

Insular ornamental metalwork

AD 300 – 500:

'Military Style' inspired art in Ireland and Britain

Volume II of II

Fiona Gavin

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Supervisor: Mr. Conor Newman

National University of Ireland, Galway College of Arts, Social Sciences & Celtic
Studies, School of Geography and Archaeology

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Appendix One - A Catalogue of Insular Military Style Art

Catalogue Notes

Objects contained in the catalogue have been grouped in terms of type *viz.* dress pins, brooches, mounts and then in terms of typology *viz* proto hand-pins, hand-pins. In the description of the objects the following conventions have been followed:

Projecting-headed pins

- (1) Unless otherwise stated, the diameter of the shank measurement has been taken at its widest point providing that the pin is not broken before this point.
- (2) Overall length refers to the length from the top of the pinhead to the tip of the shank.
- (3) Length of shank refers to the length from the top of the angled projection to the tip of the shank.
- (4) Diameter of head refers to the maximum diameter

Zoomorphic Penannular Brooches

- (1) Unless otherwise stated, diameter refers to the maximum diameter of the hoop and is always measured at the widest part of the hoop parallel to the terminals

Abbreviations

Diam. Diameter (= max. diam. measured on the outside of the rim)

H. Height

L. Length

Max. Maximum

Th. Thickness

Museum registration numbers or Portable Antiquities Scheme numbers are cited where available. Items held in private collections are noted as such.

The line-drawings are reproduced to scale (as shown on the drawings) and photographic illustrations are not reproduced to scale.

1 - The Oldcroft Pin

Artefact type: Proto hand-pin

Location: British Museum, London

Museum Register Number: P1973.8-1.1

Find spot: Found by Mr. P. Croad at grid reference SO 645060, Lydney, Gloucestershire close to Oldcroft. The site is immediately west of the Dean Road, a route between Lydney and Weston-under-Penyard

Context: The pin was found in association with some fragments of scrap silver and two fragments of textile, possibly the remains of a purse or bag. The hoard also contained over 3,000 bronze coins which provide *terminus ante quem* of 354-359 AD for the hoard.

Weight: 3.1g

Material: Silver - XRF at the BM indicated a silver content of 83.5%

Dimensions:

L. of pin = 60.5mm; L. of shank = 52.3mm; Max. Th. of shank 2.8mm, tapering to 1.4mm

Pin head: Outer Diam. = 12.1mm x 11.6mm ; Max. Th. 2.8mm; L. of projection = 2.8mm; Inner Diam. = 6.1mm x 5mm

Description:

Silver, red enamel-inlaid proto hand-pin.

The arc-shaped, beaded arcade has four beaded mouldings, each divided from the next by a plain fillet and is flanked on either end by two wide, drilled, circular settings which are inlaid with red enamel at either end; one is now empty while the other still retains a significant portion of its original inlay. The lower crescentic plate circle is decorated with a palmette with flanking downward curling, falcate-shaped lobes, each with a drilled dot. The palmette is has three enamel-inlaid dots superimposed, forming a berried leaf motif. The *verso* of the pin has been visibly squared and is plain and undecorated with no evidence of punched ornament. A narrow groove runs along the vertical edge of the lower crescentic plate. The shank has a slight bend at the tip which may be use-related.

Examination under a binocular microscope indicates that the pin was originally cast blank in one piece, and all of the surface decoration was applied post-casting. File marks are clearly visible on the shank. A chasing tool was used to create a now much

abraded ladder pattern that runs along the lower edge of the central perforation. This is similar in style and execution to chased border on the shank of an unlocalised silver disc headed pin from Ireland (Cat No. 14).

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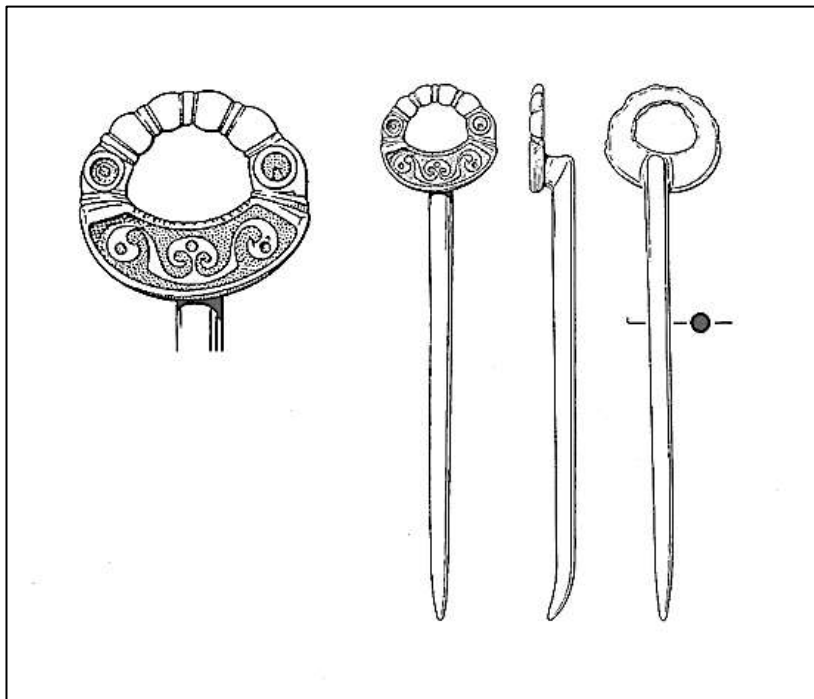


Plate AI- 1 The Oldcroft Pin, full view (top left); decorated pin head (top right) © Trustees of the British Museum; drawing after James Farrant © Trustees of the British Museum.

2 - Castletown Kilpatrick Pin

Artefact type: Proto hand-pin

Location: National Museum of Ireland, Dublin

Museum Register Number: 7.w.24

Find spot: The pin is said to have been found together with Cat. No. 11 in 1848 at Castletown Kilpatrick, Co. Meath. It then passed into W.F. Wakeman's possession and was later acquired from him by the Royal Irish Academy.

The Ecclesiastical register for 1820 lists Castletown Kilpatrick as a vicarage within the union of Drakestown, Castletown-Kilpatrick and Knough (Knock). Lewis (1937) describes Castletown Kilpatrick as 'a parish in the Barony of Morgallion, County of Meath, three miles from Nobber on the road from Kells to Ardee.

Context: No context recorded

Weight: 5.89g

Material: Silver - XRF at the NMI, Dublin indicated a silver content of 86.6%

Dimensions:

L. of pin = 84.8mm

Overall length of shank = 73.1mm

Diam. of pin head = 10.9mm

Pin head (External Diam.): 11.0mm x 10.8mm; (Internal Diam.) = 4.0mm x 3.9mm;
Max. Th. 2.0mm; L. of projection = 3.5mm;

Lower crescentic plate: D. 10.3mm x 5mm:

Upper arcade: Diam. of beads (1) 3.0mm; (2) 3.3mm; (3) 3.1mm; Diam. of intermediary fillets 0.8mm

Description:

Silver proto hand-pin.

The projecting pin head is set parallel to a round-sectioned shank at end of short right-angled arm. The head is formed of an upper arcuate arcade of three polished beads separated by two fillets and a lower crescentic plate, decorated with fine-line reserved ornament. The central bead is the largest and is flanked on either side by a smaller bead. The pinhead projects forwards and is also tilted upwards, accentuating the visibility of the small decorative plate. The lower plate is decorated with a central

cordate-shaped, motif with three, pyramidally disposed drilled dots superimposed. The dots are not of uniform shape or thickness, the uppermost being the largest. Two tendrils emanate from either side of the central device and form C-Scrolls with falcate-shaped lobes and central dots. Faint traces of a simple incised extending around the circumference of the vertical edge of the lower plate are also visible under the microscope. The vertical edge of the lower plate shows evidence of significant wear and it appears that the panel was originally set back further from the edge. No inlay material was detected following visual, microscopic and XRF analysis.

Although the *verso* of the plate is rather worn, there are definite traces of two (possibly 3) punched half-annulets on either side on the *verso* of the lower plate, just below the point where it meets the outer beads of the upper arcade. The same hollow punch was used to chase a half-annulet device into either side of the angle of the shank.¹ Faint traces on the metal also suggest that incised transverse lines were used to mark the junction between the upper arcade and the lower plate on the *verso*. There is no trace of decoration on the shank however there is evidence of an ancient repair, 43mm above the tip. This replaced section is more highly polished, and it has been soldered expertly to the original shank.

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- Youngs, S. (1989) *'The Work of Angels': Masterpieces of Celtic Metalwork 6th - 9th centuries AD*, London: British Museum Publications, no. 2.

¹ This device may have been originally intended to be a complete annulet but the punch may have impressed more deeply on one side and it is this side which has remained visible while the remainder of the annulet has worn away. This seems more probable as generally, a single annulet is placed in this position.



Plate AI- 2 Castletown Kilpatrick proto hand-pin.



Plate AI- 3 Pin head detail on Castletown Kilpatrick proto hand-pin.

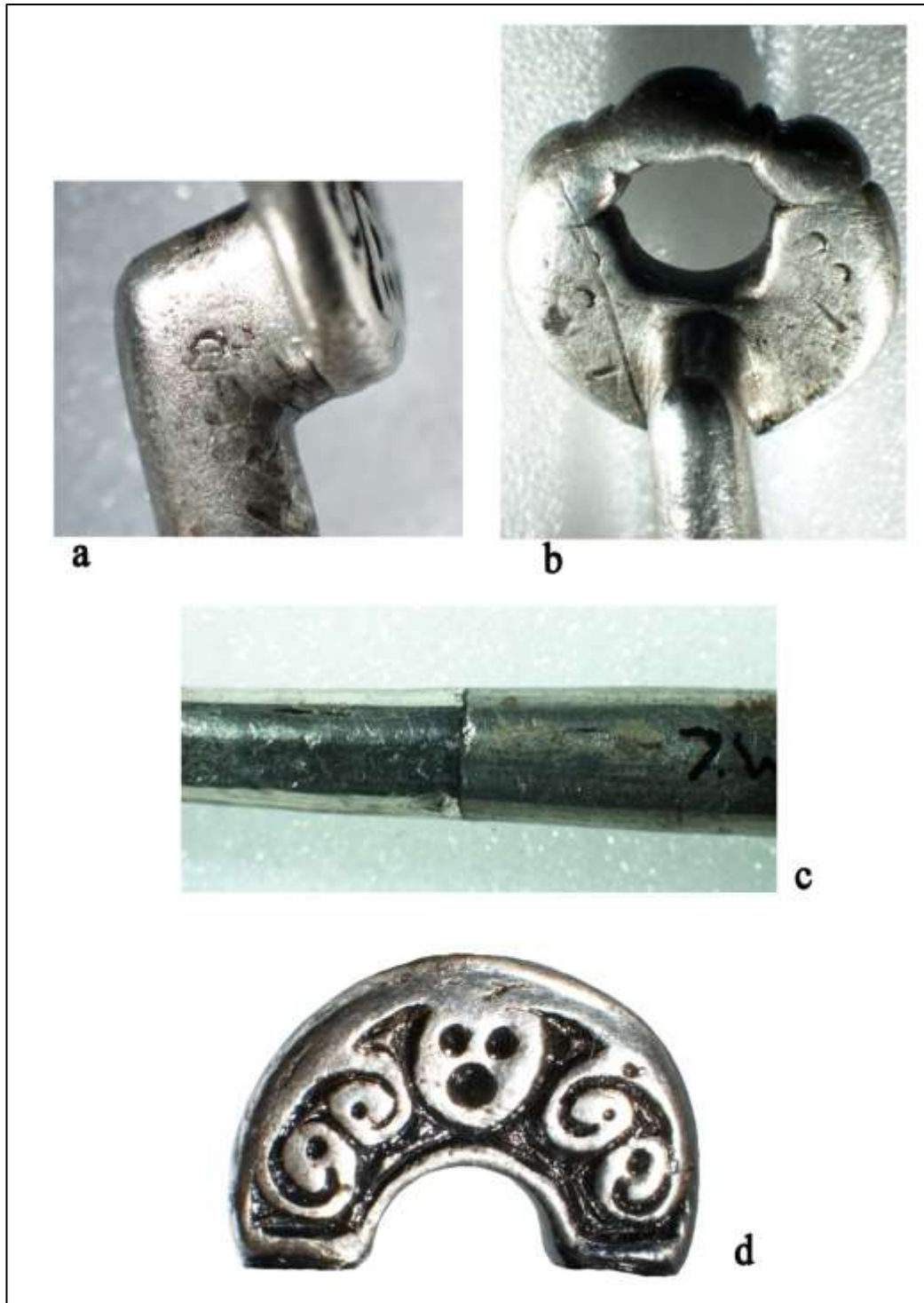


Plate AI- 4 Castletown Kilpatrick proto hand-pin (a) Punched half-annulet in angle of shank; (b) Verso of pin head with pairs of punched half-annulets on either side of the shank and transverse lines where upper and lower arcade meet; (c) Shank repair; (d) View of lower plate decoration from the perspective of the wearer.

3 - Welton-le-Wold Pin

Artefact type: Proto hand-pin

Location: British Museum

Museum Register Number: 2002,0704.1

Find spot: Welton-le-Wold, Lincolnshire

Context: Found in February 2001 by Mr. M. Jones while searching with a metal detector. An extensive Romano-British settlement site has recently been identified from both aerial photographs and extensive crop and soil marks in the field where the pin was found. Finds of Romano-British pottery, oyster shells and tiles from the central area suggest that it is most probably the site of a villa. Metal detecting on the site produced three hundred and three copper alloy and silver coins dating from the third to the late fourth century AD and the silver proto hand-pin from the same small area, spanning around 250 meters.

Weight: 2.2g

Material: Silver - XRF at the British Museum indicated a silver content of 96%

Dimensions: L. of pin = 20.7mm

L. of shank = 12.7mm; Max. Th. of shank 2.9mm

Pin head: Outer Diam. = 10.3mm; Max. Th. 2.5mm; L. of projection = 3.1mm

Upper arcade: Diam. of beads (1) 4.0mm; (2) 4.2mm; (3) 4.4mm; Th. of beads: 3.3mm-3.4mm

Description:

Silver niello-inlaid proto hand-pin.

Incomplete pin with three fingers which was cast in one piece. The lower shank is missing; what remains is undecorated and joins the pinhead at the base of the lower crescentic plate. The head is offset on a short arm, and carries a crescentic plate below an arc of three rounded, oval-shaped beads linked on the front by narrower beaded border, and bounded by a grooved channel on either side. All of the beads project an equal distance from the pin head. The *verso* of the arc of beads has pairs of incised lines running in radially from the top of each beaded collar. Individual fillets are demarcated on the *verso* by two deeply chased grooves. The lower crescentic plate is decorated with a small central cordate-shaped palmette with one drilled dot superimposed, and two outward spirals with falcate-lobed terminals, each with a central dot. The ornament was hand-cut, post-casting and much of the original

niello inlay remains *in situ*. A neat ladder pattern is incised around the vertical edge of the front plate and is bounded on either side by two deep grooves.

There is no punched dot in the angle of the shank and no trace of any punched ornament on the *verso* of the pin. It is noteworthy that this is the only example featuring an arcade with three beads does not feature the ubiquitous punched ornament of saltires, triple annulets and punched dots/annulets on the angle of the shank.

References:

- Green, T. (2011) *The origins of Louth: Archaeology and History in East Lincolnshire 400,000 BC-AD 1086*, Louth: Lindes Press, 43-6, 148.
- Youngs, S. (2005) 'After Oldcroft: a British silver pin from Welton Le Wold, Lincolnshire', in Crummy, N., Bailey, D. M., Johns, C. and Allason-Jones, L., (eds) *Image, craft and the Classical world: essays in honour of Donald Bailey and Catherine Johns*, Montagnac: M. Mergoil.

Permanent stable URL for this find: <http://finds.org.uk/database/artefacts/record/id/49655>



Plate AI- 5 Welton-le Wold proto hand-pin, *recto*.



Plate AI- 6 Welton-le-Wold proto hand-pin, *verso*.

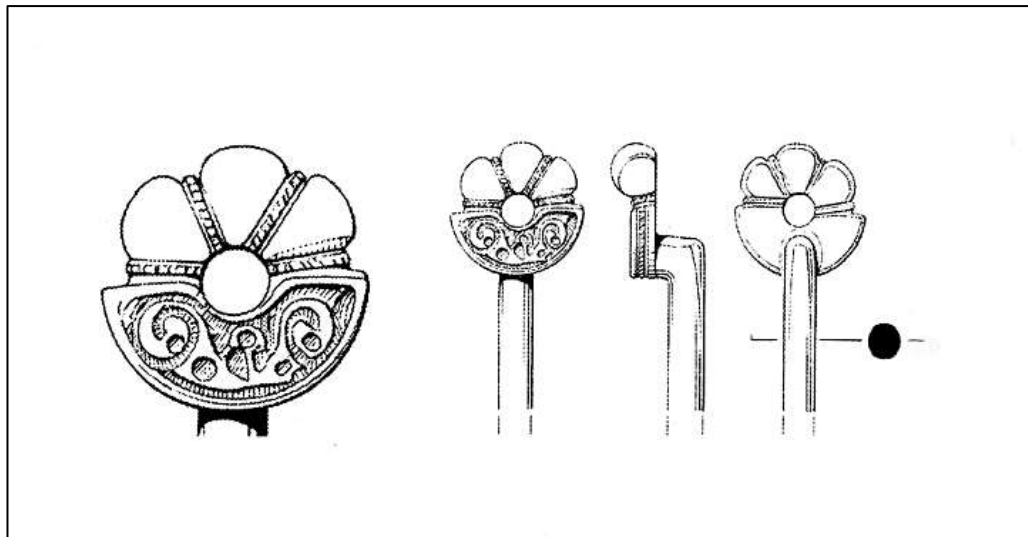


Figure AI 1 Welton-le-Wold proto hand-pin. Drawing James Farrant ©Trustees of the British Museum.

4 - Wace Pin

Artefact type: Proto hand-pin

Location: National Museum of Ireland, Dublin

Museum Register Number: NMI 2009:10

Find spot: None recorded

Context: Property of the deceased estate of J S N Wright which passed into the possession of Rupert Wace Ancient Art, 14, Old Bond Street, London W1S 4PP. The National Museum of Ireland was informed by the writer and it was purchased for their collection in 2009. No archaeological context or provenance available.

Weight: 3.95g

Material: Silver - XRF at the NMI, Dublin indicated a silver content of 89.8%

L. of pin = 52mm

L. of shank = 12.7mm; Max. Th. of shank = 2.2mm

Pin head: Max. Diam. = 12.2mm; Max. Th. = 2.3mm;

Lower crescentic plate thickness = 2.3mm

Description:

Silver, enamel-inlaid proto hand-pin.

The pin head is off-set at a right angle from the shank and consists of a lower crescentic plate surmounted by four flat, rounded beads which continue the curve of the ring. The beads are separated by beaded intermediary fillets that were created post-casting by a hollow ring-punch which was struck with sufficient force to produce a pronounced raised bead. Beading also separates the upper digital arcade from the lower crescentic plate. There is a marked thickening of the plate in cross-section. It is also of note that the pin is attached quite low on the crescentic plate. The remainder of the shank has been beaten flat and formed into a ring at some point in antiquity – the re-modelling of the shank appears quite ancient and is not the work of an antiquarian dealer. Indeed, great care appears to have been taken to preserve the original ornament when the pin was converted to a ring.

The thickened lower crescentic plate holds a pair of finely-executed, opposed S-scrolls in relief, each terminating in a falcate-shaped lobe with central dot at either end of the S-scroll. The drilled dots are not of uniform size or depth. These are reserved against a clear, amber/deep russet coloured inlay which may be degraded enamel. 30% of the original inlay remains *in situ*. Tiny nicks or stitches were cut into

the top of the cell wall to retain the inlay in place. The ornament is still exceptionally crisp and there is little evidence of wear. The surface of the silver shows signs of oxidisation and has a typical dark grey patina. There are signs of silver degradation on the verso of the lower plate (left-hand side). The *verso* of the pin head is plain, flat and undecorated as is the vertical edge of the lower crescentic plate.



Plate AI- 7 The Wace Pin. Image © Rupert Wace Fine Art.



Plate AI- 8 (left) Wace Pin with shank in its original form (speculative). Drawing by Daniel Tietzch-Tyler (right) The Wace Pin, *recto*.



Plate AI- 9 The Wace Pin, clear, amber inlay and falcate-shaped lobes with central drilled dots.



Plate AI- 10 Punched beading on the upper arcuate arcade of the Wace Pin.

5 - Newtownbond Pin

Artefact type: Proto hand-pin

Location: National Museum of Ireland, Dublin

Museum Register Number: 1944:95 R.I.A

Find spot: Newtownbond, Killoe, Co. Longford

Context: NMI records state that the pin was ‘believed found on a Bond property at Newtownbond. Possibly in the garden within the walled enclosure of a C17th House’.

Weight: 30.88g

Material: Silver - XRF at the NMI, Dublin indicated a silver content of 90.9%

Dimensions:

L. of pin = 127.0mm

L. of shank = 112.8mm; Max. Th. of shank 4.5mm, tapering to 2.0mm

Pin head: Outer Diam. = 20.3mm x 19.3mm ; Max. Th. 4.9mm; L. of projection 5.0mm

Upper arcade: Diam. of beads = (1) 6.7mm; (2) 8.7mm; (3) 6.6mm

Description:

Silver proto hand-pin.

Complete pin with three fingers that was cast in one piece. The head is offset on a short arm, and carries a crescentic plate below an arc of three elongated fingers; each of which project an equal distance from the pin head. The central finger is decorated with a punched, triple annulet motif; the others are plain and undecorated. Each is divided from the next by a fillet that features a line of punched beading that extends along the upper surface only. When viewed face on, the upper arcade is heavily most heavily worn on the right-hand side of the pin head.

The lower plate is ornamented with a complex design based on a pair of spiral-limbed triskeles that interlock to create a dominant, central, double spiral. A lateral scroll fills the area between the ‘legs’ of the triskele. All save the largest central spiral terminate in a falcate-shaped lobe with central drilled, dot. The *verso* has pairs of punched lines running in radially from the top of each beaded collar. Individual beads are demarcated on the *verso* by a punched border. Multiple single and triple annulet motifs decorate the interstices. There is a notable *entasis* on the

shank. The angle of the shank is decorated with a single, punched annulet on either side and a casting seam is still visible along its length. A punched border extends around the vertical edge of the front plate and is bounded on either side by a lightly incised line. No trace of the original inlay material remains however; microscopic examination of the vacant fields suggests that this may have been niello.



Plate AI- 11 The Newtownbond Pin.



Plate AI- 12 The Newtownbond Pin, *recto*.



Plate AI- 13 The Newtownbond Pin; *verso* with beaded divisions and triple annulet motifs (left); view of vertical edge of pin head with punched decoration (right).



Plate AI- 14 The Newtownbond Pin: punched annulet in angle of shank (left); Punched triple dot motif on central finger of beaded arcade (right).



Plate AI- 15 The Newtownbond Pin: Hand engraved fine-line design.

6 - Chilton Trinity Pin

Artefact type: Hand-pin

Location: Somerset County Museum

Museum Register Number: P1973.8-1.1

Find spot: Chilton Trinity, Somerset.

Context: Found in September 2006 by Timothy Phillips while metal-detecting in a ploughed field. No associated objects.

Weight: 3.1g

Material: Silver - XRF at the British Museum indicated a silver content of 87-91%

Dimensions:

Pin head: Max. Diam. = 16.1mm x 17.4mm

Upper arcade: L. = 15.2mm; Diam. of beads (1) 5.7mm; (2) 6.0mm; (3) 5.7mm

Beaded arcade: L. 15.2mm; left bead 5.7mm; 6.0mm; 5.7mm; Diam. of beads = left 4.7; 5.2mm; 4.6mm

Lower crescentic plate Max. D. = 17.4mm; Max. Th = 3.3mm;

Description:

Silver and enamelled hand pin.

Three elongated fingers are held above a lower crescentic plate. The two outer fingers are plain, rounded, and bead-like while the central bead is decorated with an engraved outer border framing a raised, bead with a drilled circular recess which still contains inlay, possibly red enamel. The drilled recess was originally encircled by a series of engraved lines creating a starburst effect around the central dot of enamel although only one of the lines is still visible. Each of the dividing fillets is decorated with a deeply scored line. There are traces of punched beading dividing the upper arcade and the lower plate although as the pinhead has not been heavily conserved, the presence of soil deposits makes the full extent of this difficult to determine. This division does not extend to the *verso* of the pin.

The lower plate holds a pattern of running scrollwork with eight falcate-shaped, lobed terminals, each with a centrally placed dot. There are two scored lines running the length of the vertical edge however, due to the condition of the pin, no further ornament could be identified in this position. The *verso* of the pinhead appears plain and undecorated. The pin has separated from the pinhead just at the position where it angles to meet the head. Degraded, grey-green enamel inlay was noted on the lower crescentic plate.



Plate AI- 16 The Chilton Trinity Pin.



Plate AI- 17 Chilton Trinity Pin: view of beaded arcade from above.

7 - Gaulcross Pin

Artefact type: Hand-pin

Location: National Museums of Scotland, Edinburgh

Museum Register Number: L.1962.128

Find spot: Gaulcross, Banffshire

Context: In the ring-cairn of a stone circle

Weight: 28.13g

Material: Silver - XRF at the National Museums of Scotland indicated a silver content of 70%

Dimensions:

L. of pin = 142.8mm

L. of shank = 52.3mm; Max. Th. of shank = 4.7mm, tapering to 1.7mm

Pin head: Outer Diam. = 18.8mm x 17.1mm; Max. Th. = 4.0mm; L. of projection = 2.5mm

Upper arcade: Diam. of beads = (1) 4.6mm x 8.0mm; (2) 10.1mm x 5.4mm; (3) 8.0mm x 4.7mm

Description:

Silver enamel-inlaid hand-pin.

The lower plate is surmounted by three, elongated, polished beads. Those on either end are visibly squared at the back. The central finger projects beyond the outer two and bears a sunburst motif which was also originally reserved against an inlay, most probably red enamel. The upper arcade is separated from the lower plate by fillets of punched beading and a line of punched annulets continues this division on the verso.

The lower plate is ornamented with a complex pattern of three interconnected, fine-line trisceles, with a total of fourteen falcate-shaped lobes with central dots executed in an exceptionally-accomplished, fine-line style work reserved against a red inlay. The vertical edge of the plate is ornamented with two, deep contiguous grooves. A raised band in the centre has fine arc punching that is best preserved towards the centre and has been worn away (possibly through use) on either side. The verso is flat and bears punched ornament

The upper arcade and the lower plate are divided on the *verso* by a line of punched annulets; the position of each bead is also demarcated by punched ornament. Both

flanking beads have triple annulet motif; the decoration the central bead has been obliterated by a modern drilled recess. The lower crescentic plate has a total of five small, lightly-punched triple annulet motifs. Triple annulets also decorated each side of the angle of the shank. There is some corrosion visible on the shank which also has a slight bend at the tip.



Plate AI- 18 The Gaulcross Pin.



Plate AI- 19 The Gaulcross Pin *recto*.



Plate AI- 20 The Gaulcross Pin: Punched ornament on *verso*.



Plate AI- 21 The Gaulcross Pin: single punched annulet in angle of shank.

8 - Denton Pin

Artefact type: Hand-pin

Location: Great North Museum, Newcastle, Tyne and Wear

Museum Register Number: WDW F 87

Find spot: Found in the course of excavations prior to the construction of the Newcastle Western Bypass at Denton, Newcastle-upon-Tyne NGR NZ183668

Context: Found in post-Roman plough soil south of Hadrian's Wall at Denton.

Weight: n/a

Material: Silver - XRF indicated a silver content of 95-98%

Dimensions: Overall length of pin = 27.1mm

Overall length of shank (incomplete) = Max. L. 22.8mm; Max. Th. 3.2mm - tapering to 2.3mm

Max. Diam. of pin head = 7.1 x 6.9mm

Max. W. of upper arcade = 6.8mm: L. of beads from left to right = 4.2mm, 4.3mm, 4.2mm; Max. W. of individual fingers = c. 1.8-2mm

Max. Diam. of lower plate = 7.0mm x 4.2mm; Max. Th. = 2.4mm

Description:

Silver hand-pin.

Three, elongated beaded projections are held above a lower crescentic plate. Each of the flanking beads decorated with a centrally-placed, punched annulet on the *recto*. These punch marks are larger than others occurring on the pin. The central projection is hollow and may have originally held a glass 'gem' inset. The walls of the recess are quite thin and have fractured/crumbled in a number of places. The smooth surface of the interior suggests that it was drilled out post-casting; the remains of a residue possibly resin to hold the inset in place was noted. There is evidence of a slight lip or rim on the exterior edge. This central finger is set slightly higher (0.8mm) than the two flanking digits. The dividing fillets on either side of the central projection have a line of five, closely spaced punched rings that create a beaded-border effect when viewed from above. The *verso* of the projections is flat and each one has been decorated with three punched circles. A line of punched beads has also been used to demarcate between the fingers and the lower crescentic plate.

The lower plate is ornamented with a pair of interconnected running spirals which flank either side of the crescentic plate and join a raised, centrally placed, cordate-shaped motif, with three, exceptionally tiny, drilled dots superimposed. Each of the spirals has lobed terminals although none of these have the ubiquitous drilled dot. No trace of the original inlay remains.

Two narrow grooves run around the vertical edge creating a central band with a border on either side. Nineteen horizontal grooves were cut across the central band creating a 'chunky' ladder pattern. This was texturized by the heavy application of small punched dots and occasional small nicks creating a roughened 'rilled' surface. The decoration is exceptionally similar to that on the vertical edge of the Castletown Kilpatrick pin (Cat. No. 11), albeit in a much miniaturised form. The *verso* of the lower plate has been divided into three sections, each framed by a bunched, beaded border; triple annulet motifs fill the interstices. The decoration on the *verso* was executed using a ring punch and each mark was produced by the same tool. The shank has also been decorated with a punched, triple annulet motif, just below the point where it angles to meet the head and either side of the angle of the shank.

References:

- Batey, C. (1996) 'Silver hand pin fragment', in Bidwell, P. T. and Watson, M. Excavations on Hadrian's Wall at Denton, Newcastle Upon Tyne, 1986-89. *Archaeologia Aeliana*, XXIV, 51-2.



Plate AI- 22 The Denton Pin.



Plate AI- 23 The Denton Pin: incomplete shank.

9 - Norrie's Law Pin

Artefact type: Hand-pin

Location: National Museums of Scotland, Edinburgh

Museum Register Number: FC 31

Find spot: Norrie's Law, Fife

Context: Part of a multi-period silver hoard deposited ritually in a prehistoric burial mound

Weight: 41.03g

Material: Silver - XRF at the National Museums of Scotland indicated a silver content of 92%

Dimensions:

L. of pin = 167.0mm

L. of shank = 156.8mm; Max.Th.18.0 mm; Max. Th. 5.5mm; L. of projection = 2.7mm

Upper arcade: Diam. of beads (1) 9.5mm (2) 10.5mm; (3) 9.9mm; Th. of beads: 4.4mm-4.7mm

Description:

Enamelled silver hand-pin.

The lower crescentic plate is broadly U-shaped and surmounted by three elongated projections. These are not uniform in length; the central projection is longer and wider and decorated with a quatrefoil motif, framed within a sub-circular arrangement of lentoids. The decoration on the lower plate consists of three running spirals with lobed, falcate-shaped terminals; the central spiral forms a triskele that sits within a circle creating a 'wheeled' variant. The vertical edge of the lower plate is also heavily ornamented. Two lines of punched beading enclose a central pattern consisting of three converging incised lines which repeat along the length of the vertical edge. The interstices have single punched annulets.

None of the original inlay remains *in situ*. Each bead is separated from the lower plate and from the adjoining bead by a border or circlet of raised beading. The *verso* of the pin is peppered with triplets of punched annulets, pyramidally disposed. The *verso* of the central projection has a modern drilled recess that has obliterated all trace of the original decoration. There is a single punched dot at the angle of the shank. Traces of solder were identified at the point where the shank joins the pin

head suggesting that the head and shank were cast separately. As some of the punched annulets overlie the solder it was interpreted as contemporary with the manufacture of the pin by the writer.

References:

Graham-Campbell, J. (1991) 'Norrie's Law, Fife: on the nature and dating of the silver hoard', *Proceedings of the Society of Antiquaries of Scotland*, 121, 241-59.

Graham-Campbell, C. (1993) 'The Norrie's Law Hoard and the Dating Of Pictish Art', in Spearman, R. M. and Higgitt, J. (eds) *The Age Of Migrating Ideas: Early Medieval Art In Northern Britain And Ireland*, Edinburgh: National Museums of Scotland.



Plate AI- 24 The Norrie's Law Pin; *recto*.



Plate AI- 25 The Norrie's Law Pin; *verso*.



Plate AI- 26 The Norrie's Law Pin: Punched beads demarcating individual beaded projections.



Plate AI- 27 The Norrie's Law Pin; punched annulets and raised beading on the *verso*.

10 – Tripontium Pin

Artefact type: Proto hand-pin

Location: Rugby Art Gallery and Museum

Museum Register Number: n/a

Find spot: Tripontium (Caves Inn), Warwickshire

Context: Found in an area of substantial buildings on the Romano-British site of Tripontium (SP 535795). The area lies in a valley bottom by the side of a small stream 100m, south-west of the Roman Road Watling Street (A5). The silver pin was found in the destruction levels above room nine (fig.) Over 100 fourth century coins were found the destruction levels of this building. The latest found on the site were two coins of Arcadius AD 395-408.

Weight: n/a

Material: Silver

Dimensions:

L. of pin = 81.5mm

L. of shank = 68.2mm; Max. Th. of shank 3.2mm tapering to 1.2mm

Pin head: Outer Diam. = 12.0mm x 11.5mm; Max. Th. 7.1mm; L. of projection = 3.7mm

Upper arcade: Max. Diam. 10.6mm Diam. of beads (1) 3.7mm; (2) 3.3mm; (3) 3.7mm

Description:

Proto-hand pin.

Semi-circular arc of three beads and four fillets with punched decoration held above a lower, crescentic plate. The two outer beads are pear shaped in contrast to the central bead which is circular in shape and is decorated with a six-rayed star or sunburst motif. The *verso* of each projection has a triplet of punched annulets, executed by shallow chasing with a hollow, circular punch. The upper arcade is separated from the lower crescentic plate by border of punched beads. It is smaller than the lower crescentic plate and does not extend beyond it. The lower plate is decorated with an intertwined C-scroll design executed in crisp, fine line ornament, engraved to a depth of .025mm. This is reserved against an undetermined inlay which is heavily lacquered and appears greenish/yellowish in colour. When the pin was originally examined by Wattam post-excavation, he described the inlay as dark

grey. The *verso* has a punched saltire with three punched annulets in the interstices. A band of punched beading extends around the circumference of the vertical edge. The pin is attached quite low on the plate and bears a single punched annular on each side of the angle of the shank. The back of the shank has been squared and the pinhead is tilted upwards in a pronounced manner. The curvature of the shank and the C-shaped bend at the tip suggests to the writer that this pin was intended to function as a dress fastener.

References:

Lucas, J. (1981) 'Tripontium: Third Interim Report on the Excavation of a Romano-British Settlement at Cave's Inn near Rugby', *Transactions of the Birmingham and Warwickshire Archaeological Society*, Vol. 91, Leicester: Glendinning.

Lucas, J. (2005) *Tripontium: The Fourth and Final Report*, Leicester: Glendinning.

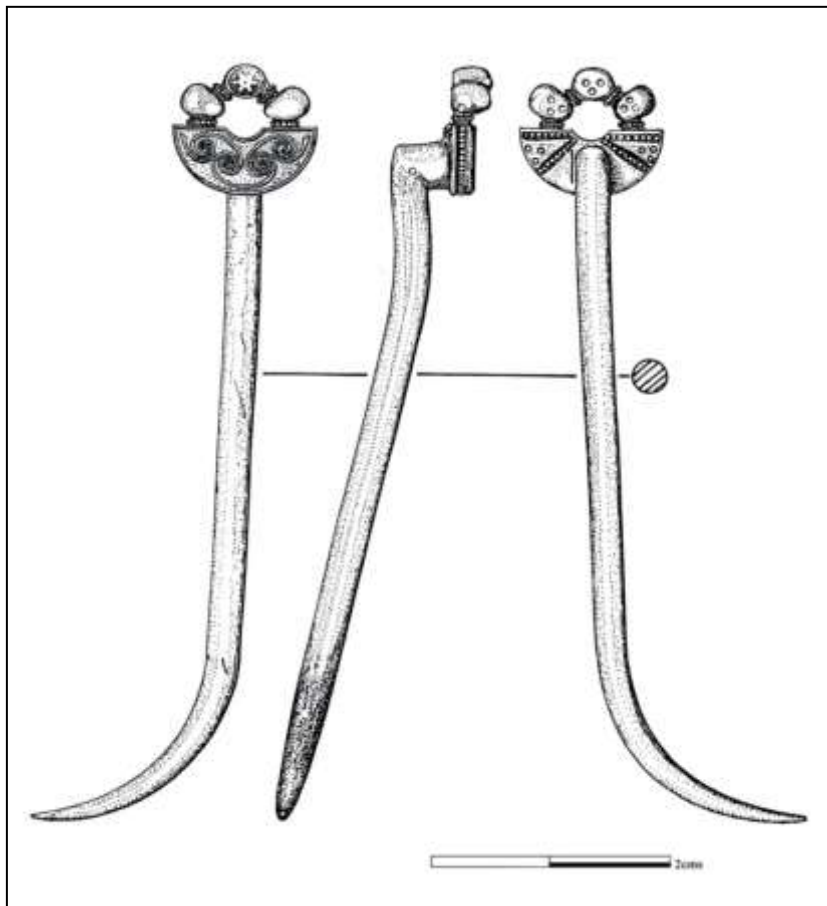


Figure AI 2 - Tripontium, silver proto handpin. After Lucas 1981, fig. 23.



Plate AI- 28 Tripontium Pin: *Recto* with schematic of decoration on central projection.



Plate AI- 29 The Tripontium Pin.

11 - Castletown Kilpatrick Pin

Artefact type: Hand-pin

Location: National Museum of Ireland, Dublin

Museum Register Number: P634

Find spot: Found together with Cat. No. 2 in 1848 at Castletown Kilpatrick Co. Meath. The Ecclesiastical register for 1820 lists Castletown –Kilpatrick as a vicarage within the union of Drakestown, Castletown-Kilpatrick and Knough (Knock). Lewis describes Castletown-Kilpatrick as being ‘a parish in the Barony of Morgallion, County of Meath, three miles from Nobber on the road from Kells to Ardee.

Context: n/a

Weight: 18.78g

Material: Silver - XRF at the NMI indicated a silver content of 82.4%

Dimensions:

L. of pin = 141.0mm

L. of shank = 131.0mm; Max. Th. of shank 4.3mm

Pin head: Outer Diam. = 15.8mm x 16.9mm ; Max. Th. 4.3mm; L. of projection 5.0mm

Upper arcade: Diam. of beads = (1) 8.6mm; (2) 8.8mm; (3) 8.5mm

Description:

Silver, red enamel inlaid hand-pin.

The present shank is a replacement and it is heavily pitted and corroded. Three elongated projections surmount the lower crescentic plate. The two outermost are plain and undecorated apart from a single arc punch mark placed centrally on the forward facing aspect of each. The central projection is decorated with a tricorne motif.

The lower plate has a pattern of three linked spirals with a trumpet-shaped adjunct. The two outside ones end in small trumpets. Microscopic examination revealed clear traces of degraded red enamel that is now a grey-green in colour. Very deep chasing is evident on the worked surfaces. The vertical edge of the lower plate is faceted and consists of three rows of sub-triangular chips; each row is demarcated by deeply

chased groove. Microscopic examination revealed no trace of inlay on the vertical edge.

The *verso* of the lower plate is heavily ornamented with punched decoration and has been divided into three zones by lines of ring punching, bordered on either side by a groove. Heavy score marks were noted, possibly related to the replacement of the shank. There are three punched annulets on the flattened back of each of the three beaded projections however there is no punched decoration in the angle of the shank.

References:

Ball, V. and Stokes, M. (1893) 'On a Block of Red Enamel Said to have been Found on Tara Hill, with Observations on the Use of Red Enamel in Ireland', *Transactions of the Royal Irish academy*, 30, 277–294, pl. XIX, 4.

Youngs, S. (1989) *The Work of Angels': Masterpieces of Celtic metalwork 6th - 9th centuries AD*, London: British Museum Publications, no. 3.



Plate AI- 30 The Castletown Kilpatrick hand-pin. Image © National Museum of Ireland.



Plate AI- 31 The Castletown Kilpatrick Hand-pin (a) Faceted ornament on vertical edge of pin head; (b) engraved tricorne on central projection; (c) Upper beaded arcade with punched ornament; (d) Punched ornament on *verso*; (e) recto of lower plate with engraved ornament and degraded enamel inlay.

12 - Long Sutton Pin

Artefact type: Hand-pin

Location: Somerset County Museum

Museum Register Number: 52.A.135

Find spot: Attributed to Long Sutton, Somerset currently but card in Museum has the following note 'West Country/Midlands (?) silver hand pin, scrolled ornament, trace of red enamel collected by Rev. Archibald Turing-Bruce'

Context: Antiquarian find

Material: Silver

Dimensions:

L. of pin = 121.6mm

L. of shank = 110.0mm; Max. Th. of shank 4.2mm, tapering to 2.4mm²

Pin head: Max. Diam. = 12.0mm; Max. Th. 2.8mm

Upper arcade: Diam. of beads = (1) 6.3mm; (2) 6.6mm; (3) 6.4mm

Description:

Silver and enamelled hand-pin in complete condition.

The pinhead features three elongated projections that form a horizontal arcade over a lower, enamel-inlaid crescentic plate. The outer 'fingers' are more slender and rounded in profile than the larger, central finger which is decorated with incised lines arranged in a starburst pattern. Each finger is separated from the next by a fillet decorated with punched beading, confined to the uppermost parts of the fillets. Each of the outermost 'fingers' rest on a collar or circlet of beads that acts as a division between the upper arcade and the lower plate.

The lower plate has been heavily engraved post casting and holds a pattern of three running scrolls. The two outer scrolls are single scrolls and each terminates in a solid clavate shaped lobe, whereas the central is an expertly executed double spiral. All of the scrollwork has been executed in fine-line ornament which was originally reserved against a background of red enamel. The vertical edge of the lower plate has been scored with a series of four parallel lines, the two outermost are not cut as deeply as those in the centre. Each of the three raised areas created have been cross scored lightly creating a light, 'rilled' affect. This engraved border along the vertical

² Shaft broken and repaired at the midpoint (47.3mm) Damage is recent (Simon Jones Pers. Comm 2009)

edge retains slight traces of enamel suggesting that it too was originally inlaid although the original colour cannot be determined (creamy white and green, may be corrosion products and some minuscule traces of a red inlay). The *verso* of the horizontal beaded arcade is decorated with punch marks; (left) a single annulet; (centre) three arranged in a horizontal row (two of which appear to have been double-struck); (right) none visible - it exhibits the highest level of wear. Two triangular areas on the *verso* are framed by a beaded border with punched annulets framed within two outer 'guiding' lines. They are not evenly spaced along the length of the border but are enough to give an impression of a beaded border when viewed from a distance. There are six punched annulets in the interstices arranged in three rows of one, two and three annulets. The angle of the shank has a single punched annulet that is positioned closer to the junction of the shank and pinhead than on other examples. This appears to be replicated on the opposite side although, due to the inopportune placement of marking paint in this position, this cannot be determined with certainty. The back of the shank has been visibly squared, and file marks are visible along its length. Some undercutting is visible along the edge of the lower plate; the cell base is heavily engraved



Plate AI- 32 The Long Sutton Pin.

13 - Leicester Pin

Artefact type: Hand-pin

Location: Leicester

Museum Register Number: In private ownership

Find spot: purported to have been found in a civic garden in Leicester

Context: n/a

Weight: n/a

Material: Silver

Dimensions:

L. of pin = 126.0mm

Max. Diam. of pinhead = 15.0mm

Description:

Silver hand-pin with three fingers set in a straight line above a U-shaped crescentic plate.³ The plate is decorated with three running scrolls which were reserved against enamel. The central 'finger' on the upper digital arcade is longer and was originally inlaid with enamel. The vertical edge of the pinhead is decorated with an incised lozenge pattern with medial lines. The shank shows evidence of recent repair at point where it joins the pinhead.

References:

Laing, L. (2000) 'An unpublished silver proto hand-pin of Norrie's Law type', *Pictish Arts Society Journal*, vol. 15, 49-50.

³ The pin was unavailable for inspection by the writer therefore the description is taken from an account by Laing (2000, 49).

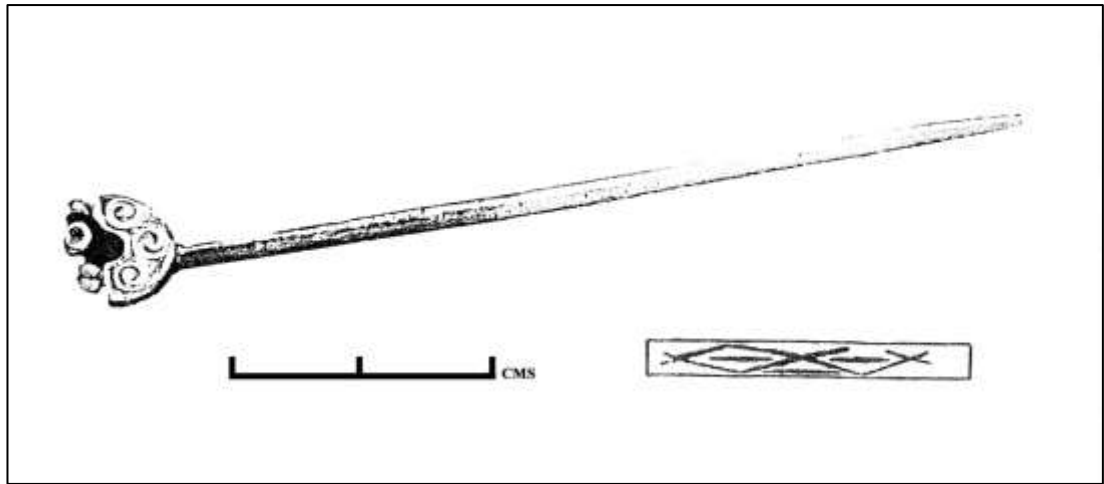


Figure AI 3 The Leicester Pin.

14 - Un-localised Silver Disc-headed Pin

Artefact type: Projecting disc-headed pin

Location: NMI

Museum Register Number: 6.W.26

Find spot: No Locality

Context: n/a

Weight: 74.72g

Material: Silver - XRF at the NMI indicated a silver content of 85%

Dimensions:

L. of pin = 269.8mm

L. of shank = 252.3mm; Max. Diam. = 6.8mm

Pin head: Max. Diam. = 22.0 Max. Th. = 6.8m; L. of projection = 9.2mm

L. of decorated panel on shank = 110.8mm x 6.5mm

Panels Max. Diam. = (1) 10.0mm x 5.4mm: (2) 10.7mm x 4.1mm: (3) 10.6mm x 4.8mm: (4) 10.8mm x 5.1mm: (5) 10.7mm x 4.3mm: (6) 11.0mm x 4.7mm: (7) 8.8mm x 4.0mm

Description:

Silver, niello-inlaid, disc-headed pin

The shank joins the disc head in a central position and they appear to have been cast as one Silver disc-headed pin, the disc sits as a right-angled projection at the top of the shank. The top, *recto* and both sides of the right-angled shaft are decorated. The disc face is decorated with opposing pairs of fine-line double spirals and double lobed spirals placed in opposite quadrants of a central circular panel on the disc face. The edge of the disc is ornamented with two bands of vandykes running in opposing directions and bordered by an incised ladder pattern. The angle of the projection also contains a panel of ornament consisting in both instances of a palmette with opposing tendrils, each terminating in a falcate-shaped lobe with a drilled dot.

There are six rectangular ornamented panels terminating in a seventh triangular panel. This is different from the usual six panel layout found on other decorated specimens. There is a saltire between each panel, bordered on either end by a line of punched annulets. The saltire over the panel with the wheat pattern had a medial line. The upper surface of the angled projection, at the point where it meets the disc-head

is decorated with a deeply incised V-shape with three annular punch marks on either side.

Panel (1): Four lines of three vandykes, each row reverses direction

Panel (2): Pair of fiddlehead scrolls, in an antithetic composition where the stems of each pair are linked through a slender, elongated trumpet-shaped junction creating a crossed-scroll variant.

Panel (3): Vertical arrangements of chevrons creating a wheat or herringbone motif. The motif in fact constitutes a visual puzzle where both the wearer and the onlooker are presented with a view of the motif the right way up.

Panel (4) Two line of vandykes border a central chain of linked diamond shapes.

Panel (5) Double S-Scrolls with falcate-shaped lobed terminals and a central dot

Panel (6) Six rows of vandykes, each row running in an opposing direction.

Panel (7) Paired arrangement of fiddlehead scrolls, stem broken by a relief, sub-triangular space.

There three faint ring punched dots underneath the last panel on the front of the shank of the pin. The pin is not complete and the end has been broken off. The shank is badly pitted in places, about one third above the break and there are several cracks apparent in the shank.



Plate AI- 33 Unlocalised silver projecting disc-headed pin, provenanced to Ireland. Disc face with tiny toothed projections to retain niello inlay.



Plate AI- 34 Unlocalised Silver disc-headed pin provenanced to Ireland. Shank detail (left) and angle of shank (right).

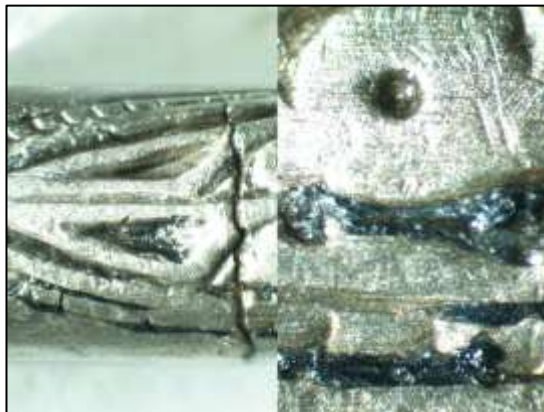


Plate AI- 35 Unlocalised silver disc-headed pin provenanced to Ireland with niello inlay.

15 - The Londesborough Pin

Artefact type: Projecting disc-headed pin

Location: British Museum

Museum Register Number: 1888,0719.100

Find spot: Provenanced to Ireland

Context: The first reference to the pin is a part of the collection of Major Sirr, Dublin. The pin then passed to Mr. C. Kirkpatrick Sharpe of Scotland who submitted it to the Society of Antiquaries of Scotland on January 24th 1848. The pin then passed to Albert Denison, 1st Baron Londesborough and was purchased through Rollin & Feuarent in 1888 by the British Museum

Weight: 116.79g

Material: Silver - XRF at the British Museum indicated a silver content of 82.4%

Dimensions:

L. of pin = 325.2mm

L. of shank = 52.3mm; Max. Diam. = 8.4mm tapering to 4.0mm

Pin head: Max. Diam. = 20.2 Max. Th. = 9.0mm; L. of projection = 11.5mm

L. of decorated panel on shank = 147.0mm

Panels Max. Diam. = (1) 3.4mm (2) 10.2mm (3) 10.8mm (4) 10.4mm (5) 12.3mm (6) 12.3mm (7) 12.9mm

Description:

The discoidal face holds three adorsed V-shapes with inwards scrolling ends and the expanded terminal of each features a centrally drilled dot. Three of these still retain their original red enamel inlay. The disc face is quite dented and bashed, particularly in the two to seven o'clock position. The vertical edge of the disc head is heavily ornamented. A line of punched beading is contained within a border of two narrow grooves and the recesses are blackened and tarnished. A double row of vandykes is contained within this border. These were gouged, post-casting using a narrow, V-shaped scorper. Striation marks are clearly visible along the lines of each cut. The vandykes are contained within a deeply grooved border and each pair is separated from the next by a horizontal grooved line. An error on the design is evident where the artisan has cut one of the vandykes in the worn direction. The significance of this error is that it provides evidence that the decoration was indeed applied post-casting

as if the error had been in the mould it could easily have been rectified prior to casting.

The shank joins the disc head in a central position and they appear to have been cast as one Silver disc-headed pin, the disc sits as a right-angled projection at the top of the shank.

Panel (1) is tucked in under the discoidal head and is quite inaccessible. It has been comparatively crudely excised into a D-shape. The roughness of the surface indicates that it was once intended to hold an inlay.

Panel (2) is broader than that on other specimens and is filled with hounds tooth, vandyke ornamentation, four doubles in three orders off-set against intact red enamel. There are no tool marks evident. The panel is framed in beading but between beading and ornamental field there is a deep groove top and bottom which was also once enamelled.

Panel (3) contains two adorsed, elongated S-shapes with the now ubiquitous a leaf/teardrop-shaped space filler between and behind the motifs. Red enamel survives in the centrally drilled dots and where visible, the surface is roughened. It too is framed by a beaded border but unlike panel two there are no grooves.

Panel (4) holds four adorsed and inverted falcate-shaped lobes with a double spiral in the centre. The drilled dots are all of differing sizes and a linear groove separates the panel from then beaded border. There is a small depression in the base of each of these drilled dots and each retains a trace of degraded red enamel. The deep linear groove features regularly-spaced chiselled notches along both latera.

Panel (5) holds two inverted berried-leaf motifs. The background had been cut away deeply and traces of degraded red enamel remain in the lower right quadrant. An empty deep linear groove separates the decorative field.

Panel (6) features a running scroll bordered by vandyke motifs, five on left side facing upwards, four on right side facing downwards. A flake of red survives in some of the recesses. The panel features an enamelled, beaded border.

Panel (7) is incomplete though it appears as if it may have been similar to panel four originally. At the point of breakage, in an area badly contorted is part of a motif that under the microscope resembles a double spiral and two opposed falcate-shaped lobes, each with a centrally drilled dot. No inlay survives.

Panel (8) The terminal, nib-shaped panel holds a field of foliate ornamentation with residual grey fill and a deep linear groove between the reserved field and beaded border with traces of red enamel.

Below the nib point are three rows of three vertical punched annulets

The top, recto and both sides of the right-angled shaft are decorated. The top of the angled shaft features a saltire comprising punched beading with linear grooves on either side and a triangular arrangement of three punched annulets. The recto of the pinhead is also ornamented with a beaded saltire, the interstices of which are decorated with punched annulet. Two different punches have been used; the circumference of one half of the annulet is decidedly thicker than the other while the second ring punch has a more regular circumference. The angle of the shank is ornamented on both sides. In both cases, the decoration is contained in an L-shaped panel framed by a deeply punched, beaded border. The overall scheme features two S-scrolls that terminate on each end with falcate-shaped lobes, each with a centrally drilled dot. The overall *schema* in the opposite panel is essentially the same in that it features two S-scrolls, however, these have been much more finely executed. Three punched annulets in triangular arrangements are situated below the beaded border of each angle panel. The top of the shaft is ornamented with a saltire that has been neatly chased using a fine ring punch. Each of the interstices holds a triangular arrangement of punched annulets. On the back of the shank features a larger more complex beaded saltire. Traces of red enamel remain in the beaded border which frames the ornamental frieze running along the length of the shank. The outward-facing parts of the head and the upper half of the shank are entirely covered with small panels of incised decoration, in which various toothed and curvilinear designs reserved against a background of red enamel alternate with plainer patterns composed of incised saltires and triangles and circular stamps. Borders of circular stamps frame everything except the triple-pelta motif on the disc face. The pin has been crudely repaired in three places, following ancient damage. It was filed roughly to achieve a rough fit and then spliced together using small rivets.

References:

- Freestone, I. C. (2000) *Report on the Composition and Affinities of the Red Enamel on the Oldcroft Pin*, Department of Scientific Research, London: The British Museum Press.
- Gavin, F. and Newman, C. (2007) 'Notes on Insular Silver in the 'Military Style'', *Journal of Irish Archaeology* XVI, 1-10.
- Smith, R. A. (1903-05) 'The Evolution of Late-Keltic Pins of the Hand Type, Well Known in Scotland and Ireland', *Proceedings of the Society of Antiquaries of London*, 2nd Ser. Xx, 354, fig. 11.
- Youngs, S. (1989) *'The Work of Angels': Masterpieces of Celtic Metalwork 6th - 9th Centuries AD*, London: British Museum Publications.



Plate AI- 36 The Londesborough Pin.



Plate AI- 37 The Londesborough Pin: Shank detail.



Plate AI- 38 The Londesborough Pin: Vertical edge of disc-head and angle of shank detail.

16 - Teltown Disc-headed Pin

Artefact type: Disc-headed pin

Location: Museum of Archaeology and Anthropology, Cambridge

Museum Register Number: MC 1899.199

Find spot: From the 16th Annual Report of the Antiquaries Committee, University of Cambridge, Museum of Archaeology and Ethnology. Entry on pin = p6 where it is ascribed to Yelltown, (?Teltown), Co. Meath.

Context: The Murray Collection: Catalogue of the collection of Irish Antiquities formed by the late Thomas R. Murray Esq., J.P. of Edenderry, Kings County, 1901.

Weight: 63.7g

Material: Bronze

Dimensions:

L. of pin = 305mm

Max. Th. of shank = 6mm

Max. Diam. of pinhead = 16mm

Max. Th. of pinhead = 7mm

Description:

There are multiple horizontal file marks along the whole length of the shaft. There is no moulding in the angle of the shank

Large decorated pin with areas of silver gilt or tinning. The pin shank is round (ish) but is distinctly flattened behind the head – in short, it can rest upright on the back of the pin angle. Ornamentation is present on the front of the disc-head, the vertical edge of the disc and in six panels on the front of the shank separated by plain bands and terminating in a nib-shaped field. The disc-head is decorated with three incurved double spirals set back to back, executed in fine-line style. An ornamental band of vandykes, set within two bounding grooves follows around the circumference of the disc face. The ornamentation along the side of the upper portion of the head has been completely worn away. The nib-shaped terminal panel is heavily worn but one fiddle-headed scroll can be identified and the possible remains of another



Plate AI- 39 The Teltown Pin.



Plate AI- 40 The Teltown Pin, decorated disc-face.



Plate AI- 41 The Teltown Pin from top to bottom – Side view of disc head; Panels 1 and 2; Panels 1, 2 and 3; Panels 4 and 5.

17 - Treanmanagh Pin

Artefact type: Projecting disc-headed pin

Location: National Museum of Ireland, Dublin

Museum Register Number: IA/L/1963:4

Find spot: Treanmanagh

Context: Found by workmen c. 1850 on the estate of Heffernan Considine at Derk near Ballyneety. Find circumstances not recorded. Referred to as the 'Derk Pin' by the Considine family, its exact find circumstances are unknown however it is recorded that it was found in the townland of Treanmanagh.

Weight: 57.01g

Material: Bronze: Traces of tinning observed under high magnification

Dimensions:

Overall length = 305mm; L. of projection = 6mm

L. of decorated portion of shank = 83.0mm

Max. Th. of shank = 6mm tapering to 4.0mm

Max. Diam. of pinhead = 14.5mm

Max. Th. of pinhead = 6mm

Description:

Disc-headed pin.

Cast bronze pin with long shaft of circular cross-section. The shaft is set at right angles and on its end in the same plane as the shaft there is a thick disc-head with straight, narrow edge. The disc-face is ornamented with three adorsed V-shaped scrolls with falcate-shaped lobes, each with a centrally-placed drilled dot. The sunken spaces around the V-scrolls are roughened, presumably to take enamel. The edge is ornamented with a central band of contiguous vandykes, the sunken spaces are roughened as if for enamel inlay.

On the front of the shaft, below the disc head, there are five narrow, decorated rectangular panels and one, the lowermost, is nib-shaped panel. The spaces between the panels have an incised saltire with punched annulets in the interstices. The group of six panels is outlined on the two long sides and on the top by a traced ladder pattern, this is somewhat worn on one side. The ornament in the uppermost of the six panels consists of a series of squares divided diagonally into two triangles. One

triangle in each square is slightly sunken and roughened, presumably for enamel. The panel immediately below contains a series of quatrefoils in relief, the background has been roughened, and therefore presumably, this once held an inlay, probably red enamel. The next two panels repeat the vandyke ornament that occurs on the narrow edge of the disc head. The design on the fifth panel is worn, a cross-shape with expanded lobed terminals in each of which there is a small dot. The design on the triangular panel is too worn to be positively identified.

There is evidence of heavy wear/damage (?) on the outermost edge of the two lower decorated panels on the shank; otherwise the pin is in excellent condition. Casting seams are visible on portions of the pin shaft. The ground between the relief motifs has been keyed for enamel and a white powdery substance remains on the face and edge of the disc head.



Plate AI- 42 The Treanmanagh Pin.



Plate AI- 43 The Treanmanagh Pin: Disc-face detail with adorsed, V-shaped scrolls.



Plate AI- 44 Treanmanagh Pin: Vandyke ornament on vertical edge of disc-face.

18 - Mulgrave Pin

Artefact type: Projecting disc-headed pin

Location: British Museum

Museum Register Number: 1883,0218.39

Find spot: n/a

Context: Purchased from Rev Earl of Mulgrave, New Ross, Wexford

Weight: 44.5g

Material: Copper alloy (leaded gun metal)

Dimensions:

Overall L. of pin = 161 millimetres

Max. Diam. of pin head = 14.8 mm x 14.1 mm

Overall L. of projection = 16.1mm

Max. Th. of shank = 6.6mm tapering to 4.4mm

Description:

Projecting disc-headed pin.

Decoration is present on the disc face, along the vertical edge of disc-head, on the angle of the shank. The pin was cast in one piece and the point is missing, otherwise the pin is in good condition. The disc-head tilts downwards and the back of the shank has been squared. There is a D-shaped recess cut into the shank at the point where it meets the projecting disc-head. This is similar in form and execution to panel 1 on the Londesborough pin (Cat. No. 15).

The panel on the disc-face is decorated with a triskele enclosed within a deeply-cut circular border. Each of the double spirals terminates in a triangle onto which a small lentoid has been engraved. The panel in the angle of the shank holds a series of five vandykes. Some of the original red enamel inlay remains in the panels in the angle of the shank and in the lower right quadrant of the disc-face. Faint traces of tinning were identified on the verso of the disc-head, at the point where it meets the pin shank. Two deep grooves are present around the circumference of the vertical edge of the disc head. These show the heaviest evidence of wear in the three and five o'clock position. These are intersected by four, evenly-spaced cuts set at intervals of 4.2mm.

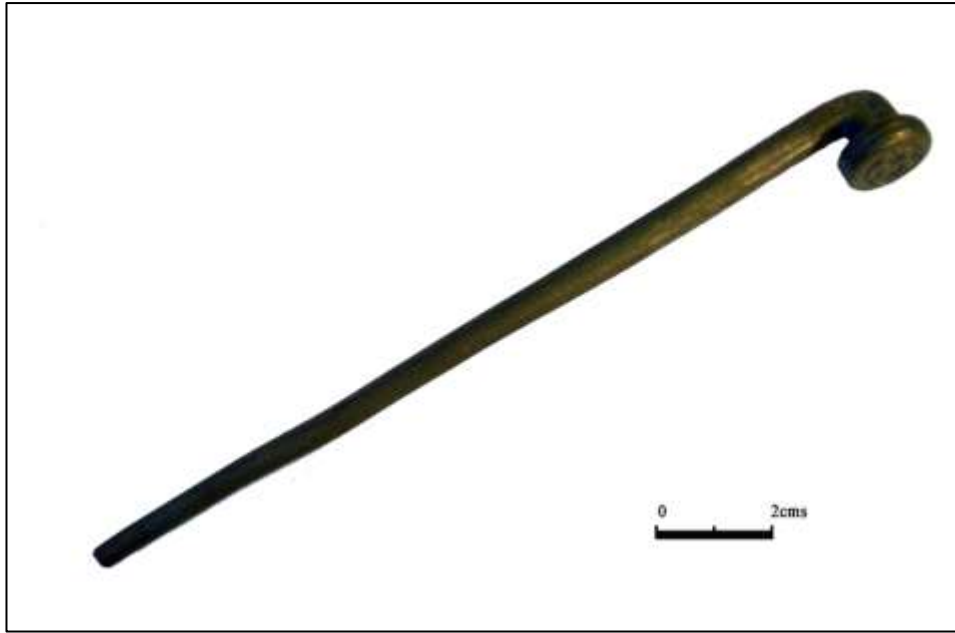


Plate AI- 45 The Mulgrave Pin.



Plate AI- 46 The Mulgrave Pin (top) Disc-face; (left and right) angle(s) of shank with engraved vandyke ornament.

19 - Unlocalised Bronze Disc-headed Pin

Artefact type: Projecting disc-headed pin

Location: National Museum of Ireland, Dublin

Museum Register Number: w201

Find spot: n/a

Context: Antiquarian find

Weight: 32.90g

Material: Bronze

Dimensions:

Overall L. of pin = 142.3mm

L. of shank = 138.9mm; L of Projection = 3.0mm

Max Diam. of disc = 12mm Projection = 3mm

Max. Th. of disc = 4.6mm

Max Diam. of shank = 5.7mm

Max Diam. of central decorative frieze = 0.88mm

Description:

The shaft is circular in cross-section with a pronounced right angled projection terminating in a thick circular disc-head. The pin was cast in one piece. The pin is generally in good condition although it was broken in antiquity and re-pointed. The surface of the pin is smooth and evenly patinated with little pitting.

The face of the disc is decorated with three adorsed V-Scrolls with falcate-shaped lobes and centrally drilled dot. The ornament is reserved against a field of red enamel, much of which remains in place. Fragments are missing however from the 5-6 o'clock position. The enamel was held in place with tiny tooth like projections cut from the surrounding edge.

The shank is undecorated but traces of silver gilding are visible on the verso of the disc-head and underneath the projecting section where the shank and head meet. The lower half of the disc-head appears flattened. This may be due to wear or it may have suffered a damaging blow in antiquity. The vertical edge of the disc-head is also decorated with a band of vandykes repeated around the circumference of the disc and bordered by a continuous groove on either side. The angle at the shank projection is

more rounded in character than on other examples, particularly those which have decorated shanks. The lower half of the disc-head appears to be flattened and distorted, possibly due to a blow.



Plate AI- 47 Unlocalised bronze projecting disc-headed pin provenanced to Ireland: Disc-face detail.



Plate AI- 48 Unlocalised bronze projecting disc-headed pin provenanced to Ireland: Angle of shank with vandykes.

20 - Broxbourne Pin

Artefact type: Projecting disc-headed pin

Location: Letchworth Museum⁴

Museum Register Number: 181.1976

Find spot: Broxbourne, Hertfordshire, NGR TL 3607

Context: Found in dredger working in gravel pits on the River Lee at Broxbourne. Donated by E Dennis of 37 New Town, Codicote, Herts. No other material was associated with the find.

Weight: n/a

Material: Copper Alloy

Dimensions:

Max. Diam of shank 300.0 mm

Max. Diam of disc 16.0mm

Max. Th. of pin head 8.0 mm

Description:

Enamel-inlaid, projecting disc-headed pin

The decorated disc-face has three adorsed V-scrolls reserved against red enamel.

Panel(1) Incised cross-cut ornament

Panel (2) Tightly-spaced cross-cut ornament

Panel (3) Saltire with punched annulets in the interstices

Panel (4) Two zones of opposed diagonal bands

Panel (5) Incised cross-cut ornament

Panel (6) Nib-shaped with incised V-shaped divided by a medial line running the length of the panel

The black deposits on the surface are typical of copper-alloy objects recovered from silts.

⁴ Formerly Hitchin Museum 4796.

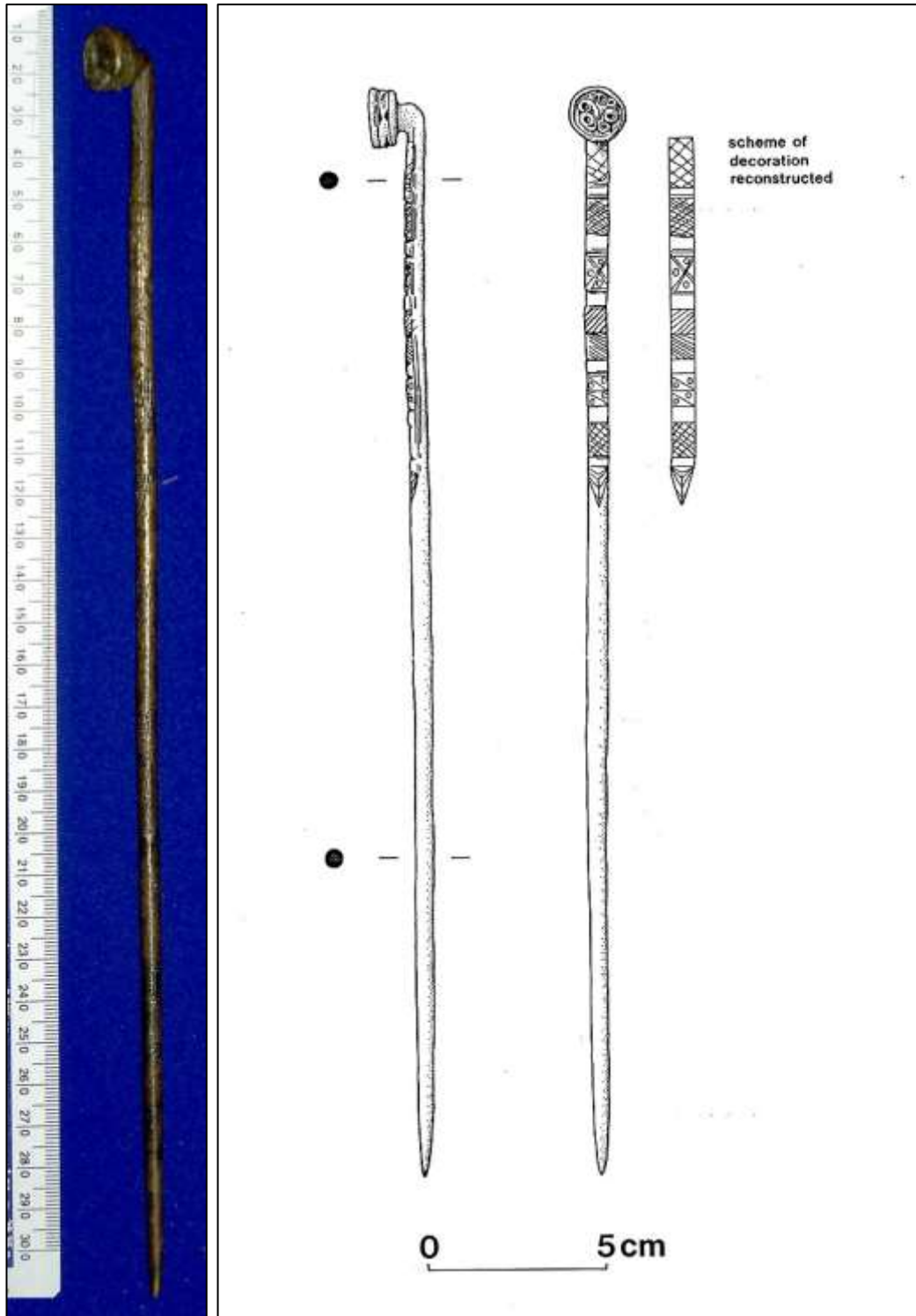


Plate AI- 49 Broxbourne pin. Image and drawing ©Hertfordshire County Museums.



Plate AI- 50 Broomfield pin, shank and disc-face decoration. Image ©Hertfordshire County Museums.

21 - Disc-headed Pin Provenanced to Ireland

Artefact type: Projecting disc-headed pin

Location: British Museum, London

Museum Register Number: OA.313

Find spot: Found/Acquired Ireland

Context: n/a

Weight: 21.7g

Material: .Bronze (leaded bronze)

Dimensions:

Overall L. of pin = 96.8mm

Max. Diam of disc-head = 13.8mm x 12.0mm.

Description:

Heavily pitted and worn disc-headed pin. The disc-face is decorated with a triskele with falcate-shaped lobed terminals. No tool marks could be identified due to the heavy wear. The vertical edge of the disc-head is decorated with two deep grooves that run around the circumference. No further details could be discerned. The head sits at a right angle to the shank which is of oval section. The pin is quite short and was repointed at some stage in antiquity.



Plate AI- 51 Unlocalised disc-headed pin provenanced to Ireland.



Plate AI- 52 Unlocalised disc-headed pin provenanced to Ireland, side view.



Plate AI- 53 Unlocalised disc-headed pin provenanced to Ireland, disc face.

22 - The Bath Brooch

Artefact type: Zoomorphic penannular brooch

Location: Roman Baths Museum

Museum Register Number: BATRM 1983.13dl

Find spot: Bath, Somerset

Context: Found during excavations of the Sacred Spring in 1979

Weight: 33g

Material: Copper alloy

Dimensions:

Max. Diam. = 71mm: Max. Th. of hoop = 4.4mm: Min. Th.of hoop = 3.3mm

Diam. of bird terminal 20.3mm x 8.7mm

Diam. of bird & fish terminal = 19.5mm x 8.9mm

L. of pin = 83.5mm; W. of barrel = 7.5mm

Max. Diam. of pin = 3.7mm, tapering to 2.1mm

Description:

Zoomorphic penannular brooch complete with pin.

Pin was cast separately and attached; it features a bend like other early examples. The barrel has been simply decorated using too deeply engraved lines (applied post-casting) leaving a raised central area. There is no further ornament although file-marks are visible on the surface of the barrel.

Sixty-three incised lines have been cut into the upper surface of the hoop following the bird terminal followed by four zones of more widely spaced punched beading. The first incised band runs from the bird and fish terminal for 21.9mm of the circumference. The beaded zone extends for 10.2mm and is followed by a further zone of incised ribbing 43.7mm long followed by beaded zone of 11.7mm followed by ribbing 47.5mm followed by 14.8mm beaded zone followed by 28mm ribbing.

On the right is a predatory bird observing a fish, possibly a salmon while on the left, a predatory bird is depicted in profile looking over its shoulder at a jagged, linear feature. The bird on the left terminal is standing with its head and curved beak inclined towards the fish below. On one leg the talon is extended and touches the body of the fish. The wings are splayed out slightly from the shoulders in a predatory

stance. The tail is not visible. The second bird is standing in a non-flight position. The bird's chest is prominent and curved and its body is rendered with small, reserved, upwardly curved lines following the contours of the body and wings, suggesting feathers.

On each terminal, all of the ornament has been finely engraved and is exceptionally crisp. Two circular ears each hold a drilled central cell containing enamel. The main enamelled field is itself leaf-shaped and below this the nostrils are formed by two, enamel inlaid lentoids. The snout is unusually elongated, is also reminiscent of a leaf and has a central division. There is no decoration on the ends, sides and *verso* of the terminals. All of the surfaces have been heavily worked post casting and where the enamel is absent it is clear that the field were hand engraved post-casting. The decoration on the zoomorphic terminals is orientated to present the wearer and not the onlooker with an upright view of the decorated friezes when worn.

References:

Cunliffe, B. (ed.) (1988) *The Temple of Sulis Minerva at Bath Volume II: the Finds from the Sacred Spring*, Oxford University Committee for Archaeology Monograph No 16, pp 23, 50, no. 48, plate XVII.



Plate AI- 54 The Bath Brooch.



Plate AI- 55 Decorated terminals as seen from the perspective of the wearer.



Plate AI- 56 Bath Brooch (top) Brooch terminals off kilter as a result of repeated fastening; (centre) Hoop decoration; (bottom) Decorative friezes on brooch terminals highlighting the relief decoration.

23 - Zoomorphic Penannular Brooch Provenanced to Ireland

Artefact type: Zoomorphic penannular brooch

Location: National Museums of Scotland, Edinburgh

Museum Register Number: FD2

Find spot: n/a

Context: Provenanced to Ireland

Weight: n/a

Material: Copper alloy

Dimensions:

Max. Diam. Of hoop = 93.0mm

L. of Pin = 92.3mm

Max. Th. of hoop = 14.3mm

Min. Th. of pin = 14.1mm

Description:

Zoomorphic penannular brooch.

The brooch is excellent condition with significant traces of enamel remaining on the decorated terminals. All surfaces are heavily patinated and there is no evidence of corrosion. The tip of the pin is missing.

The snout is decorated with three lentoids creating a central tricone which in this instance has not been pierced with the usual drilled central dot. The slanting, sub-triangular eyes are set in two folds positioned above the snout. The head itself features a pelta motif executed in superb fine-line ornament and reserved against what appears to be degraded red enamel. On the right terminal, the enamel is much degraded but traces of red remain at the top of the pelta. The ears are round and still retain a heavy layer of tinning on the upper surface. There is degraded enamel in the eyes though no trace on the snout. On the left terminal, tinning is still present on the ears but is not as well preserved as on the right hand terminal. Degraded enamel in the form of yellow paste is present in all recesses.

The hoop is completely decorated with bands of ribbing following this pattern; six narrow ribs, one broad band immediately behind each terminal. The remainder of the hoop follows a pattern of three narrow ribs, one broad band for the remainder of its circumference. Ribbing is present on the upper surface of the hoop only and there is

a division between the decorated and undecorated area provided by a deeply incised groove. There appears to be a dark paste lodged in the groove, some form of inlay? The *verso* of the terminals is also ornamented. Immediately behind the ears there is a line of punched annulets creating a beaded border and another below the eyes. These border an incised saltire which has three punched annulets in each of the interstices. Another triple annulet motif also occurs on the *verso* of each of the ears. The same pattern is repeated on the other terminal but on this side, the triple annulet motif is all but worn away.

The barrel of the pinhead has a squared outer moulding and a broad, plain, rounded centre moulding. The outer squared mouldings enclose a ring of punched beading. The pin shank is plain and undecorated apart from two bordered bands of punched beading immediately below the barrel.



Plate AI- 57 Zoomorphic penannular brooch provenanced to Ireland.

24 - East Ravendale Brooch

Artefact type: Zoomorphic penannular brooch

Location: Private ownership

Museum Register Number: 1991.461.001

Find spot: East Ravendale, Lincolnshire

Context: n/a

Weight: n/a

Material: Copper alloy

Dimensions:

Max. Diam. of hoop = 65.0mm

Description:

Cast, copper alloy, enamel inlaid penannular brooch. The brooch has broken into two parts. The terminals are inlaid with red enamel and decorated with a pelta motif. The motif is very similar in style and execution to that on an unlocalised zoomorphic penannular brooch provenanced to Ireland (Cat, No.24). The brooch appears to have been cleaned by the metal detectorist who found it. Found 1st January 1991

References:

Staves, L (2005) NLM-A0DEB5 AN EARLY MEDIEVAL BROOCH Webpage
available at: <http://finds.org.uk/database/artefacts/record/id/102826>
[Accessed: Sep 25, 2013 8:25:05 AM].



Plate AI- 58 Zoomorphic penannular brooch, East Ravendale, Lincolnshire.

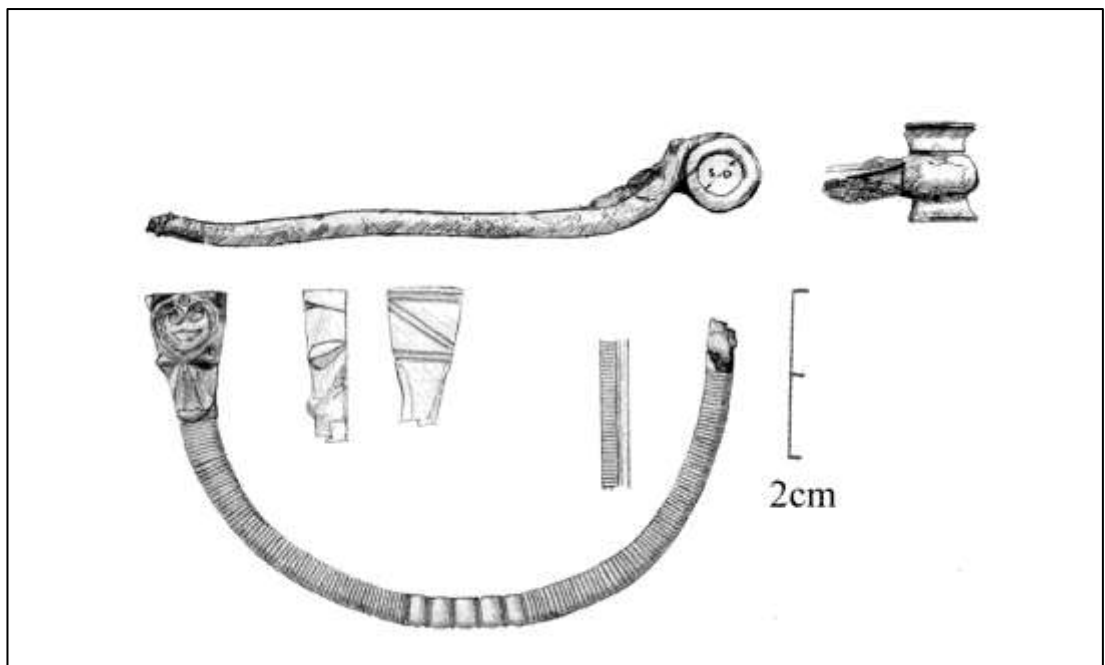


Figure AI 4 East Ravendale Brooch: After Leahy 2007.

25 - Zoomorphic Penannular Brooch Provenanced to Ireland

Artefact type: Zoomorphic Penannular Brooch

Location: National Museum of Ireland, Dublin

Museum Register Number: P735

Find spot: n/a

Context: n/a

Weight: 32.65g

Material: Bronze

Dimensions:

Max. Diam. of hoop = 73.0mm; Max. Th. of hoop = 3.5mm

L. of pin = 91.0 mm

Description:

Zoomorphic penannular brooch complete with pin.

The hoop is decorated with five small bands of ladder pattern. The terminals are square ended with rounded heads. The decoration is different on each terminal. One is decorated with a simple spiral with a lobed, falcate-shaped terminal with a central dot. The other is simplified palmette falcate shaped, inward-turning lobes. Pairs of adorsed tricornes decorate the snouts on either side. There is a transverse ladder pattern on each of the snout tips. The ears are triangular, the eyes are rounded and suck for enamel. The *verso* of the terminals feature punched saltires with triple annulets in the interstices

The barrel of the pin features four narrow mouldings, each decorated with a line of faceted, herringbone ornament. File-marks were noted on the surface of the barrel. There is a simple, incised saltire between transverse lines near the pin point. There is no enamel remaining in the terminals. The innermost sides of the terminals show the most evidence of rubbing and wear.

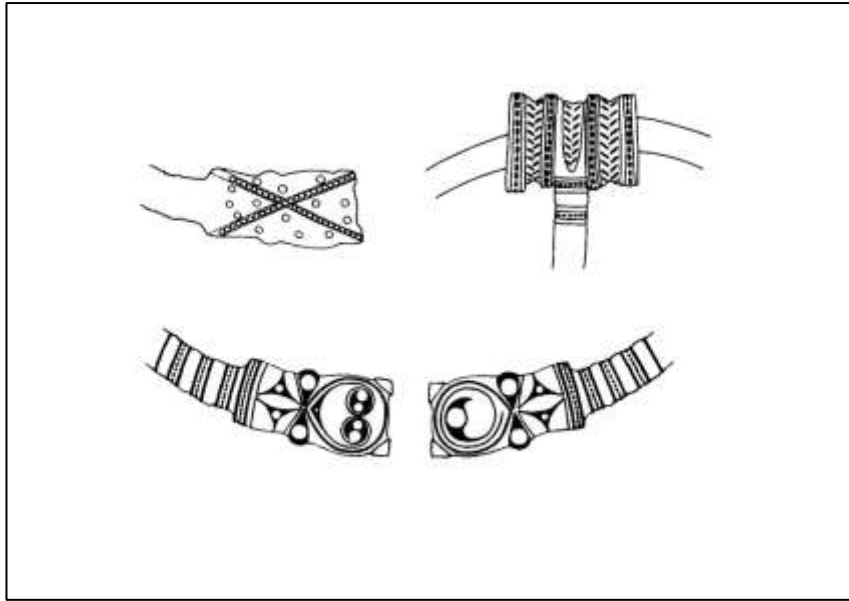


Figure AI- 5 Unlocalised zoomorphic penannular brooch provenanced to Ireland. After Haseloff and Roth 2007, fig. 24.



Plate AI- 59 Unlocalised zoomorphic penannular brooch provenanced to Ireland.

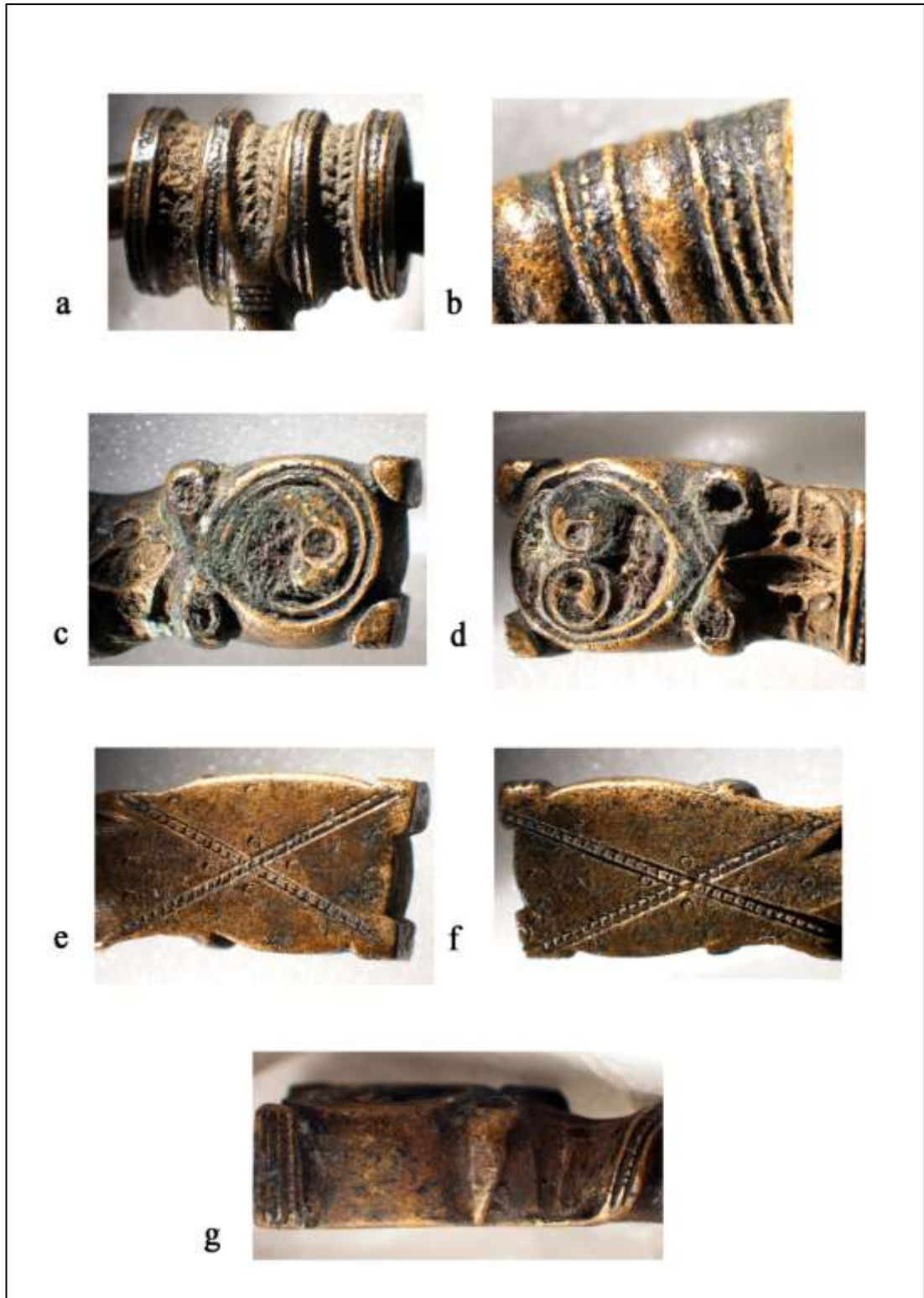


Plate AI- 60 Unlocalised penannular brooch provenanced to Ireland; (a) Barrel; (b) Hoop detail; (c) left terminal *recto*; (d) Right terminal *recto*; (e) Left terminal *verso*; (f) Right terminal *verso* (g) Right terminal vertical edge.

26 - Kilkea Brooch

Artefact type: Zoomorphic penannular brooch

Location: National Museum of Ireland, Dublin

Museum Register Number: 1945:312

Find spot: River Greese at Kilkea Castle

Context: discovered 'in the bed of the River Greese while sinking for the foundations of 'Kildare Bridge' near Kilkea castle

Weight: 28.6g

Material: Bronze

Dimensions:

Max. Diam of hoop = 57.3mm

Max. Th. of hoop = 3.0mm

L. of pin = 73.5mm

Description:

Zoomorphic Penannular brooch complete with pin.

There are three small bands of ribbing on the hoop. The terminals are thick with oval shaped heads holding paired tricornes with central dot. The eyes and ears of the zoomorph are rounded, former sunk for enamel traces of which were identified under the microscope. The *verso* of each of the terminals is badly worn but it is decorated by a saltire bound on either side by a beaded border. Pin head is barrel shaped, with a wedge-shaped central moulding, bordered by secondary mouldings with incised lined round the circumference of the outer mouldings. Immediately beyond the snout, the hoop is decorated with transverse bands of very fine beading which is confined to the upper portion only. There is a large crack running along the right-hand side of the pin and the barrel also has 2 splits

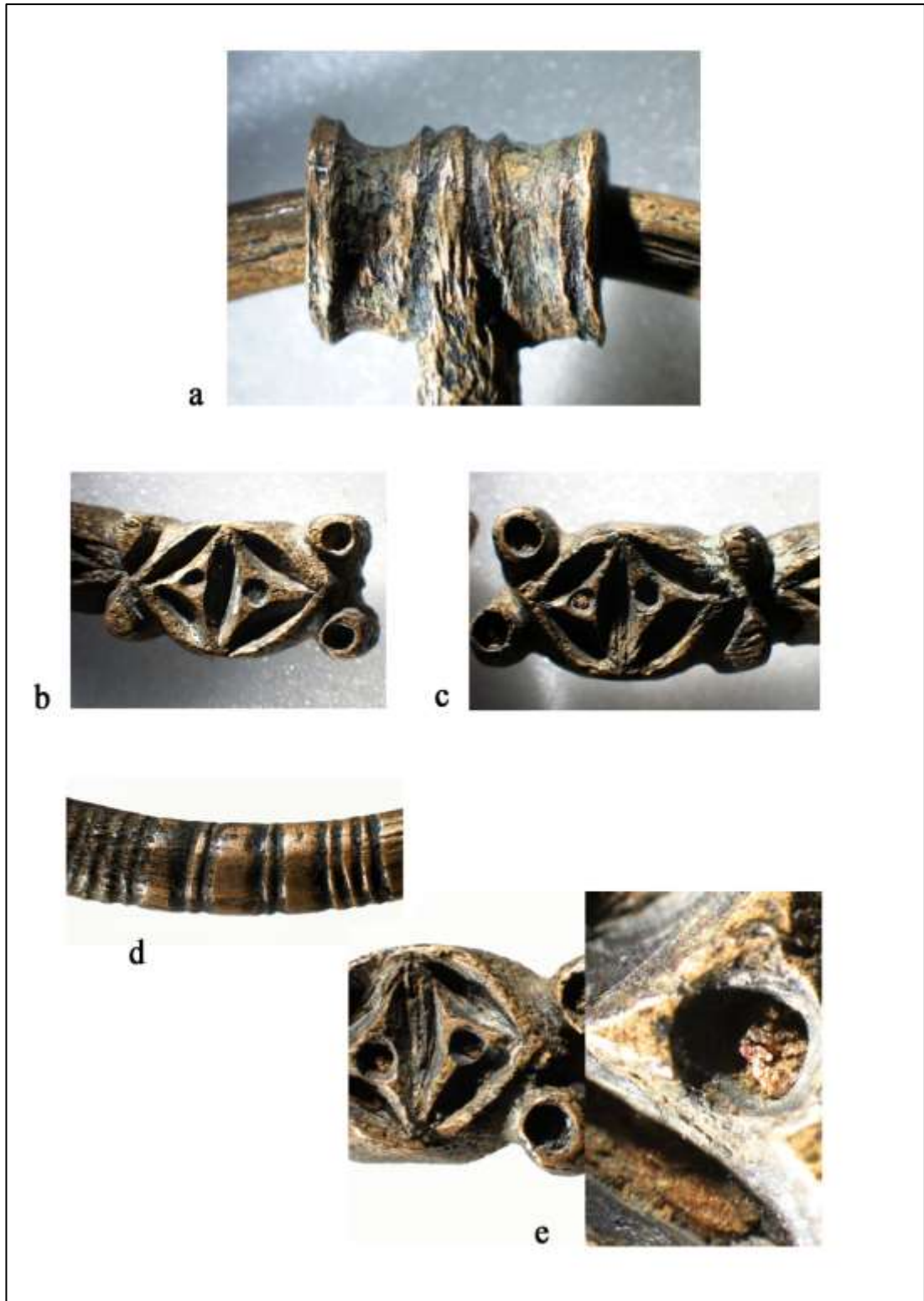


Plate AI- 61 Kilkea Brooch; (a) Barrel; (b) Right terminal recto; (c) Left terminal recto; (d) hoop 'ribbing'; (e) Left terminal, micro photography reveals enamel in drilled dot.

27 - Caistor Penannular Brooch Terminal

Artefact type: Zoomorphic penannular brooch terminal

Location: North Lincolnshire Museum, Scunthorpe

Museum Register Number: n/a

Find spot: Caistor, Lincolnshire or one of the surrounding parishes.

Context: Kevin Leahy advised the writer that the terminal was found by persons unknown who sold it to a travelling antiquities dealer, who then sold it to the late Alan Harrison. It was bequeathed to the North Lincolnshire Museum in Scunthorpe and is now in their collection.

Weight: n/a

Material: Silver with base metal core

Dimensions: n/a

Description:

The terminal is sub-triangular in shape and is decorated on the recto and the verso. Although the verso is rather worn there are four double bands of punched beading which appear to divide the head into three distinct zones while the *recto* appears to be virtually festooned with triplets of punched annulets. The fragment also has a distinctive ribbon effect on the snout; it is (uniquely) made from silver, but has a base-metal rod in its socket. The terminal end is rectangular and is decorated with slightly protruding triangles which wrap themselves around the corners, the pointed ends forming the corners of the upper surface of the object. These are the stylised ears of the zoomorphic head. These are held above a triangular panel containing a triskele of three tightly wound spirals, each terminating in a clavate-shaped lobe, the lowermost of which has a centrally placed dot. A deeply scored line runs from the ear to the end terminal.

Two large, bulbous, diamond-shaped eyes which originally contained a red enamel inlay are situated immediately below and each is framed by a border of punched beading. The snout is decorated with four, elongated arcuate lentoids, with sub-triangular recesses on either end. The terminal appears to have been deliberately detached from its original hoop.

References:

Youngs, S. (2007) 'Britain, Wales and Ireland: holding things together' in K. Jankulak and J. M. Wooding (eds) *Ireland and Wales in the Middle Ages*, Dublin: Four Courts Press, 80-10.

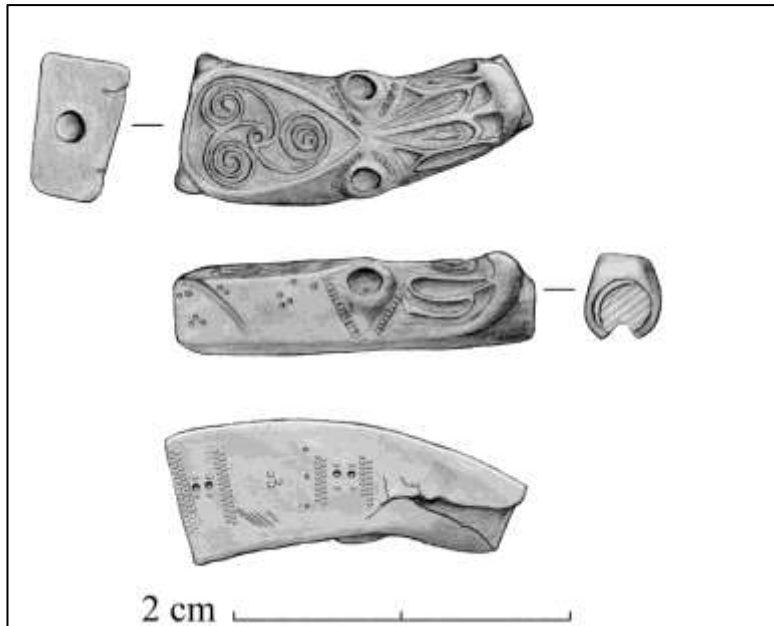


Figure AI 6- Caistor silver zoomorphic brooch terminal. Drawing by Kevin Leahy.



Plate AI- 62 Caistor silver zoomorphic brooch terminal.

28 - Loughborough Brooch Terminal -

Artefact type: Zoomorphic penannular Brooch terminal

Location: Private ownership

Museum Register Number: PAS Unique ID: LEIC-9CDC85

Find spot: Loughborough

Context:

Weight: 8.33g

Material:

Dimensions:

Max. Diam = 26.0mm x 11mm ; Max. Th. = 6mm deep

Description:

Early Medieval copper-alloy zoomorphic terminal from a penannular brooch. It is sub triangular/crescentic, and rectangular in cross-section. The intact end is rectangular and is decorated with slightly protruding triangles which wrap themselves around the corners, the pointed ends forming the corners of the upper surface of the object. These are the stylised ears of the animal head.

In front of these triangular ears is a sub-circular area decorated with a triskele motif. Three curving arms, containing swirls and punctuated with circular depressions, emerge from the centre and grasp at their ends an outer border formed of three similar arms. At its lower edge, this motif is squeezed into a slight point between two silver eyes. The right eye sits slightly proud of the surface and is silver along its sides, suggesting it is made from a short length of inlaid silver rod. The left eye is more worn and sits within the surface. Below the eyes, the sides are slightly rounded, and flanked by raised lines which converge, finally merging together at the base of the side. In front of the eyes, the snout of the animal is decorated with a raised ribbon, which begins as one line in the centre of the snout, running down from between the eyes before separating near the beast's mouth and then curving back on itself four times on each side. The lines end in expanded pointed triangular motifs. There are small circular depressions on the lines, three in the central area and one in each of the pointed triangular motifs which form the terminals. The terminal on the left (outer) side is larger than that on the right.

The whole area of decoration on the snout is encased in a crescentic shape wrapped around the brooch terminal, the edges forming points under the eyes. It is contained within a raised border, the centre of which is rounded and upturned, forming a 'lip' for the beast. The beast holds a hollow circular tube within its mouth, which appears to be intact as it has an incised line encircling its upper half; implying that this terminal was made separately from the rest of the brooch. The reverse of the object is plain, with no evidence of any decoration. The description is by W. Scott who recorded the brooch for the PAS (Scott 2011).

References:

Scott, W (2011) LEIC-9CDC85 AN EARLY MEDIEVAL BROOCH Webpage available at: <http://finds.org.uk/database/artefacts/record/id/448414> [Accessed: May 1, 2013 6:02:13 PM].

Youngs, S. 2007. 'Britain, Wales and Ireland: Holding Things Together' in K. Jankulak and J. M. Wooding (eds) *Ireland and Wales in the Middle Ages*, Dublin: Four Courts Press, 80-101.



Figure AI 7- Loughborough brooch terminal.



Plate AI- 63 Loughborough brooch terminal.



Plate AI- 64 Loughborough brooch terminal: detail.

29 - Fosse Way Silver Disc and frame

Artefact type: Mount

Location: British Museum

Museum Register Number: 1976,0901.1 & 1976,0901.2

Find spot: Fosse Way, west of Leamington Spa, Warwickshire

Context: Found c. 1965 in a roadside trench section between Chesterton and Princethorpe. Purchased from M Costello Sold Celtic metalwork from Coventry to the Museum in 1976

Weight:

Material: Silver

Dimensions:

Max. Diam. of disc = 17.0mm; Max. Th of disc = 1.3mm

Max. Outer Diam. of Frame = 17.7mm; Max. Inner Diam. of frame = 13.2mm; Max. Th. of frame = 2mm

Description:

Small enamelled disc, possibly silvered bronze or copper debased silver with fine-line ornament reserved against red enamel. The ornament consists of three double spirals each ending in a falcate-shaped lobe with a centrally drilled dot. The disc appears slightly hollowed at the back, the front with a plain flange originally covered by the frame, and a central field ornamented with a triskele of spirals, each with a subsidiary club-ended scroll with large and small dots. The surface of the silver has distinctive pink patches where the silver is apparently unevenly mixed with copper.

Though originally described as a silver escutcheon from a hanging-bowl, the object is more likely to have been a decorative mount attached to metal or perhaps wood.

The recessed background is filled with red enamel. Overall, there is good enamel retention, however, where the enamel has been lost and the base of the cell is revealed, it is apparent that the base of the field at least had been extensively tooled post-casting in much the same manner as other contemporary objects of insular silver. The surface is quite heavily patinated and appears almost black. There are also traces of sediment on much of the surface. Bright red enamel is revealed wherever the sediment has been removed. There is a plain border 1.5mm wide which runs around the circumference of the disc and the frame probably rested on this.

The mount was found in association with a ribbed frame with evenly spaced ribbing which is believed to be of copper alloy. There are some traces of a red substance (enamel?) adhering to the verso of the frame however, these green and red crystals are most likely to be corrosion products.

References:

Bruce-Mitford, R. L. S. (2005) *A Corpus of Late Celtic Hanging-Bowls with an Account of the Bowls found in Scandinavia*, Oxford: Oxford University Press. Group 1, no. 19.

Youngs, S. (1989) *'The Work of Angels': Masterpieces of Celtic Metalwork 6th - 9th Centuries AD*, London: British Museum Publications, no. 31.



Plate AI- 65 Silver disc and frame from Fosse Way.



Plate AI- 66 Fosse Way frame *recto*.



Plate AI- 67 Fosse Way frame *verso*.

30 - Anthropomorphic Mount, River Shannon, Athlone

Artefact type: Mount

Location: National Museum of Ireland, Dublin

Museum Register Number: W24b

Find spot: It was found in 1847 in the River Shannon. Presented on the 8th of January, 1948 by the Board of works. See RIA register p.51.

Context: None

Weight: n/a

Material: Bronze

Dimensions:

Head Max. Diam. 23.8mm x 14.6mm; Max. Th. 0.24mm

Overall L. of mount 96.5mm

Description:

(a)Decorated bronze mount.

A hollow cast human head riveted to a broad, U-Shaped mount that is curved along its axis, and decorated with eight cross-cut and engraved panels. The rivet is decorated with a pinwheel device. An elongated, oval face with large staring eyes, a straight, wedge-shaped nose and a small mouth rendered in a sharp linear manner. The figure is bearded; five V-shaped grooves have been cut into the metal below the nose and eight below the mouth. The forehead is decorated a band of quatrefoil motifs. XRF analysis of the black accretion noted by the writer determined that it constitutes an unknown lead/zinc/tin compound that was deliberately applied to the surface and the cheeks are decorated with tricorns. There is evidence of tinning on the left cheek. No trace of inlay was found in the eyes following microscopic examination and XRF analysis of the area. The hair is indicated by lightly engraved, parallel lines, demarcated by a short horizontal groove. There is a second, vacant rivet hole at the wider end. Overall, the decoration is very crisp and shows little evidence of wear. The mount has not been cleaned and a heavy, gritty riverine sediment is attached to all surfaces

(b)The smaller fragment is wider, but decorated in the same manner and is also curved along its axis. It has a single rivet hole at one end. There are 14 panels of decoration on this curved strip of bronze. All of the decoration was applied post-

casting using a variety of tools including gravers, punches and drills. Impressions of the various tool marks are preserved on the *verso*.

Dimensions:

Max. Diam = 108.3mm x 14.5mm

Max. Th. = 8mm

References:

Kelly, E. P. (2001) 'The Hillquarter, Co. Westmeath Mounts: An Early Medieval Saddle from Ireland', in Redknapp, M. (ed.), *Pattern and Purpose in Insular Art*, Oxford: Oxbow, 273-4, fig. 24.6.



Plate AI- 68 Anthropomorphic Mount, River Shannon.



Plate AI- 69 Anthropomorphic Mount, River Shannon; (top) Detail of forehead and eyes; (below) nose, mouth and facial hair; (right) Hair demarcated by short, groove.

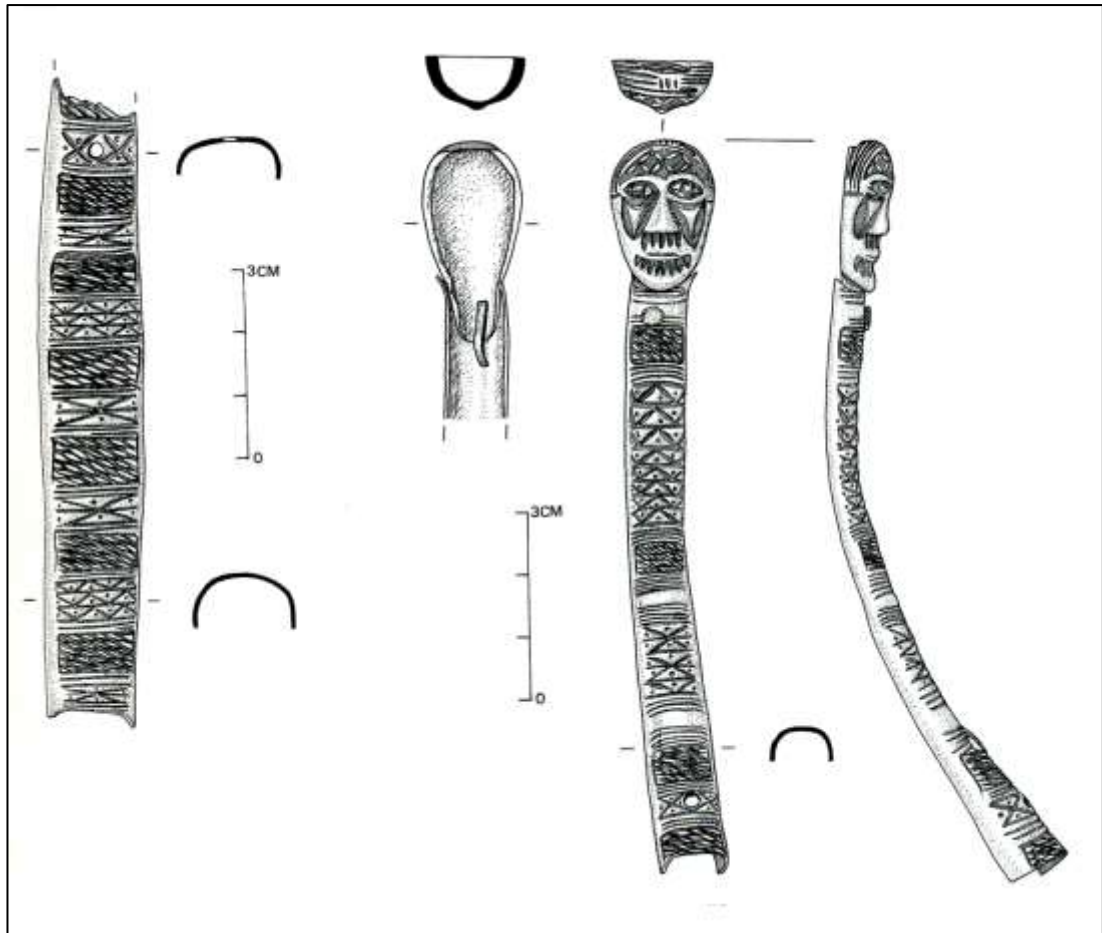


Figure AI 8 Anthropomorphic Mount, River Shannon. After Kelly 2001, fig. 24.6.

31 - Norrie's Law Mounts

Artefact type: Mount fragments

Location: National Museums of Scotland, Edinburgh

Museum Register Number (s): FC 51, FC62, FC 69, FC 113, FC 81, FC 48, FC 68

Find spot: Norrie's Law, Fife

Context: Part of a multi-period hoard deposited before the seventh century

Material: Silver

Description:

Seven fragments of a broad, U-shaped mount. Surface decoration is provided by punched annulets and incised lozenge patterns.

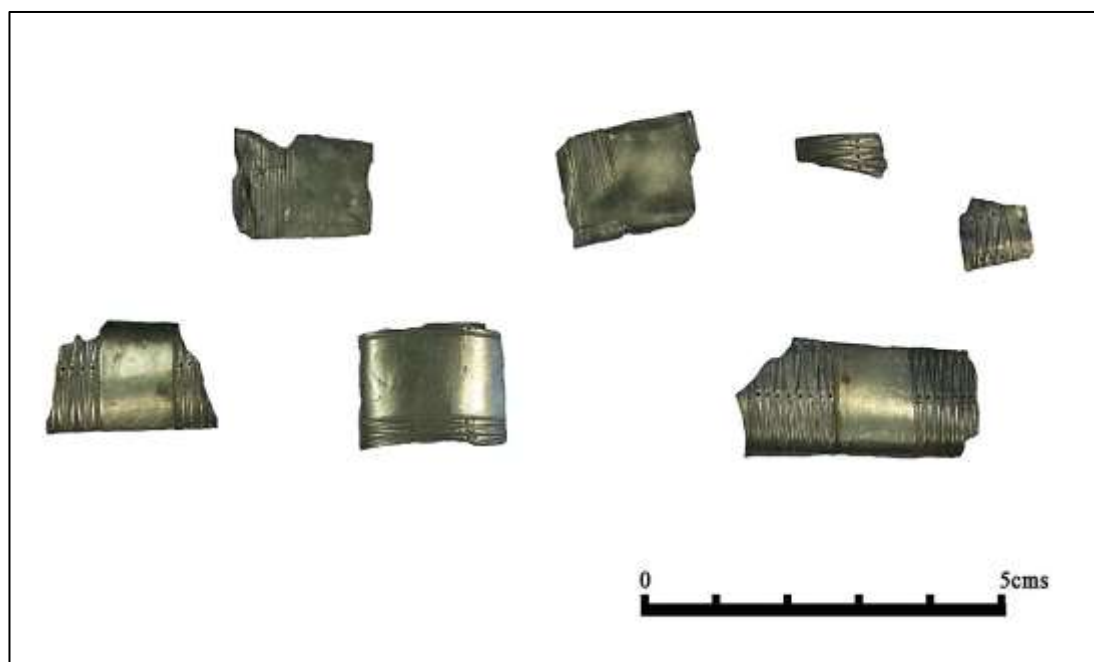


Plate AI- 70 Bottom row (left to right) FC 62; FC48; FC68 Upper row (left to right) FC113; FC69; FC 51; FC81).

FC51 Fragment of curved silver mount in good condition. Pattern is created by incised linear patterns forming lozenges and punched annulets. The fragment is bounded by a border of fine ring punching. Two rivet holes are present on the strip. Max. Diam. = 22.3mm x 17.1mm; Max. Th. 0.7mm; weight 1.31g

FC62 Slightly curved strip of silver featuring two decorated panels, each bounded by a border of punched rings with a broad, plain band in the centre. Each of the panels is framed by a border of punched annulets. These have left impressions that are visible on the verso. Max. Diam. = 35.5mm x 16.7mm; Max. Th. 0.7mm; weight 2.42g

FC69 Fragment is decorated with a border of punched annulets and incised lozenges. Max. Diam. = 13.7mm x 7.0mm; Max. Th. 0.7mm; weight n/a

FC113 The stamped and incised is more crudely executed on this example. It is noticeably different in terms of quality to the other fragments. Max. Diam. = 11.3mm x 11.0mm; Max. Th. 0.7mm; weight n/a

FC81 Fragment with deeply incised lines and score marks chased into the silver. Some of the cuts are so deep they have penetrated through to the other side. Max. Diam. = 20.9mm x 11.1mm; Max. Th. 0.7mm; weight 1.09g

FC48 This fragment is slightly curved at one end and features an ornament zone at either end of a plain, underdecorated zone. Max. Diam. = 21.2mm x 11.9mm; Max. Th. 0.6mm; weight 1.65g.

FC68 Two zones of ornamentation flank the undecorated band on this strip. The ornament is framed by a line of finely punched annulets and dots. A significant portion of the curved edge of this fragment remains. Max. Diam. = 25.8mm x 11.2mm; Max. Th. 0.7mm; weight 1.64g.

References:

Stevenson, R. B. K. and Emery, J. (1963–1964) ‘The Gaulcross Hoard of Pictish Silver’, *Proceedings of the Society of Antiquaries of Scotland*, 97, 206-211.

Appendix Two - XRF analysis raw data

A programme of non-destructive specialist analysis using a non-dispersive X-ray fluorescence spectrometer was carried out on all objects from this corpus held in the collection of the National Museum of Ireland by Dr. Paul Mullarkey. Both the metal substratum, and any applied decoration identified during visual and microscopic examination by the writer was analysed qualitatively using X-ray fluorescence (XRF). Alloys, inlays and surface decoration were identified on the basis of the values returned. The raw data is presented below together with images depicting a selection of the sample sites chosen.

The artefacts were analysed using a Spectro Midex EDXRF spectrometer using a Molybdenum anode. The diameter of the tube collimator and the measurement spot size is 0.7 mm, and the distance from the sample surface varies from 2-5mm. The operating conditions for the X-ray tube were 45kV and 0.6mA at normal air pressure. Sample counting time was 180 seconds live time. The principal elements analysed were silver, copper, tin, zinc, lead, gold, iron, arsenic and antimony. The artefacts were analysed intact within the sample chamber and the measurement spot, which is highlighted by a laser, was viewed on an adjacent computer screen, thus allowing for accurate positioning of the sample site. Two to three sites were selected for analysis on each artefact or component if cast separately. There was no sample preparation, such as polishing or abrasion of the surface, as it would have resulted in unacceptable damage. Results are affected by the surface conditions of the object, such as curvature, indentations, pitting and the presence of contaminants, surface dirt and corrosion products. Another factor affecting the results is the surface depletion and enrichment of copper, tin and lead, due to corrosion mechanisms during burial. Therefore the results contained in this study must be viewed as semi-quantitative.

Cat. No. 2

Silver Proto Hand-pin: National Museum of Ireland reg. no. 7.w.24



Plate AII- 1 Measurement spot indicated by laser beam, Cat. No. 2

SPECTRO X-LabPro

68

— Preset Sample Data

Sample Name	7.W.24 right finger	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/03/2009
Sample Status	A X X X X X	Date of Evaluation	03/03/2009

— Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error	
29	Cu	Copper	179214	3.858	%	0.011 %
50	Sn	Tin	2410	0.877	%	0.089 %
30	Zn	Zinc	42752	0.7128	%	0.0042 %
82	Pb	Lead	52765	6.693	%	0.037 %
79	Au	Gold	15577	0.7667	%	0.0093 %
47	Ag	Silver	531719	86.12	%	0.10 %
26	Fe	Iron	2195	0.0468	%	0.0015 %
33	As	Arsenic	7383	0.0320	%	0.0016 %
51	Sb	Antimony	0	< 0.051	%	(0.0) %
28	Ni	Nickel	333	< 0.015	%	(0.0080) %
24	Cr	Chromium	341	< 0.030	%	(0.0) %
25	Mn	Manganese	46	< 0.025	%	(0.0) %
27	Co	Cobalt	99	< 0.020	%	(0.0) %
83	Bi	Bismuth	3319	0.1040	%	0.0044 %
46	Pd	Palladium	1505	< 0.020	%	(0.0) %
78	Pt	Platinum	0	< 0.020	%	(0.0) %
80	Hg	Mercury	0	< 0.0010	%	(0.0) %
Sum of concentration				99.22	%	

- Preset Sample Data

Sample Name	7.W.24 dec face	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/03/2009
Sample Status	A X X X X X	Date of Evaluation	03/03/2009

- Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	144242	3.174	% 0.010
50	Sn	Tin	2334	0.866	% 0.090
30	Zn	Zinc	36748	0.6231	% 0.0040
82	Pb	Lead	47322	6.150	% 0.036
79	Au	Gold	15655	0.7856	% 0.0093
47	Ag	Silver	530984	87.33	% 0.11
26	Fe	Iron	2986	0.0852	% 0.0017
33	As	Arsenic	6172	0.0257	% 0.0014
51	Sb	Antimony	0	< 0.051	% (0.0)
28	Ni	Nickel	426	< 0.015	% (0.010)
24	Cr	Chromium	407	< 0.030	% (0.0)
25	Mn	Manganese	76	< 0.025	% (0.0)
27	Co	Cobalt	18	< 0.020	% (0.0)
83	Bi	Bismuth	2938	0.0935	% 0.0043
46	Pd	Palladium	1495	< 0.020	% (0.0)
78	Pt	Platinum	0	< 0.020	% (0.0)
80	Hg	Mercury	1541	0.0567	% 0.0034
Sum of concentration				99.18	%

- Preset Sample Data

Sample Name	7.W.24 head inlay	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/03/2009
Sample Status	A X X X X X	Date of Evaluation	03/03/2009

- Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	152960	3.818	% 0.011
50	Sn	Tin	1555	0.648	% 0.097
30	Zn	Zinc	15285	0.2847	% 0.0031
82	Pb	Lead	21489	3.190	% 0.031
79	Au	Gold	14295	0.8114	% 0.0096
47	Ag	Silver	491760	89.94	% 0.11
26	Fe	Iron	11069	0.2747	% 0.0032
33	As	Arsenic	1765	0.00452	% 0.00062
51	Sb	Antimony	0	< 0.051	% (0.0)
28	Ni	Nickel	390	< 0.015	% (0.011)
24	Cr	Chromium	341	< 0.030	% (0.0)
25	Mn	Manganese	121	< 0.025	% (0.0)
27	Co	Cobalt	24	< 0.020	% (0.0)
83	Bi	Bismuth	1048	0.0350	% 0.0040
46	Pd	Palladium	1534	< 0.020	% (0.0)
78	Pt	Platinum	0	< 0.020	% (0.0)
80	Hg	Mercury	1735	0.0852	% 0.0048
Sum of concentration				99.11	%

- Preset Sample Data

Sample Name	7.W.24 upper shank	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/03/2009
Sample Status	A X X X X X	Date of Evaluation	03/03/2009

- Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	175905	4.036 %	0.011 %
50	Sn	Tin	2534	0.980 %	0.091 %
30	Zn	Zinc	39614	0.7040 %	0.0043 %
82	Pb	Lead	46661	6.318 %	0.036 %
79	Au	Gold	12232	0.6411 %	0.0091 %
47	Ag	Silver	503937	86.40 %	0.11 %
26	Fe	Iron	2224	0.0507 %	0.0016 %
33	As	Arsenic	4953	0.0178 %	0.0012 %
51	Sb	Antimony	0	< 0.051 %	(0.0) %
28	Ni	Nickel	402	< 0.015 %	(0.010) %
24	Cr	Chromium	333	< 0.030 %	(0.0) %
25	Mn	Manganese	70	< 0.025 %	(0.0) %
27	Co	Cobalt	23	< 0.020 %	(0.0) %
83	Bi	Bismuth	2501	0.0811 %	0.0042 %
46	Pd	Palladium	1167	< 0.020 %	(0.0) %
78	Pt	Platinum	0	< 0.020 %	(0.0) %
80	Hg	Mercury	353	< 0.0010 %	(0.0) %
Sum of concentration				99.24 %	

- Preset Sample Data

Sample Name	7.W.24 lower shank	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/03/2009
Sample Status	A X X X X X	Date of Evaluation	03/03/2009

- Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	246092	5.422	% 0.013
50	Sn	Tin	0	< 0.051	% (0.0)
30	Zn	Zinc	891	0.0106	% 0.0015
82	Pb	Lead	5984	0.790	% 0.018
79	Au	Gold	1599	0.0805	% 0.0044
47	Ag	Silver	579913	92.52	% 0.11
26	Fe	Iron	1165	0.0254	% 0.0013
33	As	Arsenic	0	< 0.00051	% (0.0)
51	Sb	Antimony	0	< 0.051	% (0.0)
28	Ni	Nickel	668	0.0163	% 0.0014
24	Cr	Chromium	446	< 0.030	% (0.016)
25	Mn	Manganese	115	< 0.025	% (0.0)
27	Co	Cobalt	165	< 0.020	% (0.0051)
83	Bi	Bismuth	1827	0.0668	% 0.0035
46	Pd	Palladium	1732	< 0.020	% (0.0)
78	Pt	Platinum	0	< 0.020	% (0.0)
80	Hg	Mercury	847	0.0401	% 0.0041
Sum of concentration				99.00	%

Cat. No. 4

Silver Hand-pin: National Museum of Ireland reg. no. 2009:10



Plate AII- 2 Measurement spot indicated by laser beam, Cat. No. 4

SPECTRO X-LabPro

68

— Preset Sample Data

Sample Name	Wace pin inlay	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/03/2009
Sample Status	A X X X X X	Date of Evaluation	03/03/2009

— Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error	
29	Cu	Copper	147449	2.362	%	0.007 %
50	Sn	Tin	4253	1.789	%	0.045 %
30	Zn	Zinc	5081	0.0945	%	0.0026 %
82	Pb	Lead	1146288	77.50	%	0.08 %
79	Au	Gold	1356	0.0561	%	0.0051 %
47	Ag	Silver	71242	16.79	%	0.05 %
26	Fe	Iron	165606	1.346	%	0.004 %
33	As	Arsenic	51834	< 0.00051	%	(0.0) %
51	Sb	Antimony	0	< 0.051	%	(0.0) %
28	Ni	Nickel	93	< 0.015	%	(0.0) %
24	Cr	Chromium	405	< 0.030	%	(0.0082) %
25	Mn	Manganese	855	0.0425	%	0.0031 %
27	Co	Cobalt	282	< 0.020	%	(0.0071) %
83	Bi	Bismuth	7709	< 0.0010	%	(0.0) %
46	Pd	Palladium	401	< 0.020	%	(0.0) %
78	Pt	Platinum	0	< 0.020	%	(0.0) %
80	Hg	Mercury	609	< 0.0010	%	(0.0) %
Sum of concentration				100.00	%	

- Preset Sample Data

Sample Name	Wace pin left finger	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/03/2009
Sample Status	A X X X X X	Date of Evaluation	03/03/2009

- Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	181890	4.023	% 0.011
50	Sn	Tin	0	< 0.051	% (0.0)
30	Zn	Zinc	13001	0.2104	% 0.0025
82	Pb	Lead	26198	3.454	% 0.029
79	Au	Gold	18307	0.9228	% 0.0089
47	Ag	Silver	545841	89.12	% 0.11
26	Fe	Iron	55658	1.208	% 0.006
33	As	Arsenic	4943	0.0260	% 0.0014
51	Sb	Antimony	0	< 0.051	% (0.0)
28	Ni	Nickel	395	< 0.015	% (0.0097)
24	Cr	Chromium	453	< 0.030	% (0.020)
25	Mn	Manganese	166	< 0.025	% (0.0)
27	Co	Cobalt	27	< 0.020	% (0.0)
83	Bi	Bismuth	1103	0.0313	% 0.0033
46	Pd	Palladium	1571	< 0.020	% (0.0)
78	Pt	Platinum	0	< 0.020	% (0.0)
80	Hg	Mercury	0	< 0.0010	% (0.0)
Sum of concentration				99.03	%

- Preset Sample Data

Sample Name	Wace pin dec face	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/03/2009
Sample Status	A X X X X X	Date of Evaluation	03/03/2009

- Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	162144	3.694	% 0.011
50	Sn	Tin	0	< 0.051	% (0.0)
30	Zn	Zinc	11460	0.1910	% 0.0025
82	Pb	Lead	31612	4.291	% 0.032
79	Au	Gold	16657	0.8646	% 0.0090
47	Ag	Silver	526610	86.77	% 0.11
26	Fe	Iron	58224	1.299	% 0.006
33	As	Arsenic	4247	0.0188	% 0.0013
51	Sb	Antimony	0	< 0.051	% (0.0)
28	Ni	Nickel	317	< 0.015	% (0.0081)
24	Cr	Chromium	441	< 0.030	% (0.015)
25	Mn	Manganese	170	< 0.025	% (0.0)
27	Co	Cobalt	0	< 0.020	% (0.0)
83	Bi	Bismuth	264	< 0.0010	% (0.0)
46	Pd	Palladium	1500	< 0.020	% (0.0)
78	Pt	Platinum	0	< 0.020	% (0.0)
80	Hg	Mercury	0	< 0.0010	% (0.0)
Sum of concentration				99.15	%

- Preset Sample Data

Sample Name	Wace pin shank	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/03/2009
Sample Status	A X X X X X	Date of Evaluation	03/03/2009

- Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	118282	2.772	% 0.009
50	Sn	Tin	0	< 0.051	% (0.0)
30	Zn	Zinc	9659	0.1607	% 0.0023
82	Pb	Lead	24328	3.402	% 0.029
79	Au	Gold	19694	1.048	% 0.010
47	Ag	Silver	524996	90.40	% 0.11
26	Fe	Iron	53985	1.243	% 0.006
33	As	Arsenic	2426	0.00803	% 0.00084
51	Sb	Antimony	0	< 0.051	% (0.0)
28	Ni	Nickel	238	< 0.015	% (0.0062)
24	Cr	Chromium	372	< 0.030	% (0.0)
25	Mn	Manganese	179	< 0.025	% (0.0052)
27	Co	Cobalt	0	< 0.020	% (0.0)
83	Bi	Bismuth	419	0.0063	% 0.0016
46	Pd	Palladium	1508	< 0.020	% (0.0)
78	Pt	Platinum	0	< 0.020	% (0.0)
80	Hg	Mercury	220	< 0.0010	% (0.0)
Sum of concentration				99.05	%

Cat. No. 5

Silver Proto Hand-pin: National Museum of Ireland reg. no. 1944.45



Plate AII- 3 Measurement spot indicated by laser beam, Cat. No. 5

SPECTRO X-LabPro

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— Preset Sample Data

Sample Name	1944:45 dec face	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/03/2009
Sample Status	A X X X X X	Date of Evaluation	03/03/2009

— Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error	
29	Cu	Copper	85046	2.540	%	0.010 %
50	Sn	Tin	0	< 0.051	%	(0.0) %
30	Zn	Zinc	2372	0.0294	%	0.0011 %
82	Pb	Lead	10189	1.818	%	0.029 %
79	Au	Gold	25872	1.747	%	0.013 %
47	Ag	Silver	426084	92.57	%	0.12 %
26	Fe	Iron	1163	0.0343	%	0.0016 %
33	As	Arsenic	0	< 0.00051	%	(0.0) %
51	Sb	Antimony	0	< 0.051	%	(0.0) %
28	Ni	Nickel	249	< 0.015	%	(0.0083) %
24	Cr	Chromium	225	< 0.030	%	(0.0) %
25	Mn	Manganese	50	< 0.025	%	(0.0) %
27	Co	Cobalt	46	< 0.020	%	(0.0) %
83	Bi	Bismuth	2276	0.1070	%	0.0043 %
46	Pd	Palladium	1209	< 0.020	%	(0.0) %
78	Pt	Platinum	0	< 0.020	%	(0.0) %
80	Hg	Mercury	2263	0.1368	%	0.0066 %
Sum of concentration				98.99	%	

- Preset Sample Data

Sample Name	1944:45 central finger	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/03/2009
Sample Status	A X X X X X	Date of Evaluation	03/03/2009

- Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	149182	3.372	% 0.010
50	Sn	Tin	0	< 0.051	% (0.0)
30	Zn	Zinc	4016	0.0440	% 0.0012
82	Pb	Lead	22922	3.085	% 0.027
79	Au	Gold	35566	1.825	% 0.012
47	Ag	Silver	541969	90.66	% 0.11
26	Fe	Iron	1312	0.0291	% 0.0013
33	As	Arsenic	2501	0.00906	% 0.00089
51	Sb	Antimony	0	< 0.051	% (0.0)
28	Ni	Nickel	478	< 0.015	% (0.012)
24	Cr	Chromium	374	< 0.030	% (0.0)
25	Mn	Manganese	52	< 0.025	% (0.0)
27	Co	Cobalt	27	< 0.020	% (0.0)
83	Bi	Bismuth	2988	0.1034	% 0.0041
46	Pd	Palladium	1463	< 0.020	% (0.0)
78	Pt	Platinum	0	< 0.020	% (0.0)
80	Hg	Mercury	581	0.0103	% 0.0020
Sum of concentration				99.15	%

--- Preset Sample Data

Sample Name	1944:45 shank i	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/03/2009
Sample Status	A X X X X X	Date of Evaluation	03/03/2009

--- Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	106963	2.674	% 0.009
50	Sn	Tin	0	< 0.051	% (0.0)
30	Zn	Zinc	3141	0.03200	% 0.00100
82	Pb	Lead	18589	2.770	% 0.027
79	Au	Gold	35095	1.986	% 0.012
47	Ag	Silver	497174	91.44	% 0.11
26	Fe	Iron	2194	0.0540	% 0.0016
33	As	Arsenic	1502	0.00358	% 0.00053
51	Sb	Antimony	0	< 0.051	% (0.0)
28	Ni	Nickel	394	< 0.015	% (0.011)
24	Cr	Chromium	280	< 0.030	% (0.0)
25	Mn	Manganese	13	< 0.025	% (0.0)
27	Co	Cobalt	7	< 0.020	% (0.0)
83	Bi	Bismuth	2643	0.1011	% 0.0042
46	Pd	Palladium	1279	< 0.020	% (0.0)
78	Pt	Platinum	0	< 0.020	% (0.0)
80	Hg	Mercury	460	0.0063	% 0.0014
Sum of concentration				99.07	%

Preset Sample Data

Sample Name	1944:45 side of head	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/03/2009
Sample Status	A X X X X X	Date of Evaluation	03/03/2009

Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	142791	3.237	% 0.010
50	Sn	Tin	0	< 0.051	% (0.0)
30	Zn	Zinc	4534	0.0494	% 0.0012
82	Pb	Lead	21940	2.961	% 0.027
79	Au	Gold	40524	2.084	% 0.012
47	Ag	Silver	539551	90.60	% 0.11
26	Fe	Iron	1648	0.0367	% 0.0014
33	As	Arsenic	2708	0.01108	% 0.00099
51	Sb	Antimony	0	< 0.051	% (0.0)
28	Ni	Nickel	317	< 0.015	% (0.0080)
24	Cr	Chromium	352	< 0.030	% (0.0)
25	Mn	Manganese	28	< 0.025	% (0.0)
27	Co	Cobalt	0	< 0.020	% (0.0)
83	Bi	Bismuth	2460	0.0831	% 0.0040
46	Pd	Palladium	1595	< 0.020	% (0.0)
78	Pt	Platinum	0	< 0.020	% (0.0)
80	Hg	Mercury	272	< 0.0010	% (0.0)
Sum of concentration				99.07	%

- Preset Sample Data

Sample Name	1944:45 eye inlay ii	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

- Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	149390	4.213 %	0.013 %
50	Sn	Tin	0	< 0.051 %	(0.0) %
30	Zn	Zinc	7271	0.1542 %	0.0026 %
82	Pb	Lead	4209	0.712 %	0.021 %
79	Au	Gold	4473	0.2866 %	0.0069 %
47	Ag	Silver	458579	93.15 %	0.12 %
26	Fe	Iron	3401	0.0951 %	0.0022 %
33	As	Arsenic	0	< 0.00051 %	(0.0) %
51	Sb	Antimony	0	< 0.051 %	(0.0) %
28	Ni	Nickel	533	0.0167 %	0.0016 %
24	Cr	Chromium	227	< 0.030 %	(0.0) %
25	Mn	Manganese	189	< 0.025 %	(0.0065) %
27	Co	Cobalt	72	< 0.020 %	(0.0) %
83	Bi	Bismuth	927	0.0422 %	0.0037 %
46	Pd	Palladium	1384	< 0.020 %	(0.0) %
78	Pt	Platinum	0	< 0.020 %	(0.0) %
80	Hg	Mercury	4350	0.2747 %	0.0077 %
Sum of concentration				98.96 %	

Cat. No. 11

Silver Hand-pin: National Museum of Ireland reg. no. P.634



Plate AII- 4 Measurement spot indicated by laser beam, Cat. No. 11

SPECTRO X-LabPro

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– Preset Sample Data

Sample Name	P.634 right finger	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/03/2009
Sample Status	A X X X X X	Date of Evaluation	03/03/2009

– Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	149051	3.179	% 0.010
50	Sn	Tin	13076	4.653	% 0.094
30	Zn	Zinc	14812	0.2364	% 0.0027
82	Pb	Lead	69406	8.454	% 0.039
79	Au	Gold	20249	0.9824	% 0.0093
47	Ag	Silver	499831	80.79	% 0.10
26	Fe	Iron	37036	0.8321	% 0.0051
33	As	Arsenic	9911	0.0465	% 0.0020
51	Sb	Antimony	0	< 0.051	% (0.0)
28	Ni	Nickel	229	< 0.015	% (0.0054)
24	Cr	Chromium	405	< 0.030	% (0.0)
25	Mn	Manganese	154	< 0.025	% (0.0)
27	Co	Cobalt	0	< 0.020	% (0.0)
83	Bi	Bismuth	2278	0.0574	% 0.0038
46	Pd	Palladium	1520	< 0.020	% (0.0)
78	Pt	Platinum	0	< 0.020	% (0.0)
80	Hg	Mercury	0	< 0.0010	% (0.0)
Sum of concentration				99.25	%

Preset Sample Data

Sample Name	P.634 side of head	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/03/2009
Sample Status	A X X X X X	Date of Evaluation	03/03/2009

Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	135765	3.225	% 0.010
50	Sn	Tin	10380	4.100	% 0.100
30	Zn	Zinc	10993	0.1950	% 0.0026
82	Pb	Lead	50639	6.956	% 0.038
79	Au	Gold	13580	0.7328	% 0.0087
47	Ag	Silver	470778	83.35	% 0.11
26	Fe	Iron	22379	0.5541	% 0.0044
33	As	Arsenic	5820	0.0252	% 0.0016
51	Sb	Antimony	0	< 0.051	% (0.0)
28	Ni	Nickel	217	< 0.015	% (0.0058)
24	Cr	Chromium	359	< 0.030	% (0.0)
25	Mn	Manganese	131	< 0.025	% (0.0)
27	Co	Cobalt	56	< 0.020	% (0.0)
83	Bi	Bismuth	1279	0.0320	% 0.0032
46	Pd	Palladium	1431	< 0.020	% (0.0)
78	Pt	Platinum	0	< 0.020	% (0.0)
80	Hg	Mercury	0	< 0.0010	% (0.0)
Sum of concentration				99.18	%

- Preset Sample Data

Sample Name	P.634 dec face	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/03/2009
Sample Status	A X X X X X	Date of Evaluation	03/03/2009

- Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	101896	3.110	% 0.011
50	Sn	Tin	9395	4.749	% 0.100
30	Zn	Zinc	9280	0.2102	% 0.0030
82	Pb	Lead	35296	6.448	% 0.041
79	Au	Gold	11545	0.7980	% 0.0100
47	Ag	Silver	370355	83.13	% 0.12
26	Fe	Iron	18001	0.5721	% 0.0050
33	As	Arsenic	3674	0.0175	% 0.0014
51	Sb	Antimony	0	< 0.051	% (0.0)
28	Ni	Nickel	287	< 0.015	% (0.0098)
24	Cr	Chromium	295	< 0.030	% (0.0)
25	Mn	Manganese	62	< 0.025	% (0.0)
27	Co	Cobalt	0	< 0.020	% (0.0)
83	Bi	Bismuth	959	0.0313	% 0.0035
46	Pd	Palladium	1137	< 0.020	% (0.0)
78	Pt	Platinum	0	< 0.020	% (0.0)
80	Hg	Mercury	0	< 0.0010	% (0.0)
Sum of concentration				99.08	%

- Preset Sample Data

Sample Name	P.634 cu alloy shank	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/03/2009
Sample Status	A X X X X X	Date of Evaluation	03/03/2009

- Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	3154611	71.77 %	0.06 %
50	Sn	Tin	63495	21.36 %	0.06 %
30	Zn	Zinc	58844	1.114 %	0.007 %
82	Pb	Lead	47714	4.683 %	0.025 %
79	Au	Gold	0	< 0.020 %	(0.0) %
47	Ag	Silver	1558	0.3142 %	0.0096 %
26	Fe	Iron	7971	0.2626 %	0.0054 %
33	As	Arsenic	9821	0.1329 %	0.0047 %
51	Sb	Antimony	231	0.097 %	0.013 %
28	Ni	Nickel	5697	0.1362 %	0.0032 %
24	Cr	Chromium	297	< 0.030 %	(0.0) %
25	Mn	Manganese	391	< 0.025 %	(0.022) %
27	Co	Cobalt	1778	- 0.0661 %	0.0038 %
83	Bi	Bismuth	274	< 0.0010 %	(0.0) %
46	Pd	Palladium	18	< 0.020 %	(0.0) %
78	Pt	Platinum	0	< 0.020 %	(0.0) %
80	Hg	Mercury	0	< 0.0010 %	(0.0) %
Sum of concentration				99.95 %	

Preset Sample Data

Sample Name:	P.634 upper shank	Dilution Material:	
Description:		Sample Mass (g):	8.0000
Method:	Museum	Dilution Mass (g):	0.0000
Job Number:	404	Dilution Factor:	1.0000
Sample State:	Alloys, 32 mm	Sample rotation:	No
Sample Type:	Gold	Date of Receipt:	03/03/2009
Sample Status:	A X X X X X	Date of Evaluation:	03/03/2009

Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	No. of Impulses	Concentration	Abs. Error
29	Cu	Copper	2134993	63.65 %	0.06 %
50	Sn	Tin	76687	32.58 %	0.08 %
30	Zn	Zinc	26466	0.6386 %	0.0066 %
82	Pb	Lead	10046	1.334 %	0.017 %
79	Au	Gold	0	< 0.020 %	(0.0) %
47	Ag	Silver	788	0.1813 %	0.0092 %
26	Fe	Iron	25250	1.150 %	0.010 %
33	As	Arsenic	2377	0.0364 %	0.0026 %
51	Sb	Antimony	205	0.107 %	0.015 %
28	Ni	Nickel	4052	0.1282 %	0.0034 %
24	Cr	Chromium	230	< 0.030 %	(0.0) %
25	Mn	Manganese	362	0.0267 %	0.0042 %
27	Co	Cobalt	1146	> 0.0514 %	0.0044 %
83	Bi	Bismuth	78	< 0.0010 %	(0.0) %
46	Pd	Palladium	40	< 0.020 %	(0.0) %
78	Pt	Platinum	0	< 0.020 %	(0.0) %
80	Hg	Mercury	0	< 0.0010 %	(0.0) %
Sum of concentration				100.00 %	

Cat. No. 14

Silver disc-headed pin: National Museum of Ireland reg. no. 6.w.26

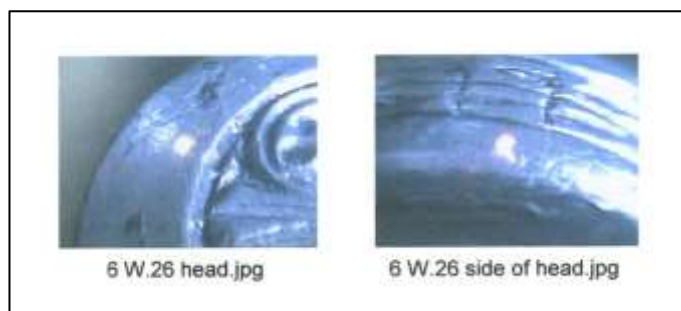


Plate AII- 5 Measurement spot indicated by laser beam, Cat. No. 14

SPECTRO X-LabPro

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— Preset Sample Data

Sample Name	6 W.26 side of head	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/03/2009
Sample Status	A X X X X X	Date of Evaluation	03/03/2009

— Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error	
29	Cu	Copper	197206	4.579	%	0.012 %
50	Sn	Tin	5580	2.154	%	0.073 %
30	Zn	Zinc	5285	0.0726	%	0.0017 %
82	Pb	Lead	33372	4.540	%	0.032 %
79	Au	Gold	30342	1.603	%	0.011 %
47	Ag	Silver	497599	86.02	%	0.11 %
26	Fe	Iron	3660	0.0862	%	0.0020 %
33	As	Arsenic	4623	0.0224	%	0.0014 %
51	Sb	Antimony	0	< 0.051	%	(0.0) %
28	Ni	Nickel	320	< 0.015	%	(0.0083) %
24	Cr	Chromium	308	< 0.030	%	(0.0) %
25	Mn	Manganese	31	< 0.025	%	(0.0) %
27	Co	Cobalt	69	< 0.020	%	(0.0) %
83	Bi	Bismuth	1719	0.0527	%	0.0038 %
46	Pd	Palladium	1511	< 0.020	%	(0.0) %
78	Pt	Platinum	0	< 0.020	%	(0.0) %
80	Hg	Mercury	189	< 0.0010	%	(0.0) %
Sum of concentration				99.14	%	

- Preset Sample Data

Sample Name	6 W.26 dec face	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/03/2009
Sample Status	A X X X X X	Date of Evaluation	03/03/2009

- Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	186554	4.994	% 0.013
50	Sn	Tin	6923	3.10	% 0.11
30	Zn	Zinc	2357	0.0278	% 0.0013
82	Pb	Lead	56291	8.765	% 0.044
79	Au	Gold	24782	1.512	% 0.012
47	Ag	Silver	399109	80.61	% 0.11
26	Fe	Iron	3209	0.0872	% 0.0021
33	As	Arsenic	11614	0.0800	% 0.0026
51	Sb	Antimony	0	< 0.051	% (0.0)
28	Ni	Nickel	329	< 0.015	% (0.0098)
24	Cr	Chromium	320	< 0.030	% (0.0)
25	Mn	Manganese	55	< 0.025	% (0.0)
27	Co	Cobalt	74	< 0.020	% (0.0)
83	Bi	Bismuth	2543	0.0897	% 0.0048
46	Pd	Palladium	1227	< 0.020	% (0.0)
78	Pt	Platinum	0	< 0.020	% (0.0)
80	Hg	Mercury	0	< 0.0010	% (0.0)
Sum of concentration				99.28	%

- Preset Sample Data

Sample Name	6 W.26 hed front ?	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/03/2009
Sample Status	A X X X X X	Date of Evaluation	03/03/2009

- Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper ?	685648	15.10 %	0.02 %
50	Sn	Tin	9878	3.587 %	0.093 %
30	Zn	Zinc	6507	0.0970 %	0.0023 %
82	Pb	Lead	29269	3.706 %	0.028 %
79	Au	Gold	20722	1.065 %	0.009 %
47	Ag	Silver	451989	75.56 %	0.10 %
26	Fe	Iron	1390	0.0319 %	0.0019 %
33	As	Arsenic	3589	0.0179 %	0.0014 %
51	Sb	Antimony	0	< 0.051 %	(0.0) %
28	Ni	Nickel	997	0.0241 %	0.0017 %
24	Cr	Chromium	346	< 0.030 %	(0.0) %
25	Mn	Manganese	121	< 0.025 %	(0.0) %
27	Co	Cobalt	329	< 0.020 %	(0.010) %
83	Bi	Bismuth	729	0.0157 %	0.0025 %
46	Pd	Palladium	1214	< 0.020 %	(0.0) %
78	Pt	Platinum	0	< 0.020 %	(0.0) %
80	Hg	Mercury	0	< 0.0010 %	(0.0) %
Sum of concentration				99.21 %	

- Preset Sample Data

Sample Name	6 W.26 shaft reverse	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/03/2009
Sample Status	A X X X X X	Date of Evaluation	03/03/2009

- Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error	
29	Cu	Copper	113639	2.559	%	0.009
50	Sn	Tin	4717	1.772	%	0.071
30	Zn	Zinc	4751	0.0609	%	0.0015
82	Pb	Lead	39011	5.159	%	0.033
79	Au	Gold	30705	1.567	%	0.011
47	Ag	Silver	524140	87.87	%	0.11
26	Fe	Iron	2891	0.0656	%	0.0017
33	As	Arsenic	4989	0.0215	%	0.0014
51	Sb	Antimony	0	< 0.051	%	(0.0)
28	Ni	Nickel	340	< 0.015	%	(0.0085)
24	Cr	Chromium	338	< 0.030	%	(0.0)
25	Mn	Manganese	53	< 0.025	%	(0.0)
27	Co	Cobalt	31	< 0.020	%	(0.0)
83	Bi	Bismuth	1558	0.0431	%	0.0035
46	Pd	Palladium	1546	< 0.020	%	(0.0)
78	Pt	Platinum	0	< 0.020	%	(0.0)
80	Hg	Mercury	214	< 0.0010	%	(0.0)
Sum of concentration				99.13	%	

Cat. No. 17

Bronze Disc-headed Pin: National Museum of Ireland reg. no. L.1963

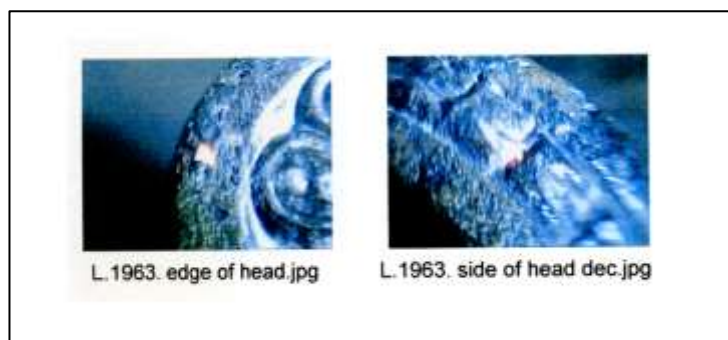


Plate AII- 6 Measurement spot indicated by laser beam, Cat. No 17

SPECTRO X-LabPro

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— Preset Sample Data

Sample Name	L1963:4 head edge	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

— Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	1622158	49.92 %	0.05 %
50	Sn	Tin	71147	33.00 %	0.09 %
30	Zn	Zinc	24459	0.6227 %	0.0066 %
82	Pb	Lead	85760	11.99 %	0.05 %
79	Au	Gold	0	< 0.020 %	(0.0) %
47	Ag	Silver	1641	0.411 %	0.012 %
26	Fe	Iron	80389	3.586 %	0.015 %
33	As	Arsenic	15726	0.2121 %	0.0064 %
51	Sb	Antimony	143	0.090 %	0.020 %
28	Ni	Nickel	2042	0.0675 %	0.0030 %
24	Cr	Chromium	224	< 0.030 %	(0.0) %
25	Mn	Manganese	403	0.0305 %	0.0042 %
27	Co	Cobalt	462	0.0209 %	0.0059 %
83	Bi	Bismuth	260	< 0.0010 %	(0.0) %
46	Pd	Palladium	21	< 0.020 %	(0.0) %
78	Pt	Platinum	0	< 0.020 %	(0.0) %
80	Hg	Mercury	0	< 0.0010 %	(0.0) %
Sum of concentration				99.96 %	

Preset Sample Data

Sample Name	L1963:4 side of head	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	510139	18.17	% 0.03
50	Sn	Tin	111105	56.52	% 0.12
30	Zn	Zinc	3002	0.0891	% 0.0039
82	Pb	Lead	112780	16.72	% 0.04
79	Au	Gold	7	< 0.020	% (0.0)
47	Ag	Silver	2746	0.747	% 0.015
26	Fe	Iron	119379	- 7.130	% 0.024
33	As	Arsenic	13106	0.1596	% 0.0055
51	Sb	Antimony	265	0.171	% 0.022
28	Ni	Nickel	2638	0.1009	% 0.0031
24	Cr	Chromium	334	< 0.030	% (0.0)
25	Mn	Manganese	831	0.0871	% 0.0053
27	Co	Cobalt	322	< 0.020	% (0.016)
83	Bi	Bismuth	349	< 0.0010	% (0.0)
46	Pd	Palladium	34	< 0.020	% (0.0)
78	Pt	Platinum	0	< 0.020	% (0.0)
80	Hg	Mercury	257	< 0.0010	% (0.0)
Sum of concentration				99.91	%

- Preset Sample Data

Sample Name	L1963:4 shaft nick	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

- Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	3685384	85.17 %	0.07 %
50	Sn	Tin	30407	11.03 %	0.05 %
30	Zn	Zinc	34841	0.6586 %	0.0063 %
82	Pb	Lead	20800	2.348 %	0.019 %
79	Au	Gold	0	< 0.020 %	(0.0) %
47	Ag	Silver	896	0.1899 %	0.0077 %
26	Fe	Iron	9308	0.2512 %	0.0048 %
33	As	Arsenic	1745	0.0175 %	0.0023 %
51	Sb	Antimony	72	< 0.051 %	(0.036) %
28	Ni	Nickel	6575	0.1607 %	0.0034 %
24	Cr	Chromium	301	< 0.030 %	(0.0) %
25	Mn	Manganese	413	< 0.025 %	(0.017) %
27	Co	Cobalt	2019	~ 0.0802 %	0.0042 %
83	Bi	Bismuth	100	< 0.0010 %	(0.0) %
46	Pd	Palladium	23	< 0.020 %	(0.0) %
78	Pt	Platinum	0	< 0.020 %	(0.0) %
80	Hg	Mercury	0	< 0.0010 %	(0.0) %
Sum of concentration				99.95 %	

- Preset Sample Data

Sample Name	L1963:4 abraded head	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

- Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	3258763	81.89 %	0.07 %
50	Sn	Tin	34689	13.60 %	0.05 %
30	Zn	Zinc	32817	0.6719 %	0.0063 %
82	Pb	Lead	23727	2.925 %	0.022 %
79	Au	Gold	0	< 0.020 %	(0.0) %
47	Ag	Silver	974	0.2165 %	0.0083 %
26	Fe	Iron	9148	0.2772 %	0.0052 %
33	As	Arsenic	3534	0.0459 %	0.0032 %
51	Sb	Antimony	141	0.075 %	0.014 %
28	Ni	Nickel	5727	0.1530 %	0.0035 %
24	Cr	Chromium	304	< 0.030 %	(0.0) %
25	Mn	Manganese	367	< 0.025 %	(0.017) %
27	Co	Cobalt	1691	~ 0.0705 %	0.0042 %
83	Bi	Bismuth	184	< 0.0010 %	(0.0) %
46	Pd	Palladium	25	< 0.020 %	(0.0) %
78	Pt	Platinum	0	< 0.020 %	(0.0) %
80	Hg	Mercury	0	< 0.0010 %	(0.0) %
Sum of concentration				99.94 %	

- Preset Sample Data

Sample Name	L1963:4 head dec	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

- Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	451143	16.15 %	0.03 %
50	Sn	Tin	105269	54.61 %	0.12 %
30	Zn	Zinc	4597	0.1369 %	0.0041 %
82	Pb	Lead	118078	18.00 %	0.05 %
79	Au	Gold	0	< 0.020 %	(0.0) %
47	Ag	Silver	3228	0.885 %	0.016 %
26	Fe	Iron	168362	- 9.843 %	0.028 %
33	As	Arsenic	13441	0.1568 %	0.0053 %
51	Sb	Antimony	71	< 0.051 %	(0.049) %
28	Ni	Nickel	421	0.0162 %	0.0023 %
24	Cr	Chromium	364	< 0.030 %	(0.0) %
25	Mn	Manganese	461	0.0471 %	0.0048 %
27	Co	Cobalt	399	< 0.020 %	(0.020) %
83	Bi	Bismuth	511	< 0.0010 %	(0.0) %
46	Pd	Palladium	24	< 0.020 %	(0.0) %
78	Pt	Platinum	0	< 0.020 %	(0.0) %
80	Hg	Mercury	428	< 0.0010 %	(0.0) %
Sum of concentration				99.91 %	

- Preset Sample Data

Sample Name	L1963:4 abraded shaft	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

- Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	5214371	84.27 %	0.07 %
50	Sn	Tin	48501	11.62 %	0.04 %
30	Zn	Zinc	51121	0.7115 %	0.0057 %
82	Pb	Lead	37524	2.327 %	0.014 %
79	Au	Gold	0	< 0.020 %	(0.0) %
47	Ag	Silver	1500	0.2625 %	0.0083 %
26	Fe	Iron	8781	0.1931 %	0.0043 %
33	As	Arsenic	5574	0.0771 %	0.0042 %
51	Sb	Antimony	142	< 0.051 %	(0.038) %
28	Ni	Nickel	10279	0.1687 %	0.0029 %
24	Cr	Chromium	580	~ 0.133 %	0.019 %
25	Mn	Manganese	837	0.0331 %	0.0036 %
27	Co	Cobalt	3325	~ 0.1071 %	0.0042 %
83	Bi	Bismuth	105	< 0.0010 %	(0.0) %
46	Pd	Palladium	50	< 0.020 %	(0.0) %
78	Pt	Platinum	0	< 0.020 %	(0.0) %
80	Hg	Mercury	0	< 0.0010 %	(0.0) %
Sum of concentration				99.95 %	

Cat. No. 19

Bronze Disc-headed Pin: National Museum of Ireland reg. no. w.201



Plate AII- 7 Measurement spot indicated by laser beam, Cat. No 19

SPECTRO X-LabPro

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Preset Sample Data

Sample Name	W.201 head enamel	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	221956	3.970	% 0.010
50	Sn	Tin	4913	2.589	% 0.045
30	Zn	Zinc	4577	0.1044	% 0.0031
82	Pb	Lead	1429861	92.77	% 0.09
79	Au	Gold	3159	0.1523	% 0.0057
47	Ag	Silver	80	0.0250	% 0.0100
26	Fe	Iron	38946	0.2380	% 0.0014
33	As	Arsenic	79370	< 0.00051	% (0.0)
51	Sb	Antimony	0	< 0.051	% (0.0)
28	Ni	Nickel	4189	0.0900	% 0.0021
24	Cr	Chromium	322	< 0.030	% (0.0)
25	Mn	Manganese	601	0.0400	% 0.0040
27	Co	Cobalt	481	< 0.020	% (0.014)
83	Bi	Bismuth	11537	< 0.0010	% (0.0)
46	Pd	Palladium	861	< 0.020	% (0.0)
78	Pt	Platinum	1072	< 0.020	% (0.0)
80	Hg	Mercury	2698	< 0.0010	% (0.0)
Sum of concentration				99.99	%

Preset Sample Data

Sample Name:	W.201 shaft	Dilution Material:	
Description:		Sample Mass (g):	8.0000
Method:	Museum	Dilution Mass (g):	0.0000
Job Number:	404	Dilution Factor:	1.0000
Sample State:	Alloys, 32 mm	Sample rotation:	No
Sample Type:	Gold	Date of Receipt:	03/04/2009
Sample Status:	A X X X X X	Date of Evaluation:	03/04/2009

Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	No. of Impulses	Concentration	Abs. Error
29	Cu	Copper	4333290	87.30 %	0.07 %
50	Sn	Tin	28720	9.062 %	0.039 %
30	Zn	Zinc	94996	1.577 %	0.008 %
82	Pb	Lead	13082	1.250 %	0.014 %
79	Au	Gold	0	< 0.020 %	(0.0) %
47	Ag	Silver	550	0.1078 %	0.0067 %
26	Fe	Iron	8501	0.1982 %	0.0042 %
33	As	Arsenic	1835	0.0233 %	0.0023 %
51	Sb	Antimony	103	< 0.050 %	(0.043) %
28	Ni	Nickel	7727	0.1621 %	0.0032 %
24	Cr	Chromium	499	> 0.088 %	0.013 %
25	Mn	Manganese	481	< 0.025 %	(0.018) %
27	Co	Cobalt	2544	> 0.0937 %	0.0043 %
83	Bi	Bismuth	130	< 0.0010 %	(0.00048) %
46	Pd	Palladium	26	< 0.020 %	(0.0) %
78	Pt	Platinum	0	< 0.020 %	(0.0) %
80	Hg	Mercury	0	< 0.0010 %	(0.0) %
Sum of concentration				100.00 %	

- Preset Sample Data

Sample Name	W.201 head tinning	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

- Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	4125231	83.91	% 0.07
50	Sn	Tin	39083	12.15	% 0.05
30	Zn	Zinc	91294	1.534	% 0.007
82	Pb	Lead	16625	1.545	% 0.015
79	Au	Gold	0	< 0.020	% (0.0)
47	Ag	Silver	800	0.1548	% 0.0073
26	Fe	Iron	10112	0.2586	% 0.0048
33	As	Arsenic	3184	0.0433	% 0.0028
51	Sb	Antimony	150	0.059	% 0.011
28	Ni	Nickel	7693	0.1628	% 0.0032
24	Cr	Chromium	377	< 0.030	% (0.0078)
25	Mn	Manganese	515	< 0.025	% (0.021)
27	Co	Cobalt	2460	- 0.0893	% 0.0042
83	Bi	Bismuth	102	< 0.0010	% (0.0)
46	Pd	Palladium	37	< 0.020	% (0.0)
78	Pt	Platinum	0	< 0.020	% (0.0)
80	Hg	Mercury	0	< 0.0010	% (0.0)
Sum of concentration				99.94	%

Preset Sample Data

Sample Name	W.201 shaft top	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	4352319	86.03 %	0.07 %
50	Sn	Tin	32640	10.01 %	0.04 %
30	Zn	Zinc	103379	1.691 %	0.008 %
82	Pb	Lead	15554	1.423 %	0.014 %
79	Au	Gold	0	< 0.020 %	(0.0) %
47	Ag	Silver	623	0.1203 %	0.0071 %
26	Fe	Iron	10548	0.2495 %	0.0045 %
33	As	Arsenic	2975	0.0408 %	0.0028 %
51	Sb	Antimony	135	0.053 %	0.011 %
28	Ni	Nickel	8121	0.1665 %	0.0032 %
24	Cr	Chromium	440	0.0516 %	0.0088 %
25	Mn	Manganese	663	0.0251 %	0.0031 %
27	Co	Cobalt	2409	~ 0.0874 %	0.0043 %
83	Bi	Bismuth	92	< 0.0010 %	(0.0) %
46	Pd	Palladium	29	< 0.020 %	(0.0) %
78	Pt	Platinum	0	< 0.020 %	(0.0) %
80	Hg	Mercury	0	< 0.0010 %	(0.0) %
Sum of concentration				99.95 %	

Cat. No. 25

Bronze Zoomorphic Penannular Brooch: National Museum of Ireland reg. no. P.735

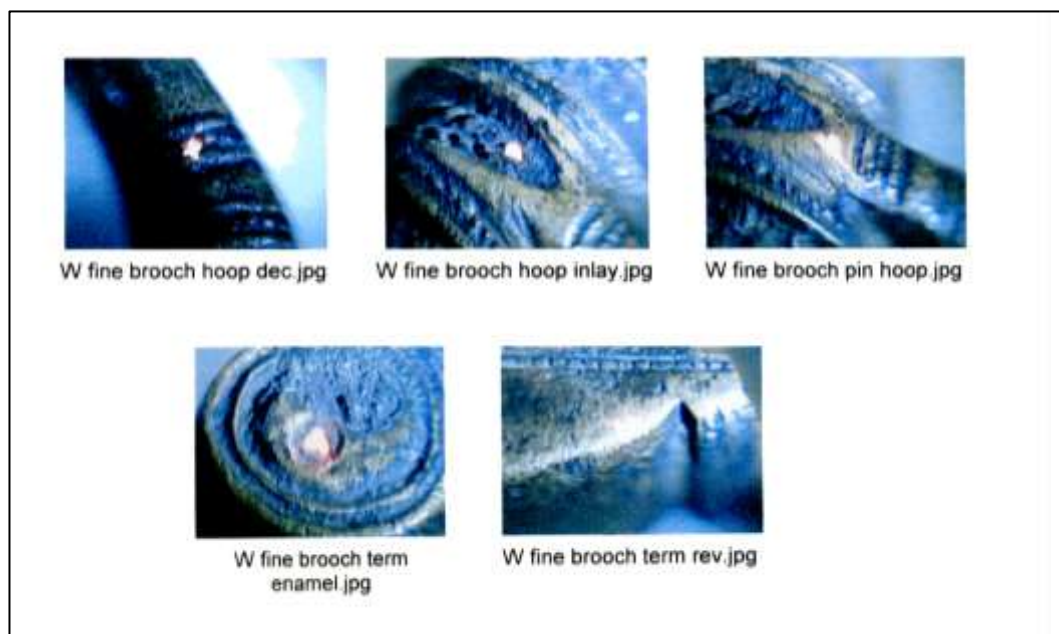


Plate AII- 8 Measurement spot indicated by laser beam, Cat. No 25

SPECTRO X-LabPro

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Preset Sample Data

Sample Name	W fine B brch hoop dec	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error	
29	Cu	Copper	2480333	66.94	%	0.06
50	Sn	Tin	57535	23.28	%	0.07
30	Zn	Zinc	24709	0.5443	%	0.0060
82	Pb	Lead	34803	4.372	%	0.028
79	Au	Gold	0	< 0.020	%	(0.0)
47	Ag	Silver	930	0.2091	%	0.0096
26	Fe	Iron	113968	4.244	%	0.015
33	As	Arsenic	5448	0.0700	%	0.0038
51	Sb	Antimony	32	< 0.051	%	(0.018)
28	Ni	Nickel	3838	0.1104	%	0.0033
24	Cr	Chromium	358	< 0.030	%	(0.0)
25	Mn	Manganese	1614	0.0974	%	0.0045
27	Co	Cobalt	1416	< 0.0594	%	0.0067
83	Bi	Bismuth	179	< 0.0010	%	(0.0)
46	Pd	Palladium	32	< 0.020	%	(0.0)
78	Pt	Platinum	0	< 0.020	%	(0.0)
80	Hg	Mercury	0	< 0.0010	%	(0.0)
Sum of concentration				99.95	%	

- Preset Sample Data

Sample Name	W fine B brch hoop inlay	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	2087688	63.80 %	0.06 %
50	Sn	Tin	44780	21.41 %	0.07 %
30	Zn	Zinc	22844	0.5704 %	0.0068 %
82	Pb	Lead	59419	8.934 %	0.042 %
79	Au	Gold	0	< 0.020 %	(0.0) %
47	Ag	Silver	644	0.1640 %	0.0100 %
26	Fe	Iron	118736	~ 4.608 %	0.016 %
33	As	Arsenic	10105	0.1340 %	0.0052 %
51	Sb	Antimony	31	< 0.051 %	(0.021) %
28	Ni	Nickel	2689	0.0884 %	0.0033 %
24	Cr	Chromium	313	< 0.030 %	(0.0) %
25	Mn	Manganese	2681	0.1669 %	0.0051 %
27	Co	Cobalt	968	~ 0.0452 %	0.0074 %
83	Bi	Bismuth	132	< 0.0010 %	(0.0) %
46	Pd	Palladium	32	< 0.020 %	(0.0) %
78	Pt	Platinum	0	< 0.020 %	(0.0) %
80	Hg	Mercury	0	< 0.0010 %	(0.0) %
Sum of concentration				99.94 %	

- Preset Sample Data

Sample Name	W fine B brch pin hoop	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

- Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	4202801	84.42 %	0.07 %
50	Sn	Tin	39251	12.03 %	0.04 %
30	Zn	Zinc	52043	0.8652 %	0.0063 %
82	Pb	Lead	17934	1.636 %	0.015 %
79	Au	Gold	0	< 0.020 %	(0.0) %
47	Ag	Silver	578	0.1112 %	0.0070 %
26	Fe	Iron	21119	0.5312 %	0.0056 %
33	As	Arsenic	2824	0.0373 %	0.0028 %
51	Sb	Antimony	45	< 0.051 %	(0.018) %
28	Ni	Nickel	7836	0.1641 %	0.0032 %
24	Cr	Chromium	401	< 0.030 %	(0.024) %
25	Mn	Manganese	841	0.0344 %	0.0033 %
27	Co	Cobalt	2283	~ 0.0823 %	0.0044 %
83	Bi	Bismuth	188	< 0.0010 %	(0.00083) %
46	Pd	Palladium	40	< 0.020 %	(0.0) %
78	Pt	Platinum	0	< 0.020 %	(0.0) %
80	Hg	Mercury	0	< 0.0010 %	(0.0) %
Sum of concentration				99.95 %	

Preset Sample Data

Sample Name	W fine B brch trtm enml	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	1797960	46.25 %	0.05 %
50	Sn	Tin	12539	6.148 %	0.042 %
30	Zn	Zinc	3765	0.0874 %	0.0053 %
82	Pb	Lead	340787	44.72 %	0.07 %
79	Au	Gold	0	< 0.020 %	(0.0) %
47	Ag	Silver	116	0.0304 %	0.0084 %
26	Fe	Iron	104447	2.417 %	0.009 %
33	As	Arsenic	23766	0.1150 %	0.0040 %
51	Sb	Antimony	0	< 0.051 %	(0.0) %
28	Ni	Nickel	2120	0.0605 %	0.0028 %
24	Cr	Chromium	334	< 0.030 %	(0.0) %
25	Mn	Manganese	1207	0.0602 %	0.0035 %
27	Co	Cobalt	1242	~ 0.0501 %	0.0062 %
83	Bi	Bismuth	1834	< 0.0010 %	(0.0) %
46	Pd	Palladium	91	< 0.020 %	(0.0) %
78	Pt	Platinum	0	< 0.020 %	(0.0) %
80	Hg	Mercury	0	< 0.0010 %	(0.0) %
Sum of concentration				99.94 %	

- Preset Sample Data

Sample Name	W fine B brch term rev	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

- Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	3200921	84.56 %	0.07 %
50	Sn	Tin	30566	12.83 %	0.05 %
30	Zn	Zinc	25984	0.5547 %	0.0062 %
82	Pb	Lead	11711	1.555 %	0.018 %
79	Au	Gold	0	< 0.020 %	(0.0) %
47	Ag	Silver	697	0.1606 %	0.0078 %
26	Fe	Iron	5647	0.1756 %	0.0048 %
33	As	Arsenic	1639	0.0213 %	0.0022 %
51	Sb	Antimony	47	< 0.051 %	(0.027) %
28	Ni	Nickel	5887	0.1657 %	0.0036 %
24	Cr	Chromium	335	< 0.030 %	(0.0) %
25	Mn	Manganese	508	< 0.025 %	(0.024) %
27	Co	Cobalt	1595	~ 0.0695 %	0.0041 %
83	Bi	Bismuth	229	0.0062 %	0.0017 %
46	Pd	Palladium	27	< 0.020 %	(0.0) %
78	Pt	Platinum	0	< 0.020 %	(0.0) %
80	Hg	Mercury	0	< 0.0010 %	(0.0) %
Sum of concentration				99.95 %	

Preset Sample Data

Sample Name	W fine B brch pin inlay	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	2503437	69.74 %	0.06 %
50	Sn	Tin	48413	20.69 %	0.07 %
30	Zn	Zinc	42252	0.9601 %	0.0071 %
82	Pb	Lead	39807	5.324 %	0.031 %
79	Au	Gold	0	< 0.020 %	(0.0) %
47	Ag	Silver	632	0.1482 %	0.0092 %
26	Fe	Iron	74311	2.707 %	0.012 %
33	As	Arsenic	6699	0.0882 %	0.0042 %
51	Sb	Antimony	57	< 0.051 %	(0.034) %
28	Ni	Nickel	4058	0.1207 %	0.0035 %
24	Cr	Chromium	302	< 0.030 %	(0.0) %
25	Mn	Manganese	1334	0.0777 %	0.0042 %
27	Co	Cobalt	1244	~ 0.0542 %	0.0060 %
83	Bi	Bismuth	153	< 0.0010 %	(0.0) %
46	Pd	Palladium	33	< 0.020 %	(0.0) %
78	Pt	Platinum	0	< 0.020 %	(0.0) %
80	Hg	Mercury	0	< 0.0010 %	(0.0) %
Sum of concentration				99.94 %	

Cat. No. 26

Bronze Zoomorphic Penannular Brooch: National Museum of Ireland reg. no. 1945.312



Plate AII- 9 Measurement spot indicated by laser beam, Cat. No.

SPECTRO X-LabPro

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— Preset Sample Data

Sample Name	1945:312 hoop	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

— Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error	
29	Cu	Copper	4167587	83.99	%	0.07
50	Sn	Tin	40500	12.40	%	0.05
30	Zn	Zinc	29203	0.4867	%	0.0058
82	Pb	Lead	17788	1.626	%	0.015
79	Au	Gold	0	< 0.020	%	(0.0)
47	Ag	Silver	1048	0.2007	%	0.0077
26	Fe	Iron	35187	0.8935	%	0.0067
33	As	Arsenic	2219	0.0274	%	0.0026
51	Sb	Antimony	98	< 0.051	%	(0.038)
28	Ni	Nickel	7437	0.1567	%	0.0031
24	Cr	Chromium	429	0.0401	%	0.0069
25	Mn	Manganese	780	0.0323	%	0.0034
27	Co	Cobalt	2167	~ 0.0779	%	0.0047
83	Bi	Bismuth	30	< 0.0010	%	(0.0)
46	Pd	Palladium	23	< 0.020	%	(0.0)
78	Pt	Platinum	0	< 0.020	%	(0.0)
80	Hg	Mercury	0	< 0.0010	%	(0.0)
Sum of concentration				99.97	%	

- Preset Sample Data

Sample Name	1945:312 term inlay	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

- Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	619760	22.45 %	0.03 %
50	Sn	Tin	21119	14.07 %	0.07 %
30	Zn	Zinc	4193	0.1334 %	0.0044 %
82	Pb	Lead	328403	61.86 %	0.09 %
79	Au	Gold	0	< 0.020 %	(0.0) %
47	Ag	Silver	368	0.1224 %	0.0096 %
26	Fe	Iron	25085	0.9109 %	0.0070 %
33	As	Arsenic	26292	0.1489 %	0.0045 %
51	Sb	Antimony	0	< 0.051 %	(0.0) %
28	Ni	Nickel	1402	0.0566 %	0.0027 %
24	Cr	Chromium	176	< 0.030 %	(0.0) %
25	Mn	Manganese	389	0.0279 %	0.0031 %
27	Co	Cobalt	218	< 0.020 %	(0.012) %
83	Bi	Bismuth	1850	< 0.0010 %	(0.0) %
46	Pd	Palladium	30	< 0.020 %	(0.0) %
78	Pt	Platinum	0	< 0.020 %	(0.0) %
80	Hg	Mercury	4124	0.1720 %	0.0047 %
Sum of concentration				99.97 %	

- Preset Sample Data

Sample Name	1945:312 term reverse	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

- Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	4016764	82.82 %	0.07 %
50	Sn	Tin	42406	13.25 %	0.05 %
30	Zn	Zinc	27327	0.4653 %	0.0057 %
82	Pb	Lead	18804	1.761 %	0.016 %
79	Au	Gold	0	< 0.020 %	(0.0) %
47	Ag	Silver	1136	0.2195 %	0.0079 %
26	Fe	Iron	36868	0.9704 %	0.0070 %
33	As	Arsenic	2089	0.0246 %	0.0025 %
51	Sb	Antimony	71	< 0.051 %	(0.028) %
28	Ni	Nickel	6943	0.1499 %	0.0032 %
24	Cr	Chromium	440	0.0458 %	0.0075 %
25	Mn	Manganese	858	0.0368 %	0.0035 %
27	Co	Cobalt	2176	- 0.0788 %	0.0048 %
83	Bi	Bismuth	2	< 0.0010 %	(0.0) %
46	Pd	Palladium	24	< 0.020 %	(0.0) %
78	Pt	Platinum	0	< 0.020 %	(0.0) %
80	Hg	Mercury	1216	0.0653 %	0.0042 %
Sum of concentration				99.91 %	

Preset Sample Data

Sample Name	1945:312 pin	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	4722297	84.25 %	0.07 %
50	Sn	Tin	45056	12.01 %	0.04 %
30	Zn	Zinc	31766	0.4767 %	0.0056 %
82	Pb	Lead	22815	1.712 %	0.014 %
79	Au	Gold	0	< 0.020 %	(0.0) %
47	Ag	Silver	1190	0.2142 %	0.0077 %
26	Fe	Iron	33461	0.7826 %	0.0062 %
33	As	Arsenic	2950	0.0380 %	0.0030 %
51	Sb	Antimony	61	< 0.051 %	(0.019) %
28	Ni	Nickel	8466	0.1558 %	0.0030 %
24	Cr	Chromium	582	~ 0.134 %	0.018 %
25	Mn	Manganese	923	0.0368 %	0.0035 %
27	Co	Cobalt	2872	~ 0.0964 %	0.0047 %
83	Bi	Bismuth	0	< 0.0010 %	(0.0) %
46	Pd	Palladium	37	< 0.020 %	(0.0) %
78	Pt	Platinum	0	< 0.020 %	(0.0) %
80	Hg	Mercury	194	0.00255 %	0.00087 %
Sum of concentration				99.93 %	

Cat. No. 30a

Bronze anthropomorphic mount: National Museum of Ireland reg. no. W.24a



Plate AII- 10 Measurement spot indicated by laser beam, Cat. No. 30a

SPECTRO X-LabPro

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– Preset Sample Data

Sample Name	W.24 R Shan head nose	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

– Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	4761046	82.37 %	0.06 %
50	Sn	Tin	42386	11.19 %	0.04 %
30	Zn	Zinc	32676	0.4809 %	0.0056 %
82	Pb	Lead	42655	3.099 %	0.017 %
79	Au	Gold	0	< 0.020 %	(0.0) %
47	Ag	Silver	5211	0.932 %	0.012 %
26	Fe	Iron	61060	1.345 %	0.007 %
33	As	Arsenic	4094	0.0464 %	0.0036 %
51	Sb	Antimony	185	0.0593 %	0.0097 %
28	Ni	Nickel	10132	0.1810 %	0.0030 %
24	Cr	Chromium	560	~ 0.119 %	0.017 %
25	Mn	Manganese	740	0.0285 %	0.0034 %
27	Co	Cobalt	3179	~ 0.1045 %	0.0052 %
83	Bi	Bismuth	270	< 0.0010 %	(0.0) %
46	Pd	Palladium	32	< 0.020 %	(0.0) %
78	Pt	Platinum	0	< 0.020 %	(0.0) %
80	Hg	Mercury	0	< 0.0010 %	(0.0) %
Sum of concentration				99.96 %	

Preset Sample Data

Sample Name	W.24 R Shan forehead	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	2403447	67.48 %	0.06 %
50	Sn	Tin	37805	16.73 %	0.05 %
30	Zn	Zinc	17102	0.3915 %	0.0061 %
82	Pb	Lead	49613	6.947 %	0.036 %
79	Au	Gold	0	< 0.020 %	(0.0) %
47	Ag	Silver	4825	1.146 %	0.015 %
26	Fe	Iron	195497	- 6.697 %	0.018 %
33	As	Arsenic	9696	0.1285 %	0.0048 %
51	Sb	Antimony	161	0.101 %	0.019 %
28	Ni	Nickel	4108	0.1240 %	0.0034 %
24	Cr	Chromium	403	< 0.030 %	(0.011) %
25	Mn	Manganese	2345	0.1269 %	0.0044 %
27	Co	Cobalt	1489	- 0.0653 %	0.0086 %
83	Bi	Bismuth	103	< 0.0010 %	(0.0) %
46	Pd	Palladium	34	< 0.020 %	(0.0) %
78	Pt	Platinum	0	< 0.020 %	(0.0) %
80	Hg	Mercury	0	< 0.0010 %	(0.0) %
Sum of concentration				99.95 %	

Preset Sample Data

Sample Name	W.24 R Shan forehead ii	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	883640	41.87 %	0.06 %
50	Sn	Tin	30418	22.97 %	0.10 %
30	Zn	Zinc	4220	0.1586 %	0.0062 %
82	Pb	Lead	31926	8.195 %	0.057 %
79	Au	Gold	0	< 0.020 %	(0.0) %
47	Ag	Silver	3692	1.324 %	0.022 %
26	Fe	Iron	442090	~ 24.62 %	0.04 %
33	As	Arsenic	14723	~ 0.2717 %	0.0057 %
51	Sb	Antimony	121	0.137 %	0.038 %
28	Ni	Nickel	1035	0.0537 %	0.0036 %
24	Cr	Chromium	487	~ 0.0870 %	0.0097 %
25	Mn	Manganese	1384	0.1116 %	0.0052 %
27	Co	Cobalt	1451	~ 0.098 %	0.018 %
83	Bi	Bismuth	0	< 0.0010 %	(0.0) %
46	Pd	Palladium	50	< 0.020 %	(0.0) %
78	Pt	Platinum	0	< 0.020 %	(0.0) %
80	Hg	Mercury	50	< 0.0010 %	(0.0) %
Sum of concentration				99.90 %	

Cat. No. 30b

Bronze Anthropomorphic Mount: National Museum of Ireland reg. no. W.24b



Plate AII- 11 Measurement spot indicated by laser beam, Cat. No. 30b

SPECTRO X-LabPro

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– Preset Sample Data

Sample Name	W.24 R Shan inlay strp ii	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

– Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	1571813	88.64 %	0.09 %
50	Sn	Tin	7293	6.766 %	0.058 %
30	Zn	Zinc	29175	1.290 %	0.011 %
82	Pb	Lead	6733	2.180 %	0.031 %
79	Au	Gold	0	< 0.020 %	(0.0) %
47	Ag	Silver	329	0.1450 %	0.0096 %
26	Fe	Iron	10369	0.5925 %	0.0084 %
33	As	Arsenic	1565	0.0319 %	0.0027 %
51	Sb	Antimony	61	0.088 %	0.022 %
28	Ni	Nickel	2610	0.1609 %	0.0052 %
24	Cr	Chromium	213	< 0.030 %	(0.0) %
25	Mn	Manganese	176	< 0.025 %	(0.013) %
27	Co	Cobalt	772	~ 0.0648 %	0.0062 %
83	Bi	Bismuth	83	0.0027 %	0.0014 %
46	Pd	Palladium	7	< 0.020 %	(0.0) %
78	Pt	Platinum	0	< 0.020 %	(0.0) %
80	Hg	Mercury	0	< 0.0010 %	(0.0) %
Sum of concentration				99.98 %	

Preset Sample Data

Sample Name	W.24 R Shan inlay strp ii	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs. Error
29	Cu	Copper	1571813	88.64 %	0.09 %
50	Sn	Tin	7293	6.766 %	0.058 %
30	Zn	Zinc	29175	1.290 %	0.011 %
82	Pb	Lead	6733	2.180 %	0.031 %
79	Au	Gold	0	< 0.020 %	(0.0) %
47	Ag	Silver	329	0.1450 %	0.0096 %
26	Fe	Iron	10369	0.5925 %	0.0084 %
33	As	Arsenic	1565	0.0319 %	0.0027 %
51	Sb	Antimony	61	0.088 %	0.022 %
28	Ni	Nickel	2610	0.1609 %	0.0052 %
24	Cr	Chromium	213	< 0.030 %	(0.0) %
25	Mn	Manganese	176	< 0.025 %	(0.013) %
27	Co	Cobalt	772	- 0.0648 %	0.0062 %
83	Bi	Bismuth	83	0.0027 %	0.0014 %
46	Pd	Palladium	7	< 0.020 %	(0.0) %
78	Pt	Platinum	0	< 0.020 %	(0.0) %
80	Hg	Mercury	0	< 0.0010 %	(0.0) %
Sum of concentration				99.98 %	

Preset Sample Data

Sample Name	W.24 Shannon strip ii	Dilution Material	
Description		Sample Mass (g)	8.0000
Method	Museum	Dilution Mass (g)	0.0000
Job Number	404	Dilution Factor	1.0000
Sample Type	Alloys, 32 mm	Sample rotation	No
Sample State	Gold	Date of Receipt	03/04/2009
Sample Status	A X X X X X	Date of Evaluation	03/04/2009

Results

The error is the statistical error with 1 sigma confidence interval

Z	Symbol	Element	Netto Counts	Concentration	Abs Error	
29	Cu	Copper	5056332	89.84	%	0.07
50	Sn	Tin	22026	6.222	%	0.031
30	Zn	Zinc	93207	1.385	%	0.007
82	Pb	Lead	14764	1.215	%	0.013
79	Au	Gold	0	< 0.020	%	(0.0)
47	Ag	Silver	973	0.1832	%	0.0072
26	Fe	Iron	28791	0.5472	%	0.0049
33	As	Arsenic	2226	0.0303	%	0.0026
51	Sb	Antimony	221	0.0800	%	0.0100
28	Ni	Nickel	9749	0.1780	%	0.0031
24	Cr	Chromium	490	~ 0.089	%	0.015
25	Mn	Manganese	913	0.0279	%	0.0027
27	Co	Cobalt	3203	~ 0.1130	%	0.0050
83	Bi	Bismuth	253	0.0049	%	0.0015
46	Pd	Palladium	49	< 0.020	%	(0.0)
78	Pt	Platinum	0	< 0.020	%	(0.0)
80	Hg	Mercury	0	< 0.0010	%	(0.0)
Sum of concentration				99.91	%	

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