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Beaded Rims on Silver Plate Vessels in Late Roman Britain and Beyond[1]

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ABSTRACT

Beaded rims are a characteristic feature of late Roman silver plate vessels, many of which have been found in British treasures including Mildenhall and Traprain Law. This paper discusses how these beaded rims provide insights into the production of silver plate, adding to what little is known of silver plate workshops. Vessels in the Mildenhall treasure provide a case study, after which measurements from beaded rims on other treasures from Roman Britain and the western Roman Empire are compared and discussed.

Keywords: silver plate; vessels; workshops; Late Antiquity

INTRODUCTION

This paper expands upon some of the research presented in the publication of the Mildenhall treasure where it was noted that the beaded rims of some vessels could be used to identify groups within the treasure produced at the same time and in the same place.[2] That publication concerned itself primarily with Mildenhall, while this paper extends its reach to other examples of silver plate – primarily those used for dining – that have been found across the Roman Empire.

Before turning to beaded rims, we will provide some brief background on terminology and materials with which this paper is concerned. 'Silver plate' is the technical term used to refer to objects made from 'plates' of sheet silver, usually formed into vessels and often decorated in flat or high relief and embellished with gilding, niello and sometimes inscriptions. Vessel forms include platters, plates, bowls and dishes, which are usually circular but can be rectangular, square, or even triangular; these are generally thought to have been used as serving vessels for shared or individual dining. Other vessels associated with liquids, either for drinking or washing, include jugs, ewers, beakers and and basins. 'Specialised' vessels are also known,

[1] This paper is based upon a presentation given at the Centre for Baltic Studies in Schleswig, Germany, on 8 December 2017 as part of the 'Silver, Status and Society' AHRC Subject Area Specialist Network workshop.
[2] Hobbs 2016, 264.

such as spice pots, plates for serving fish and even 'trick' vessels.[3] Decoration employed a range of tools – such as chisels and punches – which were used to chase designs to create relief, engrave the metal to create fine detail, or scrape the metal to remove unwanted silver. The repoussé technique was also used in some instances.[4] Utensils, particular spoons, but also strainers and toilet implements, also survive. The end products represent some of the finest 'utilitarian' items of material culture to survive from the ancient world. In Roman Britain, very fine and well-crafted objects of silver plate are characteristic of the 'Golden Age' of the period, namely the fourth century: examples include the Corbridge Lanx, the Hoxne treasure, the Thetford and Mildenhall treasures (all in the British Museum) or, in whole and broken form (*Hacksilber*),[5] the treasure from Traprain Law (National Museums of Scotland), to name but a handful of examples. Few discoveries of silver plate have been satisfactorily excavated, with the exception of the Hoxne treasure, but it is clear that some were assemblages of silver plate used for dining before being secreted in the ground (particularly the Mildenhall treasure).[6]

The rims of silver plate vessels are an important way of understanding typological developments of these objects in the late Roman period, namely the third to fifth centuries. Often the rims of these vessels were left plain and unembellished, but for plates, platters, bowls, ewers and other types of vessel, the rims (or sometimes bases) were regularly worked using different types of tools to add an extra level of embellishment to their respective vessels, irrespective of the degree to which the main body of the vessel itself was decorated. On vessels dating to the third century, the majority of which have been discovered in France,[7] the 'bead-and-reel' rim type is most commonly seen – meaning a spherical moulding combined with an ovoid 'reel' (so-named because these resemble cotton reels).[8] This is normally a single bead-and-reel, but sometimes is more complex, with double beads used.[9]

These relatively complex rims were subsequently replaced by single spherical beads, with the reel element eliminated and the size of bead increased. The Kaiseraugst treasure provides a useful barometer, since it has a well-defined deposition date of A.D. 353;[10] only six vessels out of 38 feature beaded rims (*c.* 16 per cent). In contrast, of the 15 vessels in the Mildenhall treasure, 12 of these (or 80 per cent) are beaded, and its likely date of deposition is the early fifth century, with most of its vessels made in the fourth century. Of the 14 silver plate vessels in the 'Seuso' treasure, which probably dates to the late fourth to early fifth centuries A.D.,[11] of the 11 vessels that have rims, 10 have spherical beading (*c.* 90 per cent). Therefore the introduction of single spherical beading to the rims of vessels can be inferred as an early fourth-century development which became the dominant rim type in the mid to late fourth century.

Why the workshops that produced silver plate decided to dispense with the more complex bead-and-reel type decoration and switch to spherical beading is not known (with the proviso that the bead-and-reel style is still sometimes found on vessels probably made in the fourth century – for instance, the geometric platter in the 'Seuso' treasure with a double bead-and-reel rim).[12] If beading was supposed to denote certain types of vessel, it is not entirely clear what. It may be

[3] Piperatoria in the Hoxne treasure (Johns 2010, cats. 33-6); a fish serving plate and a 'trick' vessel in the Vinkovci treasure (Vulić *et al.* 2017, cats. 6 and 9).

[4] For a discussion of some of the decorative techniques used, see Lang in Hobbs 2016, 245–6.

[5] The preferred term for deliberately broken pieces of silver plate: see Johns 1996.

[6] Hobbs 2016.

[7] Baratte and Painter 1989; Hobbs 2006, 109-10.

[8] For example, a platter from Chatuzange (Baratte and Painter 1989, cat. 190). The terminology is taken from a type of moulding seen in Classical architecture.

[9] For example, vessels from the Chaourse treasure (Baratte and Painter 1989, cats. 62–73).

[10] A summary of the arguments used to justify the burial date is provided by Guggisberg in Guggisberg and Kaufmann-Heinimann 2003, 303–4.

[11] Mango and Bennett 1994, 11.

[12] Mango and Bennett 1994, cat. 4.

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significant that vessels that can be confidently characterised as imperial *largitio* (for instance, the Constans *decennalia* platter in the Kaiseraugst treasure,[13] or the so-called 'Madrid' *missorium*[14]) do not feature beaded rims, while a number of platters of similar form and probably similar date – for instance, the niello platter from the Mildenhall treasure, or the eponymous 'Seuso' platter – do. As the latter two vessels were probably used for dining, then this may hint at beading being reserved for vessels intended for this use. However, the situation is more ambiguous because certain flanged bowls could be examples of *largitio* used by high-ranking members of late Roman society,[15] but these bear both plain and beaded rims.[16] Contemporary illustrations do not clarify the distinction either: silver vessels with beaded rims certainly appear in the *al fresco* dining scenes (picnics) of the hunt mosaic at the Sicilian villas of Caddeddi[17] and Piazza Armerina,[18] supporting the notion of beads being equated with *argentum escarium*, but they can also be found in other contexts, such as the beaded-rim vessels being offered to the Christ child in the relief from Trani, Italy, which might reasonably be considered as a form of *largitio*,[19] or those being brandished by the men of senatorial rank on the *venatio* diptych in Liverpool.[20] All this really tells us is that although the beads might have been intended to signify an intended use, the surviving evidence from the vessels themselves and contemporary illustrations does not give us a definite answer. Nevertheless, it is clear that the addition of beads to rims of vessels made of silver plate in the late Roman period was evidently an important element of distinguishing them as 'high-status' objects, intended for use by the wealthier ranks of late Roman society.

HOW BEADED RIMS WERE FORMED

In a series of experiments conducted by Lang and Holmes during the 1980s,[21] it was established that these distinctive spherical beads were made by using a punch and a spherical die (FIG. 1). As shown, the bent rim of the vessel was placed on to the die and the appropriately shaped punch struck such that the metal would be forced into the receiving die. The process was repeated around the rim (FIG. 1, A3) and the rim then folded down (A4). The resultant characteristic beads are exemplified by a flanged bowl in the Mildenhall treasure (FIG. 1, B).[22] Whether by bad luck or poor judgement of spacing, errors could sometimes result, leading to spurs of metal between beads, as shown in an example from the Kaiseraugst treasure (FIG. 1, C).[23]

Because beads were therefore formed in a not dissimilar manner to the striking of coinage, it leads to the possibility that the 'dies' used to make beads on one vessel could be 'die-linked' to those used on another. If this were possible, it would potentially help to unlock a major problem with the study of late Roman silver plate: we know very little about how its production was organised and where this took place. While mint marks tell us where coins were struck, a regular series of control marks on silver vessels, sometimes providing details of workshop locations, were not in use until the Byzantine period, from the reign of Anastasius

[13] Guggisberg and Kaufmann-Heinimann 2003, cat. 59.
[14] Almagro-Gorbea *et al*. 2000.
[15] Or might be the types of 'small . . . silver bowls' that are referred to by Symmachus in his lists of gifts (*Ep*. 7.76), in which case they are vessels that are proscribed for use by the senatorial class as well as, or alongside, the emperor himself (Hobbs 2022).
[16] Hobbs 2022.
[17] Wilson 2016.
[18] Dunbabin 2003, fig. 86.
[19] Hobbs 2016, 269, pl. 408.
[20] Gibson 1994, no. 7.
[21] Lang and Holmes 1983.
[22] Hobbs 2016, cat. 5.
[23] After Guggisberg and Kauffmann-Heinimann 2003, cat. 84 and fig. 83.

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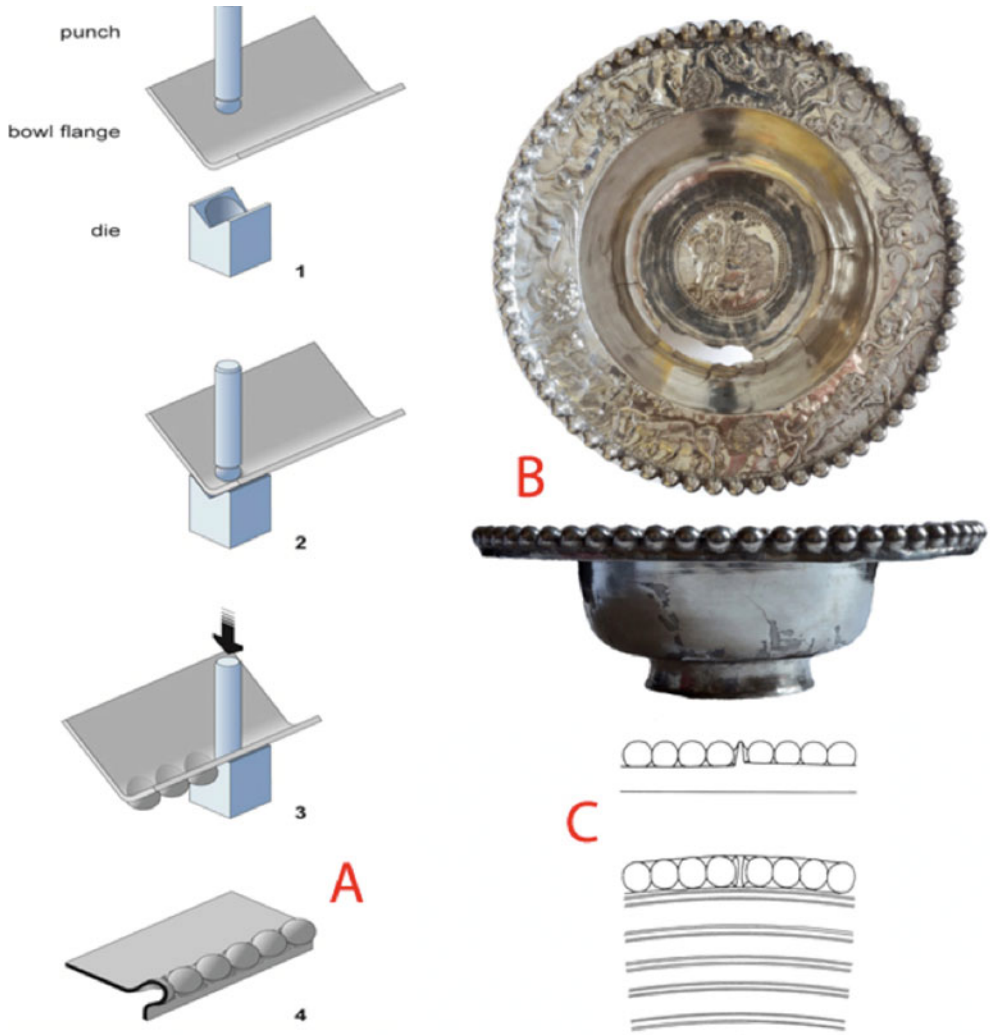

FIG. 1. The creation of beaded rims on late Roman silver plate. (*A & B © Trustees of the British Museum*)

(A.D. 491–518) onwards,[24] meaning that any method of improving our understanding of these workshops must be of benefit. Before this date, the only knowledge we have of the production sites for late Roman plate derives from graffiti on the reverses of some vessels and other supplementary evidence: only ten places of production are known, primarily located along the Rhine/Danube frontier.[25] Vessels with spherical beaded rims have been discovered all over the western Empire, and there is little correlation with the production places. It is also worthy of note that none of the pieces of silver plate found in Britain, many of which feature beaded rims, can be linked with any of these production places through inscriptions or other evidence.

[24] Dodd 1961.
[25] For further discussion, see Hobbs 2016, ch. 15 and in particular table 27 and pl. 406.

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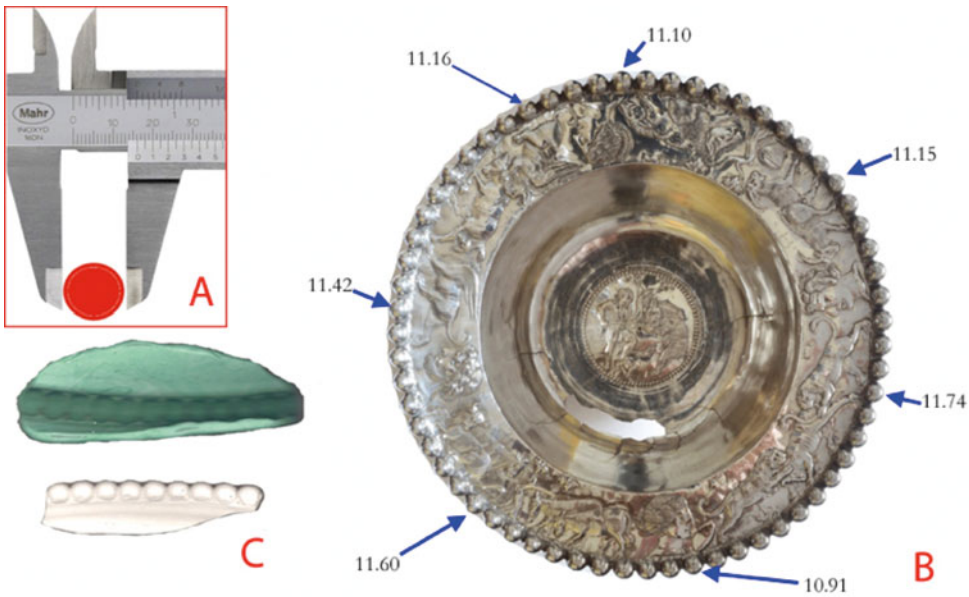

FIG. 2. Techniques used for assessing average bead size on vessels. (© *Trustees of the British Museum*)

This is, however, hardly surprising, since material culture in Late Antiquity moved around a great deal, and silver plate is likely to have remained in circulation for long periods and in many cases changed hands with great regularity. If we return to coinage comparisons, the Hoxne treasure was dominated by coins struck at mints relatively close at hand (Trier and Lyon), but also included some coins struck as far away as Antioch and Nicomedia.[26] This distribution pattern therefore shows how difficult it is to make connections between places of production, places of use and eventual place of burial; the latter two might also not necessarily be closely linked in spatial terms either.[27]

The possibility of identifying 'die links' between the spherical beads on different vessels, and its potential for shedding some light on the production of vessels made from silver plate, therefore led to the recording in detail of the sizes of beads on vessels in the Mildenhall treasure, as part of the research that led to its publication.[28] The main method for characterising beads, as they tend to be rather featureless, was to establish their 'mean diameter'. As shown in FIGURE 2, this began with the use of a pair of digital calipers to record these diameters (A). On vessels with at least 50 beads around the rim, the diameter of every tenth bead was recorded (FIG. 2B), while on vessels with fewer than 50 beads every fifth bead was sampled. A method was then sought of making facsimiles of the beads themselves, in order to retain a record of the beads that was independent of the vessels to which they belonged, particularly useful when examining comparanda remote from their host institution. This was carried out using a special type of

[26] Guest 2005, 98 and table 44.

[27] As regards the ore sources – i.e. where the metal came from that formed the silver plate in the first place – this is also an area of study very much in its infancy. Some work on lead isotopes has been conducted (e.g. by Hungarian scholars looking at the 'Seuso' treasure, and Croatian colleagues examining the Vinkovci treasure discovered in 2013). Although potentially fruitful, this research is at an early stage, and may not in any case offer any definitive answers, since silver plate is likely to have been extensively recycled.

[28] Hobbs 2016.

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TABLE 1. EXAMPLES OF LATE ROMAN SILVER VESSELS WITH BEADED RIMS, ARRANGED IN DESCENDING ORDER BY THEIR MEAN BEAD SIZE

No.	Provenance	Vessel	Inv. no.	Total beads	Rim d.	Mean (mm)	Bead/ rim (%)
1	Traprain Law	circular platter? (fragment only)	GVA43	5 survive	n/a	17.52	n/a
2	Traprain Law	circular platter (fragment only)	GVA64	13 survive	n/a	12.60	n/a
3	Traprain Law	square vessel (fragment only)	GVA88	6 survive	n/a	12.57	n/a
4	Traprain Law	circular platter? (two fragments only)	GVA63	13 survive	n/a	12.35	n/a
5	Mildenhall	Bacchic platter	1946 1007.1	135	605	12.15	4.0
6	Mildenhall	niello platter	1946 1007.4	128	556	11.63	4.2
7	Mildenhall	large flanged bowl	1946 1007.5	63	297	11.33	7.6
8	Coleraine	piece of *Hacksilber*	1855, 0815, 16	9	n/a	11.19	n/a
9	Coleraine	piece of *Hacksilber*	1855, 0815, 18	9	n/a	11.16	n/a
10	Coleraine	piece of *Hacksilber*	1855, 0815, 20	4	n/a	11.15	n/a
11	Coleraine	piece of *Hacksilber*	1855, 0815, 15	6	n/a	10.32	n/a
12	Mildenhall	large flanged bowl	1946 1007.8	66	269	10.23	7.6
13	Mildenhall	large flanged bowl	1946 1007.6	67	266	10.01	7.6
14	Mildenhall	large flanged bowl	1946 1007.7	66	266	9.95	7.6
15	Traprain Law	square vessel (two fragments only)	GVA86	42 survive	n/a	9.69	n/a
16	Coleraine	*Hacksilber*	1855, 0815, 19	5	n/a	9.67	n/a
17	Traprain Law	flanged bowl (two fragments only)	GVA37	12 survive	n/a	9.04	n/a
18	Mileham	square platter	1840, 1111.1	134	375	8.95	4.8
19	Traprain Law	square vessel (fragment only)	GVA78	20 survive	n/a	8.68	n/a
20	Traprain Law	deep bowl	GVA21	26 survive	n/a	8.65	n/a
21	Vinkovci	shepherd platter	cat. 3	193	700	8.65	2.4
22	Traprain Law	flanged bowl	GVA23	50	167	8.35	10.0
23	'Seuso'	hunting platter	cat. 1	254	705	8.28	2.4
24	Traprain Law	flanged bowl	GVA27	42	152	8.27	10.8
25	Traprain Law	flanged bowl	GVA24	61	159	8.21	10.4
26	Polgardi	triton/nymph: leg B;griffin to foot, left	78. 1878	64	n/a	7.75	n/a
27	Kaiseraugst	large platter	1962.13847(cat. 84)	198	483	7.70	3.0
28	Polgardi	triton/nymph: leg B; griffin to foot, right	78.1878	68	n/a	7.63	n/a
29	Polgardi	nymph/triton: leg A; griffin to foot, left	78.1878	64	n/a	7.46	n/a
30	Polgardi	nymph/triton: leg A; griffin to foot, right	78.1878	64	n/a	7.37	n/a
31	Kaiseraugst	large platter	1962.5.a.b.(cat. 58)	189	483	7.32	3.0
32	Vinkovci	deep platter withlion head handles	cat. 7	194	480	7.23	3.0
33	'Seuso'	geometric ewer 'B' (rim)	cat. 12	41	110	6.93	12.6
34	Sucidava	small bowl	33.712	43	145	6.89	9.6
35	'Seuso'	geometric ewer 'A' (base)	cat. 11	?	135	6.84	10.2
36	Polgardi	triton/nymph: leg B;plate to griffin, left	78. 1878	44	n/a	6.57	n/a
37	Traprain Law	triangular bowl	GVA35	42	n/a	6.52	n/a

Continued

TABLE 1. CONTINUED

No.	Provenance	Vessel	Inv. no.	Total beads	Rim d.	Mean (mm)	Bead/ rim (%)
38	'Seuso'	geometric ewer 'B' (base)	cat. 12	53	135	6.48	9.6
39	Mildenhall	Bacchic plate	1946 1007.3	64	185	6.46	7.0
40	Traprain Law	flanged bowl	GVA26	44	140	6.40	9.2
41	Polgardi	nymph/triton: leg A; plate to griffin, right	78. 1878	45	n/a	6.38	n/a
42	Mildenhall	pedestalled plate	1946 1007.13	54	114	6.36	11.2
43	Polgardi	triton/nymph: leg B; plate to griffin, right	78. 1878	45	n/a	6.34	n/a
44	Vinkovci	platter with scallopshell rim	cat. 5	146	322	6.33	3.8
45	Polgardi	nymph/triton: leg A; plate to griffin, left	78. 1878	45	n/a	6.29	n/a
46	Mildenhall	pedestalled plate	1946 1007.14	54	114	6.24	11.0
47	Mildenhall	flanged bowl	1946 1007.10	77	171	6.20	7.2
48	'Seuso'	geometric ewer 'A' (rim)	cat. 11	44	112	6.20	11.0
49	Carthage	small flanged bowl	AF3276	74	169	6.13	7.2
50	Traprain Law	flanged bowl	GVA25	uncertain	132	6.13	9.2
51	Vinkovci	flanged bowlwith umbo	cat. 16	104	231	6.05	5.2
52	Mildenhall	flanged bowl	1946 1007.9	77	169	5.96	7.0
53	'Seuso'	fluted basin	cat. 13	125	468	5.86	2.4
54	Mildenhall	Bacchic plate	1946 1007.2	65	188	5.80	6.2
55	Carthage	flanged bowl	AF3275	86	175	5.73	6.6
56	Kaiseraugst	small plate	1962.12837 (cat. 74)	92	161	5.54	6.8
57	Polgardi	nymph/triton: leg A;attachment plate	78. 1878	21	n/a	5.49	n/a
58	Traprain Law	square vessel	GVA34	29 survive	n/a	5.44	n/a
59	Vinkovci	ewer	cat. 10	44	90	5.44	12.0
60	Traprain Law	plate (fragment only)	GVA38	18 survive	n/a	5.30	n/a
61	Traprain Law	flanged bowl	GVA22	61	140	5.22	7.4
62	Kaiseraugst	small plate	1962.12838 (cat. 75)	92	163	5.21	6.4
63	Vinkovci	ewer	cat. 8	48	91	5.16	11.4
64	Traprain Law	fluted bowl (incomplete)	GVA19	77 survive	n/a	5.11	n/a
65	Vinkovci	ewer	cat. 12	49	85	5.04	11.8
66	Polgardi	triton/nymph: leg B;attachment plate	78. 1878	23	n/a	4.97	n/a
67	Kaiseraugst	oval fish dish	1962.60 (cat. 54)	86	n/a	4.37	n/a
68	Vinkovci	flanged bowl	cat. 22	83	?	4.01	?
69	Polgardi	nymph/triton: leg A;lower slide, lower	78. 1878	?	n/a	3.68	n/a
70	Vinkovci	conical beaker	cat. 24	?	101	2.50	5.0

quick-drying silicone, normally used by dentists to take impressions of teeth.[29] In each example, approximately ten beads were sampled using this silicone. Once set, this allowed a plaster cast of the area of beading sampled to be created, of exactly the same dimensions as the original rim section (FIG. 2C). To increase the number of values to calculate a mean, the diameter of each bead on these casts was also measured. Standard deviation was then applied to all the values recorded in order to exclude outliers and come up with a mean bead diameter on each vessel being studied. These are the 'mean' figures for Mildenhall that are included in Table 1 (column 7) alongside other comparanda from Britain and other discoveries from the western Empire (and discussed in more detail below).

BEADED RIMS AND THE MILDENHALL TREASURE

The publication of the Mildenhall treasure provided an opportunity to assess the usefulness of examining beaded rims in such detail. There were two particular instances where the exercise proved most fruitful. The first concerned the pair of Bacchic plates in the treasure,[30] which are quite clearly, even on the most cursory inspection, made as companion pieces, probably to accompany the Bacchic platter.[31] Yet an examination of the beaded rims on these vessels also proved very insightful: subjectively they look identical, but in reality are not. Both carry beads that are uncharacteristically ovoid in shape, but the first difference noted was that Mildenhall cat. 2 has one more bead than cat. 3 (FIG. 3A). The mean bead size is also different, and considerably so: it also explains the fact that cat. 3 has one fewer bead, for its bead size is almost 1 mm greater than that of cat. 2, despite the fact that the circumference of each plate is more or less identical.[32]

The only conclusion to be drawn, specifically in relation to the rim beads, is that two different sets of dies were used to create the beaded rims on Mildenhall cats. 2 and 3. This becomes all the more intriguing when other aspects of these plates are taken into account. The first is the somewhat subjective matter of style: there is very little difference between the overall style of the figures that appear on these two vessels (for instance, the figures are very anatomically well drawn, which is typical of high classical art), but the compositions are quite different in subtle ways. There is a nice flow and neatness to the figures of cat. 3, which pays great respect to the circular 'canvas' on which the scene is acted out; but this is not the case with cat. 2, where the back of the maenad, for instance, seems uncomfortably close to the vessel's rim, and the fawn at the bottom appears as if it is trying to chase the snake out of the vessel. The lower half of the water nymph at the top of the vessel is rather sketchy and may even be unfinished. In summary, the style, finesse and compositional integrity of cat. 2 are not quite up to the standard of cat. 3, notwithstanding the inherent subjectivity of this analysis.

When the vessels are turned over (FIG. 3B), there is also one other obvious difference that becomes clear. Roman vessels made of silver plate were often worked into shape by attaching them to metalworking chucks to hold them in place while they were worked up using metalworking hammers. These chucks sometimes left a mark on the metal. The remains of the chucks can clearly be seen on both vessels, yet are in entirely different places; both are within each vessel's respective foot-rings, but a larger chuck, just inside the foot-ring edge, appears to have been used for cat. 2 than that used for cat. 3.

In the case of these two vessels, therefore, a close examination of the beads, aspects of the style and vessel manufacture can lead to only one conclusion: that they may well have been made in the

[29] The specific type of putty used is called Provil Novo, made by Heraeus.
[30] Hobbs 2016, cats. 2 and 3.
[31] Hobbs 2016, cat. 1.
[32] Mildenhall cat. 2 is 188 mm in diameter; cat. 3, 185 mm.

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FIG. 3. The Bacchic plates from the Mildenhall treasure. (© *Trustees of the British Museum*)

same workshop at the same time, but they were not made by the same person. This may at first sight seem rather at odds with the final aspect of these vessels, in many ways the aspect over which most ink has been spilled:[33] they both bear the Greek name 'Eutherios' scratched onto their reverse (FIG. 3C). It is unclear if this name is related to the identity of the owner of the vessels, or the workshop in which the vessels were made,[34] but if it is the latter, then this might seem to undermine the argument that two sets of hands were involved in their production. However, close examination of the lettering is suggestive, according to Roger

[33] This is because of the association between this name and a courtier of the emperor Julian; for further discussion, see Hobbs 2016, 268–9, with references.
[34] Hobbs 2016, 76; Tomlin in Hobbs 2016, 233–4.

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FIG. 4. The four large flanged bowls in the Mildenhall treasure. (© *Trustees of the British Museum*)

Tomlin who examined all the inscriptions on the Mildenhall vessels, of two different hands.[35] This may suggest that 'Eutherios' was the owner of the workshop, or perhaps the master silversmith who worked on cat. 3, with an assistant, still learning his trade, working on cat. 2, but signing it with the name of his master – just as works by the Renaissance artist Giovanni Bellini are more often than not not the work of Bellini himself but his workshop in general.[36]

The second example of the value of examining beaded rims in detail relates to the four large flanged bowls in the Mildenhall treasure (FIG. 4).[37] In a similar manner to the pair of Bacchic

[35] Tomlin in Hobbs 2016, 233: 'on balance, it seems that the two graffiti, although contemporary, are probably by different hands.'

[36] Thanks to our colleague Dr Rachel King for providing this parallel.

[37] Hobbs 2016, cats. 5 to 8.

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plates, a cursory glance at these vessels suggests that they constitute a complete set, made at the same place and at the same time. But the devil is in the detail, and this is when some key differences start to emerge. In particular, there are aspects of cat. 5 that identify it as the odd one out. First, it is much heavier than the other three vessels: its weight of 1,718 g, or 5.2 Roman pounds, is approximately 25 per cent greater than each of the other three vessels.[38] Its decoration is also out of kilter with that of the other three vessels: its central medallion of a hunter attacking a bear has no relation to the Alexandrian theme that unites cats. 6 to 8, and decoration on its rim flange features the only mythical beasts across the narrative cycle – griffins – whereas all the other vessels exclusively feature real animals.

It is not surprising, therefore, that its beads are also very different to the other three vessels. It has three or four fewer beads around its rim than the other vessels in the set,[39] and a mean bead diameter of 11.33 mm, which is over 10 per cent larger than the bead sizes of all the other vessels (cat. 6, 9.95 mm; cat. 7, 10.23 mm; cat. 8, 10.01 mm). All this invites the conclusion that cat. 5 is the interloper, added to the set at a different time – presumably later – to make the set up to four vessels instead of three. This is entirely validated by subsequent more detailed inspection of the insides of the beads, on vessels where – fortunately for us – the rims were not turned down and in to such an extent as to prevent access to the bead undersides. Close-up images taken of beads from all four vessels were very revealing (FIG. 5).[40] Cats. 6 to 8 (FIG. 4B–D) all had beads that exhibit a distinctive 'Y' shaped die-flaw (if we might call it that), entirely lacking on cat. 5 (FIG. 5A). This is categorical proof that the set of dies used to form the beads on cat. 5 are not the same as those used to form the beads on the rims of cats. 6 to 8. It does not mean that cat. 5 was not made in the same workshop, but it does indicate that cat. 5 was definitely not made at the same time as the other three vessels, utilising a larger mass of raw material and with a different approach to its design, and used different dies to make its beaded rim. In other words, it was probably made by someone else.

Beyond these two particular examples, it was also noticed that the mean bead size of cat. 5 (11.33 mm) was very similar to that of the niello platter, cat. 4 (11.63 mm) (FIG. 6). This raised the intriguing possibility that they were made using the same set of beading dies and by inference in the same metalworking workshop at a similar time. Close inspection of the beads on these vessels using a digital microscope[41] confirmed that the bead sizes were extremely similar, but it was unfortunately not possible to identify any sufficiently characteristic die flaws, or any other tooling marks, to prove beyond doubt that they were made using the same die set.[42] Although it cannot be ruled out that these two vessels were made in the same workshop, at the present time the evidence provided by the beads on their rims cannot prove this to be the case. Nevertheless, it does demonstrate the value of examining these rims in a higher level of detail than has been carried out in the past. Having demonstrated this possible link, future research may uncover other indicators that further strengthen the case for a common origin of these two quite distinct vessels.

Detailed examination of the large flanged bowls in the Mildenhall treasure (cats. 5 to 8 inclusive) therefore provided concrete proof that three of their rims were created using the same set of beading tools, but one was not. The process began by measuring the diameters of the beads, followed up by microscopic examination of the undersides of the beads.

[38] Cat. 6 weighs 1,301 g (4 pounds); cat. 7, 1,320 g (4 pounds), cat. 8, 1,271g (3.9 pounds).
[39] 63 beads, as opposed to 66, 66 and 67 beads respectively (cats. 6, 7, 8).
[40] Thanks to Hayley Bullock in our Conservation department for these images.
[41] A Kyence instrument was employed at 20× magnification. A glaring filter was used on occasion to increase the quality of the images.
[42] It is also worth adding that it was not possible to take images of the insides of the beads on the Mildenhall niello platter (cat. 4) because these are obscured by the turned-down rim.

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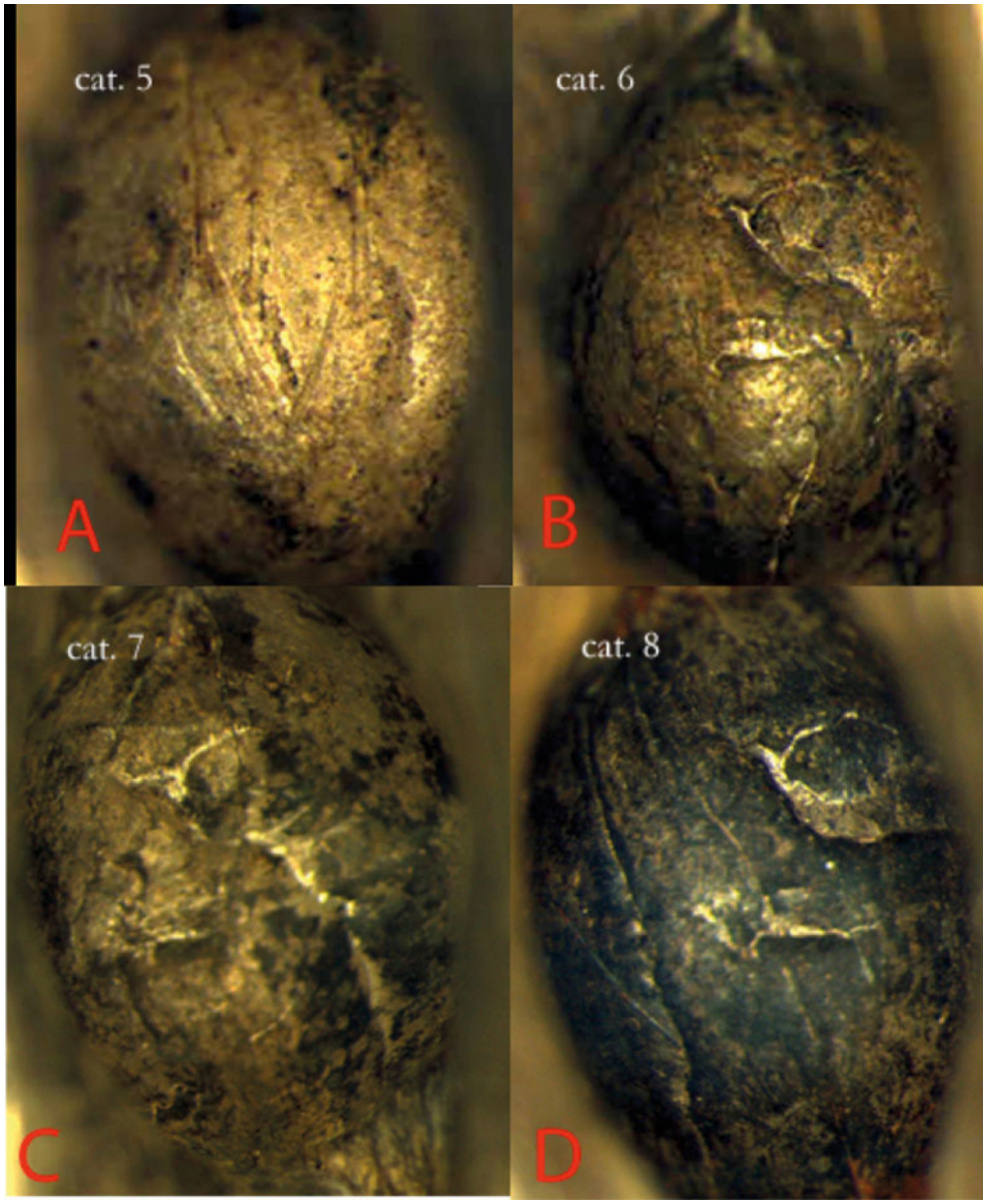

FIG. 5. The undersides of beads on four large flanged bowls from the Mildenhall treasure. (© *Trustees of the British Museum*)

BEYOND MILDENHALL: BEADED RIMS AND THE CORPUS OF LATE ROMAN SILVER

As a follow-on project, the authors of this paper decided to examine these vessels once again under a high-resolution microscope to see if any minute features on the outer surface of these beads could be identified, thus proving that they were made using the same sets of dies. But we also wanted to

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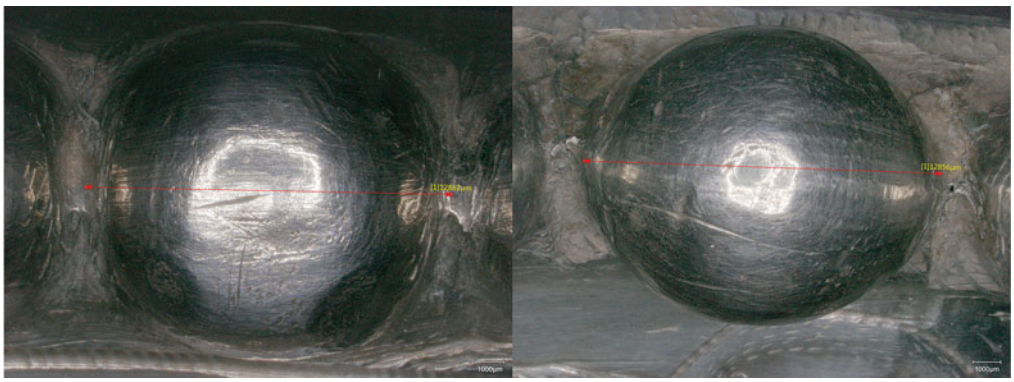

FIG. 6. A bead on the rim on the Mildenhall niello platter (left) in comparison with a bead on the rim of the large flanged bowl with hunter and bear (right). (© *Trustees of the British Museum*)

establish something else: when the mean bead diameters of vessels from *different* discoveries were very closely matched, could microscopic examination show that these beads, too, were made using the same die sets? If successful, this would begin to improve our understanding of the workshops in which these objects were made: if vessels from different places of discovery have identical beads, then this could establish that they were made in the same place at approximately the same time, even if they subsequently ended up in far-flung places. It would not necessarily tell us where the workshop was located (unless a vessel in question was one of the few with an inscription revealing its place of production),[43] but it may allow us to begin grouping vessels into 'production schools', something that has not been possible in the past.

Two vessels from two different discoveries were chosen. The first was another vessel from the Mildenhall treasure,[44] and the other was from the Carthage treasure.[45] Both vessels have much in common, setting their beaded rims aside. Both are small flanged bowls of similar size: the Mildenhall vessel has a rim diameter of 107 mm and the Carthage vessel 127 mm. Their weights are, however, rather different: the Mildenhall vessel is almost twice the weight of that from Carthage – 627 g as opposed to 332 g – in effect two Roman pounds for the former and one Roman pound for the latter.

The beads on their respective rims also invited close comparison (Table 1; nos. 49 and 52). The Mildenhall vessel has 77 beads, with a mean diameter of 5.96 mm, the Carthage vessel 74 beads and a mean diameter of 6.13 mm.[46] This means that in size, they differ by only 0.17 mm, a negligible amount. It might be argued that this small discrepancy is enough of a difference to preclude the use of the same set of beading tools, but in the case of Mildenhall cats. 6–8 (discussed above), which we know for certain were made using the same set of tools, the maximum difference in diameter is actually greater, 0.28 mm, which provides a useful guide to the possible margin of error.

Unfortunately, although microscopic examination of the rims of these two vessels proves that they are extremely similar in shape and size (FIG. 7), it is not possible to be certain that they were

[43] For instance, a platter in the Vinkovci treasure (Table 1, no. 21) has a graffito on its reverse that informs us that it was made at Aquileia (Vulić *et al*. 2017, 141).

[44] Hobbs 2016, cat. 10.

[45] British Museum AF3276.

[46] Additional measurements taken under high magnification came up with similar mean figures of 6.1 mm for Mildenhall cat. 10 and 6.3 mm for Carthage AF3276.

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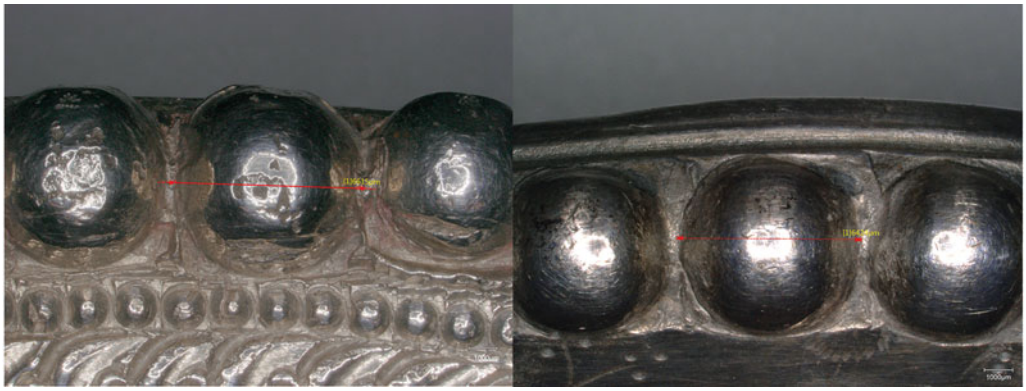

FIG. 7. Comparison between a bead from the rim of a small flanged bowl in the Mildenhall treasure (left) and the Carthage treasure (right). (© *Trustees of the British Museum*)

made using the same sets of beading dies. On the other hand, this possibility still remains, in the sense that the analysis did not discount either the idea that the same tools were used to make them. So although it is a source of some frustration that the rims of these bowls cannot be proven to have been made using the same set of tools, it was nonetheless worth investigating this possibility. At the very least, it draws attention to the possibility that these objects may also belong to the same 'production school', which is beneficial to future research.[47] It must also be borne in mind that, in future, improved 3D scanning techniques may allow surface contours to be compared in sufficient detail to make such comparisons possible.

OVERALL ANALYSIS OF BEADED RIM DATA

Despite the difficulties encountered when attempting to find 'die matches' between vessels from different findspots, the data gathered during the research on the Mildenhall treasure on beaded rims nonetheless raise some interesting discussion points when looked at as a body of data. Seventy vessels were examined from nine discrete discoveries, all of which provided comparanda during research on the Mildenhall treasure (Table 1).[48] The headline findings are as follows: the range of bead sizes recorded varies greatly, from the largest bead diameter at 17.52 mm (a *Hacksilber* fragment from Traprain Law) to 2.50 mm (a beaker in the Vinkovci treasure). As might be expected, vessels with a larger rim diameter tend to feature larger beads than vessels with smaller rim diameters or where the beading is applied to only one part of the vessel, for instance the foot-ring of a ewer (e.g. nos. 59 and 63 in Table 1). But there are some interesting exceptions, particularly with regard to platters (vessels with a rim diameter greater than 300 mm).[49] Whereas the two platters in the Mildenhall treasure have beads with diameters at the

[47] It is interesting to note that metal was added to the rim to increase the 3D effect on the Carthage bowl AF 3276. This is quite a common feature of Sasanian silver production, but has not been seen Roman silverware (Lang in Baratte *et al*. 2002, 99). Therefore it would have been even more interesting if it had transpired that the rims were made using the same die sets, because both Sasanian and Roman production techniques would then appear to have been taking place in the same workshop.

[48] The discoveries were a mixture of treasures/hoards and single finds from the following sites: Coleraine, Kaiseraugst, Mileham, Mildenhall, Polgardi, 'Seuso', Sucidava, Traprain Law and Vinkovci. For publication information, please see Hobbs 2016, table 32, 299–303.

[49] Hobbs 2010.

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upper end of the table (positions 5 and 6 respectively), much smaller beads, in relative terms, feature on vessels from Vinkovci (Table 1, no. 21) and 'Seuso' (Table 1, no. 23). This is despite the fact that both the latter vessels are amongst the largest platters known from late antiquity, with diameters of 700 mm (Vinkovci) and 705 mm ('Seuso'). The final column of the table provides data on the overall diameter of the respective vessels accounted for by the beads.[50] The contrast between these four vessels of large diameter is very clear: for example, 4 per cent of the overall diameter of the Mildenhall Bacchic platter (Table 1, no. 5) is beaded rim, but only 2.4 per cent of the eponymous 'Seuso' hunting platter (Table 1, no. 23). This demonstrates that there is not always a direct correlation between the size of beading tools used and the size of vessel to which a beaded rim was to be added. Having said that, the largest pieces of surviving beaded rim are pieces of *Hacksilber* from Traprain Law (Table 1, nos. 1 to 4) and it seems highly unlikely that these derive from anything other than large serving vessels, i.e. silver platters. The pieces of *Hacksilber* from Coleraine, however, three of which almost certainly derive from the same vessel (Table 1, nos. 8–10), may also derive from platters, but could also have belonged to large flanged bowls, sandwiched as they are in the table between the flanged bowls from Mildenhall (Table 1, nos. 7, 12–14).[51]

Some of the correlations between bead sizes from different treasures or single finds are certainly intriguing. It has been argued that the quadruped from Polgardi, discovered near lake Balaton in 1880, may be part of the 'Seuso' treasure, and indeed the vessels used for washing in the treasure could have been used in combination with it.[52] Therefore it must be of interest that some of the bead sizes on these separate objects are also very similar, notably the base of one of 'Seuso's geometric ewers (Table 1, no. 35) and beading found on one of the legs of the Polgardi stand (Table 1, no. 36). This hints at a common origin for these objects, if the same set of beading tools had been applied, even if it is not possible to prove that this was the case. In this context, it is worth noting that Zsolt Mrav has highlighted the strong stylistic similarities between elements of the decoration on these independently discovered objects, particularly the use of quatrefoils and dotted rings.[53]

The similarity of bead sizes between one of the small flanged bowls in the Mildenhall treasure (Table 1, no. 52) and a vessel from the Carthage treasure (Table 1, no. 49) has already been discussed (see above). But it is notable that two other small flanged bowls from different discoveries entirely also have highly comparable bead sizes, from Traprain Law and Vinkovci (Table 1, nos. 50–51). Once again, one cannot but help but speculate that a common workshop origin for these four vessels is entirely plausible, if only it were possible to prove that the beads were all made using the same set of dies. Also of note here is the fact that these vessels (i.e. nos. 50 and 51) are undecorated, with their only main embellishment being the beaded rims themselves. This introduces another interesting facet to the discussion; namely that there is no major distinction between plain vessels and those that are decorated. This potentially offers a further insight into how silver plate was produced: vessels of similar form were worked up

[50] Calculated by dividing the mean bead size by the overall vessel diameter, doubling the result (since beads appear on both sides of the vessel) and then converting this into a percentage. For example, for no. 5 in Table 1 (the Mildenhall Bacchic platter) the mean bead diameter is 12.15 mm. This is divided by the rim diameter (605 mm) to give a figure of 0.02, doubled (0.04) and then converted into a percentage (4.0 per cent).

[51] Another general observation is that the percentage of vessel diameter made up by beads tends to be low for platters (*c.* 5 per cent or less) but is often high for flanged bowls (between 6 and 10 per cent). Even higher figures (more than 10 per cent) often apply to smaller serving vessels (e.g. the 'pedestalled plates' from Mildenhall, Table 1 nos. 42, 46) or liquid serving vessels (e.g. the rims of ewers from 'Seuso': Table 1, nos 33 and 48). The greater percentage of the diameter made up by the beads, the more visually dominant they are in the overall 'look' of their respective vessels, but it is unclear if this was a deliberate choice of the makers or simply a quirk of the beading tools selected.

[52] Mráv 2012.

[53] Mráv 2012, 91–2, figs. 19–20.

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into their intended form (e.g. a flanged bowl) and may have been left plain throughout the remainder of their life as a circulating artefact.[54] They might have a beaded rim added, at which point they may circulate without further embellishment, but equally they might also – presumably depending on their commissioner's wishes – have further decoration added still, e.g. raised decoration on their rim flanges, as is the case with the six bowls in the Mildenhall treasure. This is why examining and comparing these vessels is insightful: common mean bead sizes on vessels from very different parts of the empire, which may have little else in common apart from their general form, may indicate common origins, despite other differences.

SUMMARY AND CONCLUSIONS

In this paper, we have tried to demonstrate that there is much benefit to be gained from detailed recording of beaded rims, a common feature of late Roman silver plate. This is because so little is known about the production of this material, meaning that much detective work needs to be conducted in order to try to find clues as to where, when and to some extent how these objects were manufactured. Successes are to be had when this detailed examination is combined with other aspects of these objects that invite comparison, as discussed in relation to the Bacchic plates and the large flanged bowls from the Mildenhall treasure. More difficulties arise when comparing pieces of silver plate from diverse treasures. At the present time, it has only been possible to show that many of these vessels share very similar bead diameters, which may allow us to speculate on a common origin, but does not allow us to prove beyond doubt that this was the case. Nevertheless, it is hoped that this work provides a starting point for further research that may lead to a better and more nuanced understanding of silver plate production in Late Antiquity.

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[54] Such simple plain bowls are exemplified well in the Hoxne treasure where they constitute the most unassuming objects in the entire hoard (Johns 2010, 92–5).

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