in the grooves on the right-hand image. Photo on left: Will Murray; on right: Alison Sheridan.

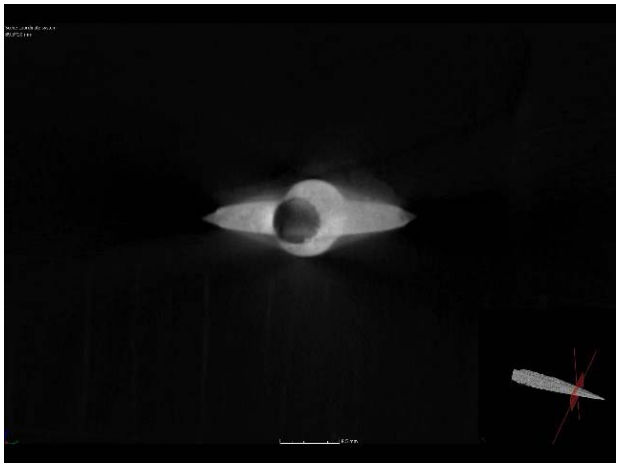


Figure 22: Micro-CT scan image showing that the inner end of the socket is not symmetrically-positioned. The small image at the bottom right indicates the position (in red) of the CT 'slice'.

6.3 The spearhead is of Type 11A in the latest typology of British Late Bronze Age spearheads (Davis 2015), and is among the longest examples of its type.

6.4 Investigation of the contents of the socket revealed that there were no traces of wood (from a shaft) present; instead, a considerable amount of fresh-looking grass stems was found, stained by the copper. This suggested that a very small rodent (such as a field mouse) may have set up house, perhaps in the fairly recent past, in the socket.

6.5 Compositional analysis of the bronze of the spearhead, undertaken by Peter Northover, revealed that it is of 86.7% copper, 11.4% tin and 0.68% lead, with trace amounts of several other elements. Lead isotope analysis by Jane Evans and Vanessa Pashley revealed that the lead probably originated in a central English ore field. Compositional analysis of the gold by Lore Troalen using XRF revealed the gold to be of high purity, and lead isotope analysis of the gold showed that it grouped with southern Irish and southern British ore compositions. Further analysis is needed to check whether the lead in the gold had been present as a natural inclusion or had been added; an origin of the lead content in an English ore field seems likely.

6.6 Over much of the surface of the spearhead were the remains of animal hide, its hairy side in contact with the metal (Figure 23). At the socket, however, remains of woven textile were found both above and below the metal, adhering to it (Figure 24). These are described and discussed below.

Figure 23: detail of the sheepskin wrapping at the tip of the spear. Photo: Will Murray.

Figure 24: fragment of woven textile adhering to the gold socket band. Photo: Alison Sheridan.

The Pin

7.1 A complete but fragmented bronze sunflower-headed, swan's neck pin was found lying over the pommel, hilt and upper blade area of the sword, its head at the pommel end (Figure 25). The pin had broken into several fragments, probably in antiquity (as the fracture surfaces are not fresh). Its overall length is *c* 239 mm, with a shank diameter of 4.25–5.9 mm and a head diameter of 26.6 mm. The head is *c* 2.3 mm thick over most of its surface. The exterior of the head is decorated with a design of concentric circles, each around 0.25 mm wide. The design may well have been made using the lost wax method of casting rather than by scribing a design into the head after casting. The centre of the head has a low nipple (Figure 26). This marks the point where, on the back of the head, the shank of the pin is attached.

Figure 25: the pin as found. Photo: Will Murray.

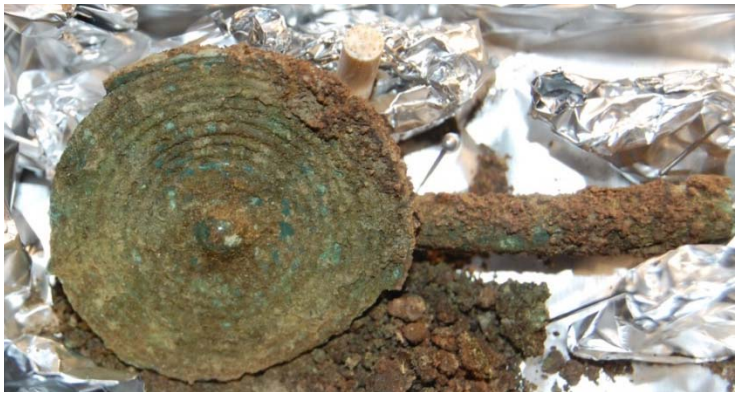


Figure 26: the pin after cleaning. Photo: Will Murray.

7.2 Fragments of woven textile were associated with this pin, including in the narrow area between the shank and the back of the pinhead – thereby indicating that the pin had been in use, securing a piece of textile.

7.3 Compositional analysis using XRF revealed that the pin, like the sword and the spearhead, is of leaded bronze.

The Animal Skin Wrapping for the Spearhead

8.1 This was examined by Esther Cameron, using scanning electron microscopy (Figures 23, 27). It was concluded that the substance was sheepskin, and not that obtained from a Late Bronze Age sheep bred for its wool; the closest modern parallel for the sheep whose skin was used at Carnoustie is the wild sheep.

8.2 The position of the sheepskin fragments indicate that it had been wrapped around both sides of the spearhead.

Figure 27: Conventional binocular microscope photograph of a fragment of the sheepskin, with the individual hairs clearly visible. Photo: Alison Sheridan.

8.3 Whether the animal skin that was found beneath the annular mount is part of the same wrapping material remains to be elucidated.

The Woven Textile Fragments

9.1 Fragments of textile found associated with the pin, the spearhead socket area and the annular mount were examined by Susanna Harris using scanning electron microscopy. It was concluded that all were of sheep's wool (Figure 28), and that at least two different textiles were represented. One, found around the socket of the spearhead (Figure 24), is a fine, tabby weave, woven using z-spun thread with one thread system finer that the other. The other, found associated with the pin and the annular mount (Figure 29), is a slightly coarser fabric, woven with z-spun yarns with thread systems of similar diameter. There is no sign of any dye in either fabric.

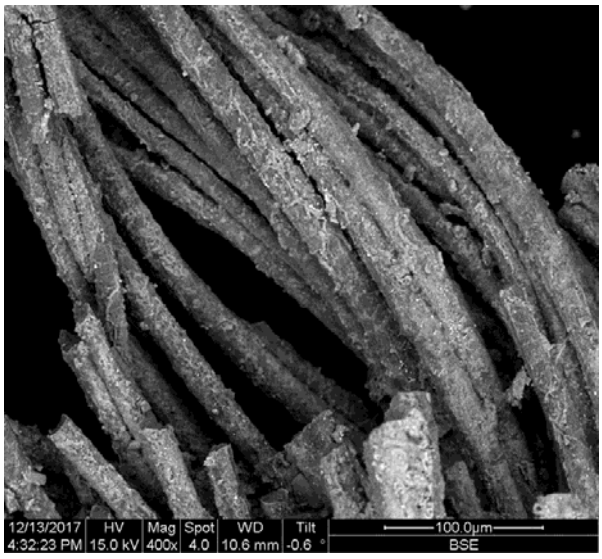


Figure 28: Scanning electron microscope image of individual wool fibres. Image: Lore Troalen and Susanna Harris.

Figure 29: fragment of woven textile on shaft of pin. Photo: Susanna Harris

9.2 It is suggested that the finer material had probably been used to wrap around and protect the gold end of the spearhead, while the slightly coarser fabric could either have been a garment, or a piece of cloth used to wrap the metal objects. The fact that fragments of this fabric were found both underneath the sword and above it strengthens the idea that it had been wrapped around the sword (encompassing the annular mount as well), and the fact that fragments were found between the head and shank of the pin indicates that the pin had been used to secure the ends of this fabric.

The Unidentified Organic Object ('biscuit')

10.1 This enigmatic object, found near the annular mount (Figure 30, left), has been baffling, and continues to baffle. In its cleaned state, it measures just over 30 mm in length. Micro-CT scanning of the object while still inside its sediment matrix failed to reveal its shape: it appeared to be of a similar consistency to the surrounding sediment. The removal of this sediment to reveal its extent did not uncover any clues as to what it had been. In its current, cleaned state, it has one forked end and one foot-like end (Figure 30, right). It would be worth checking to see whether the forked ends are spaced at the same distance as the two loops on the interior of the annular mount: if this had been the case, then might this have been a strap that had run through the loops?

Figure 30: the enigmatic organic object, the so-called 'biscuit': left: *in situ* to the left of the annular mount; right: after removal of surrounding sediment.

Other Finds

11.1 Examination of plant remains by Susan Ramsay revealed the presence of various items that were extraneous to the deposit. The grass stems found in the socket of the spearhead have already been mentioned; also present, in the sediment surrounding the artefacts, were two carbonised cereal grains (including one of barley); unburnt seeds of plant species that grow on waste ground (eg fat hen); charcoal of various species; and root wood. The cereal grains and charcoal could have derived from the Bronze Age settlement in the immediate vicinity, while the waste-ground plants may represent modern contaminants, and the roots relate to plants or trees that grew in the area, entwining themselves around the archaeological material.

The Radiocarbon Date

12.1 A sample of the scabbard was submitted to SUERC for dating, and the result was as follows: SUERC-75019 (GU45283), 2855±33 BP, 1071–940 cal BC at 68.2% probability, 1118–924 cal BC at 95.4%.

Discussion

13.1 This deposit of a set of weaponry plus a pin is of considerable significance, nationally and internationally, for several reasons:

- First, it provides a very rare example of the survival of Late Bronze Age organic items – the wooden scabbard, the sheepskin wrapper, the woven textiles and the mystery object – in Britain and Ireland. It is exceptionally rare for any remains of a scabbard to survive, and the presence of substantial parts of a scabbard at Carnoustie may well help to elucidate the nature and function of the annular mount. Regarding the textiles and sheepskin: before the discovery of the remarkably-preserved waterlogged Early Bronze Age cist at Whitehorse Hill on Dartmoor (Jones 2016) and the Late Bronze Age settlement at Must Farm, Cambridgeshire (http://www.mustfarm.com/progress/site-diary-6-textiles/), only a handful of textile and animal hide fragments were known from Britain and Ireland (Bender Jørgensen 1992, 18–20; Wincott Heckett 2012, 432–3; Hurcombe 2014).
- Second, the gold-bound spearhead is one of only five examples of spearheads adorned with gold binding in Britain and Ireland (Coles 1971; Davis 2015, 46 n. 1), the others being from Pyotdykes near Dundee (Coles et al 1964), Harrogate, Yorkshire (Davis 2015, no 486), Lough Gur, County Limerick, south-west Ireland (Coles et al 1964, pl XVIII) and 'Ireland' (ibid, Waddell 1998, 239. A sixth gold-embellished spearhead, found in the river Thames near Taplow, Buckinghamshire, has gold studs rather than a band: Davis 2012, No 701). While the shape of the spearheads varies, that of the Harrogate example is closest to the Carnoustie example.
- Third, the survival of a pommel is an exceedingly rare occurrence.
- Fourth, the fact that it has been possible to obtain a radiocarbon date is very important, since dates for Ewart Park phase metalwork in Scotland are sparse (ScARF 2012, table 2; http://tinyurl.com/clxgf5s). The fact that the Carnoustie date is slightly earlier than the 900–800 BC date bracket for Ewart Park metalwork is not a problem; given that so few dates exist for this period in Scotland, this new information is a valuable addition, which extends the currency backwards in time.
- Fifth, the fact that this is a dryland find, in the vicinity of a Late Bronze Age settlement, is very unusual indeed and this helps us in our attempt to understand why it was deposited.
- Finally, the fact that a very similar deposit was found at Pyotdykes, just 20 km to the west of Carnoustie, is remarkable. Along with numerous other finds of Late Bronze Age metalwork in Tayside and Fife, this attests to the wealth of the Late Bronze Age elite in this part of Scotland. The Pyotdykes deposit comprised two swords (with traces of a composite wood and animal skin

scabbard associated with one) and a gold-bound spearhead; a plug of woven nettle-fibre or flax fabric was found in the spearhead socket.

13.2 Before considering the parallels for, and the broader social context of, the Carnoustie deposit, it would be useful to consider the sequence of actions involved in depositing it and to address the question of whose possessions these would have been, and why they were buried.

13.3 Having decided to bury what may well have been the owner's most precious possessions, the owner will have wrapped them carefully to protect them. It appears that the sword (in its scabbard, and with the annular mount) was laid in the hollow scoop first, wrapped in a garment or a piece of cloth of woven wool, fastened with a fine pin – the kind of pin that could have fastened a cloak. After that, the spearhead was placed beside and slightly overlapping the sword, its blade wrapped around with a piece of sheepskin and its socket protected by a piece of fine woven woollen cloth.

13.4 The fact that the items had been deposited with such care, and that the findspot is within a roundhouse-settlement of presumed Late Bronze Age date, suggests that they had been buried for safe-keeping. In other words, this does not look to be a metalworker's stash of waste bronze for recycling, nor does it resemble a votive deposit, many (but by no means all) of which are found in watery or wetland contexts. If this is indeed a burial for safekeeping, then this constitutes a rare and important example of this kind of behaviour, an example that is possibly comparable with the Pyotdykes hoard.

13.5 The practice of depositing valuable metalwork is well known in Late Bronze Age Britain and Ireland (and indeed further afield), and parallels for the individual object types – and for the combination of the types – are easy to cite.

13.6 Among the many *comparanda* for the sword, an example from Mey, Caithness (Colquhoun & Burgess 1988, 94, no 512; NMS X.DL 50) offers a close match, differing only in having one fewer rivet holes in its hilt. While sword pommels are rare, good examples of cast copper alloy pommels are known from the hoards found at Grosvenor Crescent, Edinburgh and at Tarves, Aberdeenshire (Coles 1960, 53, 97–8, 118–9, Figures 2.4, 6; Colquhoun & Burgess 1988); and at Tosson in Coquetdale, Northumberland, a pommel of tin-lead alloy was found (Colquhoun & Burgess 1988, 92 no 98, pl 175C, 6-7). Scottish finds of Late Bronze Age chapes are listed by Coles (1960, 86), and to these can be added the tongue-shaped chape from the St Andrews hoard (Cowie et al 1991). As for the annular mount, *comparanda* are very rare but include one from the Grosvenor Crescent, Edinburgh hoard (Colquhoun & Burgess 1988, pl 174, 9).

13.7 The rare *comparanda* for spearheads with gold foil have been mentioned above. Spearheads with decorated sockets are commoner, with numerous examples documented by Richard Davis in his review of Late Bronze Age spearheads in Britain (2015, eg pl 97, showing examples on Type 11 spearheads). The designs usually feature bands of horizontal lines, sometimes framing triangular or other designs. As for the distribution of Type 11A spearheads in general, this is widespread across Britain (ibid, pl 154), and Davis lists 525 examples. And as for parallels for large late Bronze Age spearheads from Scotland, the following can be cited: Bracadale, Skye (blade only: ibid, 74 no 288; NMS X.DG 114), Eyre Point, Raasay (lacking socket mouth and point: ibid, 75, no 290; NMS X.DG 113), Loch Kinnord, Aberdeenshire (ibid, 74 no 285; University of Aberdeen Museums, Aberdeen, ABDUA:19672), near Banff (also lacking mouth and point: ibid, 74 no 286; Banff Museum) and Wigtownshire (ibid, 75 no 294; NMS X.DG 15).

13.8 The sunflower-headed swan's neck pin is an artefact type whose design elements have an international distribution (Coles 1959). In 1959 and 1960 John Coles listed eight examples in Scotland hoard (Coles 1959; 1960, 89), and to these can be added the five found in the large hoard at St Andrews, Fife (Cowie et al 1991).

13.9 *Comparanda* for the textiles are discussed by Susanna Harris in her detailed report; these include fragments found in the hoards from St Andrews (Gabra-Sanders 1994) and Pyotdykes (Coles et al 1964).

13.10 As for parallels for the overall assemblage of metalwork, these include (in various permutations) the hoards from Grosvenor Crescent, Edinburgh (Colquhoun & Burgess 1988, nos 474, 488, 513, 530, 547 and 607A, pl 174); from Tarves, Aberdeenshire (Coles 1960, 97–8, Figure 6); from Pyotdykes, Angus (Coles et al 1964); and from St Andrews, Fife (Cowie et al 1991). The Grosvenor Crescent hoard comprised seven swords (of which one has a bronze hilt and domed pommel, and one is lost), an annular mount, a ring, the head of a sunflower-headed swan's neck pin, and possibly a socketed axehead. The Tarves hoard comprised two swords (including one with a cast bronze pommel), a tongue-shaped chape and a sunflower-headed swan's neck pin). The Pyotdykes hoard, as noted above, comprised two swords (one in a scabbard) and a spearhead with gold binding and with a plug of woven textile in the socket. The far larger hoard at St Andrews contained (inter alia) large spearheads, a tongue-shaped chape and five sunflower-headed swan's neck pins. The combination of a single sword with a single spearhead seems to be matched only at Dalton-in-Furness in Cumbria (Colquhoun & Burgess 1988, 89–90 no 462, pl 173A; Davis 2015, 164 no 1150). The association of one or more swords with one or more spearheads is relatively common, not just in Britain but further afield, especially along the Atlantic façade.

13.11 The fact that international parallels can be found for the objects, and the combination thereof, discovered at Carnoustie reminds us that their owner will have belonged to an elite that was well-connected. The term 'Atlantic Bronze Age' has been coined to describe the period, roughly between 1100 BC and 800 BC, when extensive, interlocking networks of contacts were operating up and down the Atlantic façade (and across the North Sea as well). These allowed wealthy and powerful community leaders to interact and compete with each other internationally in various ways – by exchanging goods and gifts, by feasting, by participating in ostentatious votive deposits that showed off their wealth in bronze, and by Figurehting. (See, for example, Needham & Bowman 2005 on the widespread distribution of flesh-hooks and other feasting gear.) Fashions in weaponry and jewellery would be shared at an international scale, and clearly it was important for high-status men to show off their credentials as warriors – hence the frequent finds of weaponry. As noted above, Tayside and Fife appear to be rich in finds of Late Bronze Age metalwork (as can be seen, for example, in Trevor Cowie and Mark Hall's review of such finds from the river Tay: Cowie & Hall 2010), and the directionality of the links is well illustrated by the hoard, mostly of jewellery, found at Balmashanner in Angus (Coles 1960, 98–9). Here, connections with Scandinavia, Ireland, northern England, central Europe and Atlantic Europe are attested, and it appears that eastern Scotland was an important stopping-point on the two-way transfer of amber and metal between Ireland and Scandinavia.

13.12 Thus, the Carnoustie find has a lot to tell us about the socially stratified nature of Late Bronze Age society, and about the sophisticated, cosmopolitan elite in this part of Scotland. The owner of the objects found at Carnoustie would have been a wealthy, important member of the community.

13.13 While an impressive amount of analysis, over and above that set out in the PERD for the work, has already taken place in a relatively short time, the work of post-excavation analysis has not yet finished for this site. It is expected that further information, to assist in our understanding of the context and deposition of the Bronze Age metal items, will be drawn out from the overall post-excavation analyses and dating of the archaeology discovered on the Carnoustie site. This report will be incorporated witin the eventual publication of all post-excavation analyses, scheduled for March 2019.

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