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Front and Inside Back Cover: Viking-Age beads of glass and shell with bronze spacers and pendants from grave 182B at Ire (Hellvi), Gotland, Sweden, ca. 850 C.E.; Gotlands Museum (photo: Matthew Delvaux).

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KARLIS KARKLINS, editor

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PATTERNS OF SCANDINAVIAN BEAD USE BETWEEN THE IRON AGE AND VIKING AGE, CA. 600-1000 C.E.

Matthew C. Delvaux

This paper places Johan Callmer's seminal chronology of Viking-Age beads in the broader contexts of subsequent research. It begins with an examination of how Callmer's chronology of grave goods can be linked into preceding chronologies from the cemeteries of late Iron-Age Bornholm and mainland Sweden (ca. 540-860). It then considers how these chronologies compare with those available from the early Scandinavian emporium at Ribe, a site of bead production and trade (ca. 700-850). Finally, it provides a detailed analysis of Callmer's classification system and the implications of his chronological framework (ca. 800-1000). Comparing these diverse chronologies reveals divergent patterns of bead use, enriching our understanding of how individuals, communities, and networks connected with each other through beads in the late Iron Age and the early Viking Age.

INTRODUCTION

It is forty years since Johan Callmer (1977) published his dissertation, *Trade Beads and Bead Trade in Scandinavia ca. 800-1000 A.D.* This work has endured as a standard reference through four decades of paradigmatic change and evidence accumulation. Intervening scholarship has reoriented the ways by which we investigate the past and revised our frameworks for understanding the early middle ages (Effros 2017; Hodges and Whitehouse 1983; McCormick 2001; Wickham 2005). Beads have interested scholars throughout these developments in part due to two of Callmer's central claims: Viking-Age bead assemblages show considerable change over time, and the distribution patterns for beads preserve traces of the routes by which they traveled.

Viking-Age beads retain significant potential for contributing to our understanding of the early Middle Ages. Here, I advance that agenda by placing Callmer's classification system and assemblage chronologies within broader and more varied social and temporal frameworks. Three sections contribute toward this goal: 1) pre-Viking burials, identifying changing patterns of bead use, 2) early Scandinavian emporia, where beads were made, traded, and supplied to others, and 3) reassessing Callmer's Viking-Age classification system and chronology in light of this work and subsequent Scandinavian research. Each section begins with a brief critique of evidence and methods, presents a chronological framework, and discusses the implications arising from these chronologies. I base my discussion on published reports of the assemblages, and I have also examined representative samples of the beads described in these works. This comparative analysis of extant chronologies for Scandinavian beads reveals that patterns of bead use varied by context. Different types of beads circulated among different communities at different times, and these differing communities implicitly shared their beads through differing means of exchange.

PRE-VIKING BURIALS

Any investigation of Scandinavian beads in the centuries preceding the Viking Age must reckon with the legacy of Emil Vedel who, along with Johan Andreas Jørgensen, excavated a large number of rich inhumation burials on Bornholm between 1866 and 1902. The elites of Iron-Age Bornholm accumulated remarkable wealth, as witnessed by the cult center at Sorte Muld (Adamsen et al. 2009), and their tendency to inhume rather than cremate their dead preserved a substantial record of their material lives. Vedel and Jørgensen ensured that remains recovered from these burials were saved from the vicissitudes of modern erosion and agriculture. They delivered their artifacts to the National Museum in Copenhagen for conservation, and Vedel (1878, 1886, 1890, 1897) published articles and monographs extensively documenting his work.

Vedel and Jørgensen excavated about 20 sites, accounting for a significant portion of the burials recovered from late Iron-Age Denmark. Two sites proved particularly productive: Bækkegård, excavated between 1876 and 1880, uncovering 168 graves (Jørgensen 1990), and Lousgård, excavated between 1886 and 1887, uncovering 50 graves (Lyngstrøm 1989). These sites yielded thousands of beads, but both pose problems for researchers. In the case of Bækkegård, Vedel or an intermediary delivered most of the beads to Copenhagen in a single package, which museum staff subsequently restrung as spurious assemblages for exhibition, approximating the descriptions recorded in Vedel's reports. In the case of Lousgård, Jørgensen conducted most of the excavations, and Vedel (1886:413-417) hurried an interpretation of the site into his first monograph, which was already in the process of being published. Staff at the National Museum sorted the artifacts according to this initial interpretation, but Vedel (1890:87-101) soon revised his understanding of the site. These revisions led to a number of discrepancies between Vedel's descriptions and the artifacts as preserved by the National Museum. As a result, although a large number of beads survive from Iron-Age Bornholm, many lack identifiable contexts.

Beads have proven especially difficult to ascribe to particular contexts due in part to Vedel's methods of recording. Vedel mistakenly identified opaque glass beads as being made of either stone or paste (*lermasse*), which suggests that occasional beads of other materials such as fossils, limestone, or shell might have accidentally been subsumed into these categories as well. Conversely, he attempted to distinguish mosaic beads from beads of painted glass (*malet glas*) without clarifying the criteria he used to differentiate these categories. Vedel also made broad use of a category that he described as "other glass" (*andet glas*). In some cases, his notes indicate that this category included segmented beads, but in many cases no further details survive. This means that bead researchers working with the rich assemblages of Bækkegård and Lousgård must either study the preserved artifacts while accepting uncertainties about their provenance, or they must rely on Vedel's records while accepting uncertainties over their accuracy.

For bead researchers, the significance of Bækkegård and Lousgård hinges on Karen Høilund Nielsen's (1987) analysis of these sites and their artifacts. She approached these difficult sites by adopting Vedel's system of classification, relying on his catalog for Bækkegård, and then conducting her own inspection of artifacts from other sites. She identified 90 assemblages from Bornholm with 10 or more beads, comprising approximately 3,800 beads. Of these, 47 assemblages (52%) with about 1,500 beads (40%) derive from Bækkegård, and 15 assemblages (17%) with about 700 beads (18%) derive from Lousgård. The remaining 28 assemblages (30%) account for approximately 1,600 beads (42%). Høilund Nielsen demonstrated that Vedel's terms of analysis and his records for Bækkegård preserved sufficient detail for a correspondence analysis and seriation of bead assemblages and associated grave goods. She identified four basic types of bead assemblages, defined according to the dominant materials and colors of the beads. This work has largely superseded previous studies by C.J. Becker (1953) and Mogens Ørsnes (1966).

Before outlining Høilund Nielsen's system of classification, however, three subsequent publications must be taken into account. First, Lars Jørgensen (1990) published a major review of previous research on Bækkegård, including modern investigations that assessed Vedel's methods and yielded a previously undiscovered grave. Jørgensen (1990:23-27) also examined Høilund Nielsen's sources and methods. He suggested that some of her assemblages should not have been treated as closed contexts and argued that some of the early artifact types had been too loosely defined, introducing a potential source of imprecision in divisions between the early phases.

Lars Jørgensen and Anne Nørgård Jørgensen (1997) subsequently applied Jørgensen's earlier suggestions to the evidence of a rich set of new excavations at Nørre Sandegård Vest. Vedel had visited this site but left it largely unexcavated, and major campaigns in 1986 and 1987 contributed to an eventual total of 59 graves from the late Iron Age. In analyzing these finds, the authors revised Høilund Nielsen's seriation to accommodate Jørgensen's comments (Jørgensen and Nørgård Jørgensen 1997:24-35). This produced a more reliable seriation and allowed the authors to refine the absolute chronology that Høilund Nielsen had proposed.

Finally, Høilund Nielsen (1997) undertook revisions of her own work, testing whether the Bornholm classification and chronology applied to other areas as well. She had few opportunities for comparison, however, since most late Iron-Age communities in Scandinavia cremated their dead at temperatures that rendered glass beads unrecognizable. In central Sweden, however, lower temperatures were used for cremation burials, and Høilund Nielsen focused on these assemblages as a basis for comparison with Bornholm. She adjusted her analysis to accommodate the recommendations proposed by Jørgensen, and she included graves from the mid-Iron-Age cemetery at Lovö where independent work provided a chronology to verify the early phase divisions that Jørgensen had questioned. Høilund Nielsen concluded that the bead assemblages of central Sweden divided into the same four groups that she had found on Bornholm, as well as a fifth group found only in Sweden.

Taken together, these studies provide an established sequence of bead assemblage types for late Iron-Age Bornholm and mainland Sweden. It bears repeating that these assemblage types, and thus their connections to particular periods of time, are only suggestive and not strictly defined. Moreover, the assemblage types do not occur in a rigid sequence but overlap, such that burials with different assemblage types may nevertheless be ascribed to a common phase. Additionally, the use of correspondence analysis makes persons buried with heirloom artifacts seem more closely linked to previous generations than to theirs. Individual graves must always be examined for artifact types which could provide a *terminus post quem*.

The discussion below refers primarily to the assemblages from Sweden and Bornholm for which Høilund Nielsen (1997: Abb. 5) published complete inventories. I have expanded this catalog to include all late Iron-Age graves from Bækkegård (Table 1) as inventoried by Vedel (1878) with reference to Jørgensen (1990). Discussion of phases takes into account both Høilund Nielsen's chronology and the chronology developed by Jørgensen and Nørgård Jørgensen (1997). Where discrepancies occur in the published seriations, Høilund Nielsen tends to seriate assemblages one phase earlier than Jørgensen and Nørgård Jørgensen. I have preferred to follow Jørgensen and Nørgård Jørgensen's later dates to diminish the potential effect of heirloom items skewing grave assemblages earlier than their actual date.

Høilund Nielsen (HN) Group R3A (540-660)

Bornholm phases 1A1-1D1. Cf. Lövo bead horizons 3-4

R3A assemblages are characterized by a large number of undecorated orange and red opaque beads (Figure 1). Barrel shapes, cylinders, and cones are common. The ends of these beads are typically flat with distinct edges where the ends meet the body or face. Translucent blue, opaque white, and decorated beads of diverse colors are rare but stand out strongly where they occur. Similar assemblage groups at Lovö in the Mälar region are classified as p3 or p4.

There are 43 assemblages with published inventories ascribed to group R3A: 14 from Bækkegård, 14 from other sites on Bornholm, and 15 from mainland Sweden. Assemblages range from 2 to 159 beads with a median of 57 and an average of 69. R3A assemblages seriate into Bornholm phases 1A through 1D1, or between 540 and 660. The consistent appearance of numerous high-quality red and orange beads throughout the early 600s suggests that the major glass production centers of the Near East managed to continue manufacturing and exporting glass despite prolonged conflicts between the Byzantine and Sassanid empires.

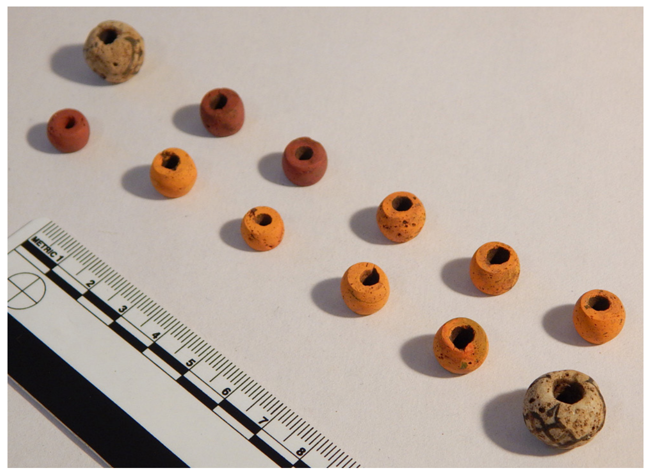

Figure 1. Bead assemblage from burial K45 at Nørre Sandegård, Bornholm, typical of HN Group R3A (540-660). Similar orange and red beads are also common during the Viking Age (Bornholms Museum 1409x1307 (all images by the author).

HN Group R3B (630-800)

Bornholm phases 1D1-2C. Cf. Lovö bead horizon 5

R3B assemblages are characterized by a large number of decorated beads, most frequently with a base color of translucent blue or opaque white (Figure 2). These polychrome beads are often combined with undecorated beads in opaque green, opaque white, and translucent blue. Many assemblages include rock-crystal beads, and some

Table 1. Høilund Nielsen (1991) Bead Groups.

Group	Dating	Burials in Study	Average Beads	Total Beads	Characteristic Beads
R3A	540-660	43	69	2,951	Red, orange
R3B	630-800	75	50	3,033	White, green, blue, decorated
R3C	750-775	12	31	371	R3B with gold-foil, colorless < 12%
R3D	775-800+	7	46	319	Gold-foil, silver-foil, colorless >12%
R3E	750-800+	*Not inventoried*			Drawn beads

Figure 2. Bead assemblage from grave 6 at Lousgård, Bornholm, classified by Høilund Nielsen as belonging to Group R3B (630-800). Associated grave goods link this assemblage to Bornholm phase 2A (700-750). Note especially the three large mosaic beads at the bottom of the image, which become scarce after the early Viking Age (National Museum of Denmark C5594).

beads of bronze and wood also occur. Similar assemblage groups at Lovö in the Mälar region are referred to as p5. This is the final phase at Lovö.

There are 74 inventoried assemblages ascribed to group R3B: 35 from Bækkegård, 12 from other sites on Bornholm, and 27 from mainland Sweden. Assemblages range from 6 to 164 beads with a median of 35 and an average of 40. As such, although some assemblages were larger than during the preceding period, most assemblages are about half the size. R3B assemblages seriate into Bornholm phases 1D1 through 2C, or between 630 and 800. The smaller size of assemblages may reflect the broad economic downturn of the 600s, while the presence of a few extravagant displays may reflect intensified competition among local elites against this backdrop of impoverishment. This economic collapse also set the stage for the early Islamic conquests, and the changing types of glass found in Scandinavian bead assemblages beginning in the mid-600s may reflect the economic restructuring that occurred after the rise of the Umayyad caliphate.

HN Group R3C (700-800)

Bornholm phase 2B

R3C assemblages are similar to R3B assemblages, incorporating decorated blue and white beads together with undecorated beads of green, white, and blue. R3C assemblages, however, may be distinguished by the presence of colorless beads and segmented gold-foil beads (*see* Figure 5). Høilund Nielsen (1987:53-54) judged that an assemblage may be classified as R3C if the colorless or gold-foil beads are present but comprise no more than 12% of it. Metal-foil beads are considered especially important as indicators of long-distance exchange since the techniques used to make these beads are thought to have been limited only to the Near East (Sode et al. 2010:320-323).

There are twelve inventoried assemblages ascribed to group R3C: three from Bækkegård, four from other sites on Bornholm, and eight from mainland Sweden. Assemblages range from 14 to 77 beads with a median of 30 and an average of 31. Most assemblages are about the same size as R3B assemblages, which continued into the period when R3C assemblages were deposited. After R3C assemblages enter the cemetery sequences, however, exceptionally large assemblages become rare.

Relatively few assemblages are ascribed to the R3C assemblage type. R3C assemblages seriate into Bornholm phases 2A through 2C, or between 700 and 800 (Høilund Nielsen 1997), although a more precise focus of 750-775 is tenable (Jørgensen and Nørgård Jørgensen 1997). The scarcity of extravagant displays during this period may indicate diminished elite competition and relative social stability. Furthermore, if the R3C assemblages were all deposited during the short period of 25 years, as Jørgensen and Nørgård Jørgensen suggest, this rapid rate of deposit suggests broad access to exotic imports and a resurgence of long-distance exchange.

Høilund Nielsen strained her definitions to include assemblages from the Swedish mainland in this group. Two assemblages (RAÄ:27:3A; SHM 31039:6) in particular are comprised of more than 40% gold-foil beads. Additionally, two of the Swedish assemblages (RAÄ:27:3A and RAÄ:27:137) lack polychrome beads which make up an average of 20% of the other assemblages. Finally, although green beads make up 20% of the Bornholm assemblages, including the assemblages from Bækkegård, green beads are typically absent from the Swedish mainland and make up only 5% of the Swedish assemblages assigned to this group.

These divergences represent a clear occurrence of geographic variation; communities in different places had access to different kinds of beads. The prominence of green beads on Bornholm and their relative scarcity on mainland Sweden indicates that, although beads played a privileged role in elite displays both in central Sweden and on Bornholm, the selection of beads which reached the elites of central Sweden had already been culled. Among the elites of the south Baltic, green wound beads were highly valued and assiduously collected, whereas segmented gold-foil beads were less likely to be retained and more frequently passed on to communities that lay further north.

HN Group R3D (775-800+)
Bornholm phases 2C-VIK

R3D assemblages are characterized by colorless, gold-foil, and silver-foil beads. These beads comprise at least 15% and often more than 40% of the assemblages (*see* Figure 5). Undecorated blue and green beads occur, as do white beads. Decorated beads also occur, most often with a base of white, but occasionally with blue and green. When Høilund Nielsen expanded her study to include central Sweden, she noted that rock-crystal and carnelian beads could appear as well.

There are five assemblages ascribed to group R3D: two from Bækkegård, three from other sites on Bornholm, and none from mainland Sweden. Assemblages range from 8 to 120 beads with a median of 43 and an average of 50. R3D assemblages seriate into Bornholm phases 2C through the Viking period, or between 775 and an unspecified date after 800. Most R3D assemblages, however, were likely deposited no later than about 860, when rock-crystal and carnelian beads became dominant, as discussed below.

HN Group R3E (750-800+)
Not found on Bornholm; Seriated alongside Bornholm phases 2B and 2D

R3E assemblages are characterized by the appearance of a large number of drawn beads in various colors. Høilund Nielsen (1997) classified two assemblages as type R3E, and both of these derive from mainland Sweden. She characterized these assemblages as consisting of drawn cut beads of diverse colors, often smaller than the other beads of the late Scandinavian Iron Age. Although these assemblages had few associated finds, Callmer (1977:89) noted the occurrence of similar drawn cut beads throughout the Viking Age, but with especially high representation between 845 and 860.

Discussion

In the graves of Bornholm and central Sweden, high rates of inhumation or low cremation temperatures preserved unusually large numbers of beads from the late Iron Age. These survivals reveal how the composition of assemblages changed over time, providing a key for interpreting associated grave goods. These assemblages also offer important insights into the changing political, economic, and social circumstances of the communities in which the beads were collected and eventually deposited. Additionally, the uneven distribution of specific bead types, such as the wound green beads present on Bornholm but rare in mainland Sweden, suggest traces of the routes by which these artifacts moved. In short, the beads of Iron-Age Scandinavia preserve information about the individuals, communities, and networks that all played a role in the collection and deposition of beads.

The vast majority of these beads are made of glass which was not produced locally. Most of this glass derived from major production centers in the Near East: Egypt, the Levant, Syria, and Iran (Henderson 2013:282-290; Whitehouse 2003). Some glass presumably reached Scandinavia via exchange through Western Europe which mediated travel between Scandinavia and the Near East via Mediterranean routes and which was also home to several small production centers.

Nevertheless, the chronologies for the beads of Western Europe collapse at the cusp of the Viking Age. Merovingian sequences come to an end with the period of Carolingian expansion (Friedrich 2016:92-95; Koch 2001:160-164, 2007:118-125; Sasse and Theune 1996:219-221; Stauch 2004:77-98). Beads were simultaneously falling out of circulation in Anglo-Saxon England (Brugmann 2004:42-70; Hamerow 2016), and most of the early medieval beads from Ireland were entering their final period of use (Mannion 2015:89). By the year 700, Scandinavians had few opportunities to obtain beads from the West.

The Scandinavian demand for beads, however, did not dissipate. Scandinavians found access to beads through two different means. First, they continued to import finished beads, but as western interest in beads disappeared, they sought new routes, both south and east. Second, they began to import glass as a raw material. This could be obtained from minor production and recycling sites in the West or from major production centers in the Near East. Both options demanded the creation of new centers for craft production and redistribution which needed to operate on a larger scale than Iron-Age centers like Uppåkra or Sorte Muld had previously supported.

The Viking Age is, in large part, the story of these two changes – the pioneering of new routes that could satisfy Scandinavian demands and the creation of new communities to support these routes (Barrett 2015). Beads played an essential part in both of these changes. The burials of Bornholm and Sweden provide one important line of evidence, revealing how demand and access to beads changed across the late Iron Age, foreshadowing the transformations of the Viking Age. Early Scandinavian emporia – the sites of production and exchange that flourished across northern Europe – provide a second line of inquiry.

PRE-VIKING EMPORIA

New communities began to develop in Western Europe during the long 8th century with the emergence of craft and trade centers known as emporia. These sites include Quentovic and Dorestad in Francia and Frisia, respectively, as well as sites like Hamwic and Ipswich in England. Three sites in Scandinavia stand out as counterparts in this development: Ribe on mainland Denmark, Åhus near the south Baltic coast of Sweden, and Paviken on the west coast of Gotland. Additionally, the site of Groß Strömkendorf, located on the north German coast near Wismar and associated with the early medieval trading place of Reric, should be considered alongside these sites (Pöche 2005). These locations were particularly well suited to facilitate maritime traffic moving from the Frisian homewaters of the present-day Netherlands into the Baltic and toward central Sweden (Näsman 2000; Sindbæk 2009). In general, these Scandinavian sites functioned as seasonal camps throughout much of the 700s, rather than as sites of permanent settlement. Permanent occupation of Scandinavian emporia sites began only during the late 700s or early 800s, whereas Reric was destroyed in 808, preceding the foundation of nearby Hedeby.

The craftsworkers who gathered at these sites initially procured glass from the West where it was scavenged from old Roman mosaics, recovered from broken glassware, produced in small amounts as a raw material, or carried in bulk from the Near East. But only on arrival in Scandinavia did glass become valued as a raw material for producing beads. The emporia that were developing in Western Europe supported new institutions of church and state which discouraged bead use – the concentration of authority around increasingly powerful monarchs reduced the incentive for elites to compete via costume displays among the living, while lavish funeral rites were giving way to unfurnished churchyard burials for the dead. As such, beads are scarce or absent from the emporia sites that developed in Western Europe, whereas in Scandinavia, bead production proved to be a central activity at these sites and a catalyst for their growth.

Ribe stands out as the best excavated of these early Scandinavian emporia as the result of two extended series of campaigns: 1970-1976 and 1984-2000 (Feveile 2006). For the purposes of bead research, with regard to the chronology of proto-urban bead production, the most important excavations occurred in 1990-1991, in advance of the construction of a new post office. These excavations are commonly referred to as the *Posthuset* (post office) excavations. The trenches cut through about 80 m^2 of what had been an active marketplace between 705 and 850, and their distinct stratigraphy established the phasing for the rest of the site.

The Ribe Chronology

Claus Feveile and Stig Jensen (2006) published a detailed analysis of the Posthuset excavations including a thorough discussion of the glass and beads. The chronology of the beads excavated there spans from 705 during the site's initial period of use to 850 when later disturbances cut into the Viking-Age stratigraphy. Phase A was assigned to the pre-emporia layers and is not further discussed here. The subsequent emporia period was broken into eight phases (B-I), although the last two phases overlap (H/I). These phases were dated using dendrochronology, coins, and artifact types, with the phases ranging from 10 to 35 years in length. Over 2,400 beads were collected from the Posthuset excavations, and 1,788 could be associated with particular phases from the emporia period (Table 2).[1]

Ribe Posthuset Phase B (705-725)

During Phase B (705-725), the first phase of Ribe's period as an emporium site, beads were already circulating in large numbers. There are 486 beads ascribed to this period, deposited at a rate of 24.3 beads per year. Blue melon beads (n=32; 7%) and so-called Ribe beads (n=29; 6%) appear among the earliest layers. The blue melon beads are made from translucent glass similar in appearance to the blue glass beads found in the graves at Bornholm. Ribe beads are made of similar blue glass but are ring-shaped and decorated with lines. The most common colors for decorations are red, white, and yellow, often applied as alternating straight and wavy rings around the bead. These two types of beads, however, make up only 13% of the period beads. Although diagnostic types appear, variety was the rule.

Ribe Posthuset Phase C (725-760)

During Phase C (725-760), 463 beads were deposited at a rate of 13.2 beads per year. Blue melon beads become scarce, constituting only 3% of the period beads (n=17), while Ribe beads become prevalent (n=142), constituting

Table 2. Ribe Posthuset Diagnostic Beads.

Phase	Dating	Glass Beads	Loss per Year	Blue Melon	Ribe Beads	Wasp Beads	Metal-Foil	Blue Segmented	Green Tubes	Eye Mosaic	Drawn Cut	Tesserae	Tesserae Loss / Year
A/AA	<705	1										3	
B	705-725	486	24.3	32	29		1					592	29.6
C	725-760	463	13.2	17	142	12			1		1	988	28.2
D	760-780	37	1.9	3	9	2						174	8.7
E	780-790	288	28.8		1	91	5	1	4		1	185	18.5
F	790-800	227	22.7		1	11	46	9	36		2	53	5.3
G	800-820	108	5.4			1	38	10	15	5	15	17	0.9
H/I	820-850	179	6.0	1	7		5	3	6		53	35	1.2
J	1100s	6	0.1						1		1		
None		635		9	4	97	79	13	39		85	157	
Total		2,430		62	193	214	174	36	102	5	158	2,204	

31% of the period beads. Beadmaking was presumably becoming a more specialized craft with emphasis on fewer but more complex beads than in the preceding period. The increasing presence of polychrome blue beads indicates that the craftsworkers at Ribe were making beads to meet the demands of rural elites, such as those of Bornholm, who were being buried with beads of this style and who may, in fact, have patronized the same craftsworkers who frequented Ribe.

This period of proliferating beadmaking also witnessed experimentation in bead types. This includes the first known wasp beads, of which 12 have been attributed to this period. Although they account for less than 3% of the period beads, they stand in sharp contrast to the more frequently encountered Ribe beads. Wasp beads typically consist of a thin black cylindrical body decorated with yellow rings, sometimes also appearing in other colors such as red. Although the appearance of these beads contrasts superficially with Ribe beads, both styles include highly visible decorations that advertise the extra time and expertise that the beadmakers invested in each bead. As the elites of Bornholm consumed similar polychrome beads during this phase, they demonstrated a similar interest in eye-catching decorations.

Ribe Posthuset Phase D (760-780)

During Phase D (760-780), beads became extremely scarce – although this impression is sharpened by the stratigraphic mixing of Phase D layers with layers from other phases, so that some beads lost during this period cannot be definitively assigned to it. As a result, only 37 beads were recovered from contexts dating to this phase, at a rate of loss of only 1.9 beads per year. The bead varieties present during Phase D are distributed similarly to the preceding period, including three blue melon beads (8%), nine Ribe beads (24%), and two wasp beads (5%). The similarities between these beads and the beads of the preceding period, as well as their scarcity, suggest that they are mostly old beads kept in lengthy circulation, rather than newly made. This decline in bead production likely stems from restricted access to glass. The loss rate of tesserae – the most readily quantifiable raw material for making beads – drops from over 28 tesserae per year during preceding periods to only 8.7 tesserae per year.

Conversely, there is no evidence for a general decline in the demand for beads among Scandinavian elites. Ribe Phase D phase overlaps with Bornholm Phases 2B (750-775) and 2C (775-800). All three late necklace types (R3B, R3C, and R3D) have been seriated into Phase 2B. This helps qualify the earlier observation that Bornholm elites had greater access to green beads than their counterparts in Sweden. During this period, the elites of Bornholm were probably not acquiring these beads from Ribe, as might be expected, nor were they acquiring beads from Sweden where the selection of beads was small. Instead, Bornholm was likely the hub for routes that connected south to the Danube and the glass- and bead-production centers beyond.

Despite this suggestion of expanding access to beads via southern routes, the size of bead assemblages was decreasing and large assemblages became rare. During Phases 2B and 2C in the cemeteries of Bornholm and mainland Sweden (750-800), 18 inventoried assemblages ranged from 12 to 54 beads with a median and average of 31 beads. These elite sought to bury their dead with beads that could not be found at Ribe, even though this choice limited their ability to collect large assemblages. As a result, beadmaking in Ribe languished, and in the 20 years that this phase endured, a new generation may have almost entirely displaced the older craftsworkers familiar with beadmaking. Much of the technical knowledge for high-quality bead production may thus have been lost.

Ribe Posthuset Phase E (780-790)

During Phase E (780-790), 288 beads were deposited at a rate of 29 beads per year (Figure 3). This increased rate of loss parallels a similarly increased loss of tesserae, with 185 deposited at a rate of 19 per year. Local bead production renews with particular emphasis on wasp beads (n=91) which comprise 32% of the period beads while the old Ribe style appears with only one example and blue melon beads are completely absent. This suggests that few of the old workshops or families retained the technical expertise for beadmaking through the preceding period of diminished production. Conversely, the 12 wasp beads deposited during Phase C may have been the early experiments of a young beadworker who, during Phase E, found a renewed source of prosperity after 20 years of dormant demand.

Phase E also witnessed Ribe's first period of oriental bead imports.[2] These include metal-foil and blue segmented beads, cold-cut green tube beads, and drawn cut beads. Eleven oriental beads of these various types appear at Ribe during Phase E. While they constitute only 4% of the period beads, they are significant as indicators of newly found access to finished bead imports. These styles are further discussed below in the context of Callmer's classification system.

Ribe Posthuset Phase F (790-800)

During Phase F (790-800), 227 beads were deposited at a rate of 22.7 beads per year. This is nearly a return to the rate of loss when beadmakers were active at Ribe during its earliest phases. Wasp beads decline, with 11 examples constituting 5% of the period beads. This rapid decline may indicate the death of a beadmaker or the dissolution of a workshop. Meanwhile, imported oriental beads become common. Segmented beads are the most prevalent, with 46 metal-foil beads (20%) and nine blue beads (4%). Green tube beads are represented by 36 examples (16%). Drawn beads again occur but only rarely, with just two examples (1%).

Figure 3. Beads from a phase E (780-790) context at the Ribe Posthuset excavations. Most are wound and may have been made on site. Oriental imports include a fragmentary gold-foil bead (left side of second row) and a fragmentary cold-cut green tube bead (bottom right) (Sydvestjyske Museer ASR 9x261).

The influx of oriental beads at Ribe occurs after their arrival in the cemeteries of Bornholm and mainland Sweden, as indicated by the seriations of Høilund Nielsen. This indicates that, at least with regard to beads, Ribe functioned first as a center for local craftwork and only later as a hub for finished imports. It also indicates that the emporium's inhabitants lay further down the bead supply chain than the elites of Bornholm, and the merchants of the emporia must have been competing with other exchange networks capable of drawing material goods from distant sources. If this is the case, then the emporia ultimately depended on the elites for their survival, and not vice versa.

Ribe Posthuset Phase G (800-820)

During Phase G (800-820), 108 beads were deposited at a rate of 0.9 beads per year. The appearance of new bead varieties reveals that although the overall bead trade was declining, it nevertheless remained active. Oriental beads dominate the period's small assemblage. This includes 38 metal-foil beads (35%), 10 blue segmented beads (9%), 15 green tube beads (14%), and 15 drawn cut beads (14%). The increase of drawn cut beads corresponds with the appearance of a new oriental import: eye mosaic beads. Five such beads (5%) may be ascribed to this period. These beads typically come in variants that are blue or green, and both are present at Ribe. The blue variants likely traveled north via the Danube, whereas the green variants likely traveled north via the Volga (Callmer 1991). Their joint appearance at Ribe indicates that traffic to this emporium arrived from the south via both routes.

Ribe Posthuset Phase H/I (820-850)

Phases H and I (820-850) are treated as a single chronological period in the literature. During these phases, 170 beads were deposited at a rate of 6.0 beads per year. Local bead production seems to have renewed, with five melon beads (3%) and seven Ribe beads (4%) appearing. There were 35 tesserae lost at a rate of 1.2 tesserae per year, slightly higher than the preceding period but still much lower than during the early phases at Ribe. Nevertheless, oriental imports still dominate the period assemblage, with 67 oriental beads (39%). Metal-foil, blue segmented, and green tube beads diminish to a combined total of 14 beads (8%), while eye mosaic beads disappear altogether. Drawn cut beads, however, became increasingly prolific. There are 53 drawn cut beads (31%) from these phases. They correspond to Høilund Nielsen assemblage type R3E, found in Sweden but not on Bornholm. This indicates that the old networks centered on Bornholm had already fallen apart, although the newly forming networks unfortunately fall outside the scope of this limited survey.

Discussion

The chronology of beads at Ribe adds greatly to the picture Høilund Nielsen and her interlocutors drew from Bornholm. Nevertheless, the discussion above depends on only a small part of the available evidence from Ribe. Jan Holme Andersen and Torben Sode (2010) classified 501 beads from the 1970-1976 excavations and analyzed them by phase. This work followed on Sode's (2004) earlier study of beadmaking technologies at Ribe and retains a similar focus on materials and technique. This evidence generally confirms the outline presented above, although the stratigraphy of the 1970-1976 excavations was preserved only in general layers and lacks the chronological precision of the Posthuset excavations.

Moreover, although Ribe has attracted significant attention among early Scandinavian emporia due to its excellent stratigraphic preservation, other Scandinavian sites are available for comparison, particularly Åhus in southern Sweden and Paviken near the western shore of Gotland. Both sites have yielded extensive evidence for bead production, with Åhus showing strong similarities to early Ribe. Åhus has also been subject to two major campaigns, although published information remains largely limited to a small set of articles (Callmer 2002; Callmer and Henderson 1991). Paviken has likewise been subject to two major excavation efforts. The first took place between 1967 and 1973, resulting in a single publication (Lundström 1981). Additional excavations have been conducted more recently and although the annual reports have been made available, a comprehensive study of the site is eagerly anticipated (Karn 2014a, b, 2015).

Thus there remains significant research potential for bead studies of the period immediately preceding the Viking Age and substantial groundwork has already been laid. The available evidence suggests contrasting chronologies between elite graves and emporia deposits, with emporia developing in the early 700s, partly in response to elite demands, but with elite demands shifting away from emporia later in the century. It remains to be seen how these chronologies fit with other sites of the period, particularly those like Uppåkra, Sorte Muld, Gudme, and Lofoten, which have attracted much attention on their own merits as central places. These sites, however, typically lack a close chronology for beads, further complicated by the destruction of most Viking-Age layers by modern agriculture at sites in southern Scandinavia.

At present, Høilund Nielsen's typology of assemblages remains the most useful chronological key for interpreting Scandinavian beads at the cusp of the Viking Age. Norwegian beads are sorely in need of renewed attention, with Synnøve Vinsrygg's (1979) dissertation enduring as the most recent sustained study. Meanwhile, discussion of beads from the Vendel period in Sweden generally remains largely limited to local contexts, such as the classification system for Lovö which Høilund Nielsen found useful for comparisons with her own typology.

Looking further afield, Birte Brugmann (2004) has thoroughly reworked previous Anglo-Saxon bead chronologies. Mags Mannion (2015) has surveyed early medieval Irish assemblages, and Joanna O'Sullivan (2013) has treated the Viking-Age beads from Ireland to a more focused study. Continental beads from the Merovingian period are typically discussed in terms of individual cemeteries, in part because the rich number of finds at many of these sites parallels the abundance of finds excavated from

Bornholm. Nevertheless, Ursula Koch (2001, 2007) has progressively developed her systemization of Merovingian beads which has been further expanded by Eva Stauch (2004). Matthias Friedrich (2016:92-95) has reviewed these and other German-language efforts in a useful commentary. Barbara Sasse and Claudia Theune (1996, 1997) have discussed Merovingian beads more generally.

VIKING-AGE SCANDINAVIA

Against this background of pre-Viking-Age contexts, Callmer's study offers enriching insights. It hinges on a survey of 299 assemblages including 10 or more Viking-Age beads, for an aggregate total of 14,936 beads.[3] Only beads of glass, faience, rock crystal, carnelian, agate, amethyst, and jade were counted for this study. Beads of other common materials – such as amber, silver, shell, limestone, and wood – were either omitted or not encountered among the selected assemblages. Accompanying pendants – often of silver, copper alloys, or amber – were noted but left as a separate category and not included in the analysis of beads.

The majority of assemblages (n=164; 55%) and beads (n=9,750; 65%) derive from inhumation burials, while the remaining assemblages (n=134; 45%) and beads (n=5,186; 35%) derive from cremation burials.[4] Not all assemblages, however, were recovered or documented under ideal conditions. Callmer considered 225 of the assemblages (75%) comprising 11,406 beads (76%) to have been excavated under expert conditions. This, however, includes the work of some early excavators such as Vedel whose methods of recording and handling artifacts are described above, as well as that of Hjalmar Stolpe who occasionally used dynamite and other explosives to speed the excavation of burial mounds at Birka (Gunnar Andersson 2017: pers. comm.; Erikson 2015). Conversely, Callmer considered 50 of the assemblages (17%) comprising 1,518 of the total beads (10%) to have been non-expertly excavated, and he described an additional 12 of the assemblages (4%) comprising 1,066 of the total beads (7%) as non-expertly discovered but recovered with some degree of expert oversight.

Callmer's data suggest that professional archaeologists have tended to encounter cremations with greater frequency than non-expert investigators. Moreover, professional archaeologists have tended to recover more beads, averaging 55 beads per inhumation and 37 beads per cremation as compared to the non-experts' 48 beads per inhumation and 28 beads per cremation.[5] Refined excavation techniques have almost certainly been a factor in this increased rate of recovery. It is also likely that early non-expert investigators culled damaged or deformed beads from their assemblages before depositing them for preservation since assemblages deposited by professional archaeologists tend to include twice as many unclassifiable beads as assemblages delivered by non-experts.

Since these numbers represent only assemblages where more than 10 beads were retained, they give only a partial picture of Viking-Age bead use. Graves with fewer than 10 beads have been frequently encountered, especially in contexts interpreted as male burials (Lagerholm 2009; O'Sullivan 2015). Furthermore, among female burials, a focused study of 78 graves from Gotland (Thedéen 2008:85) indicates that age could be a determining factor, with girls who survived the perilous years of early youth but who died before reaching a marriageable age receiving the largest number of beads. Similar large assemblages dominate Callmer's study, with the 74 assemblages (25%) that contain 50 or more beads comprising a total of 8,873 beads or 59% of the primary material.

Burial practices were not uniform across Viking-Age Scandinavia (Svanberg 2003), and Callmer (1977:7) explicitly omitted Gotland from his study due to the special character of its assemblages. Nevertheless, the evidence from Gotland suggests that the majority of beads studied by Callmer may have been buried with girls aged 5 to 15. By extension, most of these beads had been acquired less than 15 years before their final deposition. This suggests that Callmer's dataset may be particularly well suited for identifying precise windows of time when bead styles changed. Conversely, a dataset dominated by the beads buried with young girls may be a weak basis for discussing how beads circulated among women who survived into adulthood or among other segments of the population.

Callmer's own study supports this conclusion, since larger assemblages more easily fit into his chronological framework, with an apparently short period between collection and deposition. The 252 assemblages that could be sorted according to his rules ranged from 10 to 1,216 beads, with a median of 33 and an average of 53. The 44 assemblages which did not conform to Callmer's rules but needed to be sorted as arbitrary addenda ranged from 10 to 184 beads, with a median of 24 beads and an average of 34. This means that large assemblages tended to follow period norms more closely, whereas smaller assemblages tended to deviate from period norms and appear idiosyncratic. It seems likely that these smaller assemblages belonged to older women throughout Scandinavia, just as they did on Gotland. Further study is required to show, however, whether this association is correct and whether the processes by which aging women refined their assemblages may be detected.

Despite the problems of representativity that these observations suggest, Callmer's data proved sufficient to develop an elaborate classification system for Viking-Age beads. He based his classification system on bead material and technique, shape, proportions, size, diaphaneity (translucency), color, and decorations – specifically lines and eyes applied to wound glass. Altogether, Callmer posited 595 bead types. From the 14,936 beads comprising his primary material, Callmer assigned beads to 391 of these 595 different types (66%), accounting for 12,272 of his total beads (82%). More narrowly, 95% of all classified beads fall within the 146 types for which Callmer found seven or more examples. He noted the material and technique for an additional 1,291 beads (9%), leaving the remaining 1,373 beads (9%) entirely unclassified.

Callmer then posited a classification system for assemblages using the presence or prevalence of various bead types to sort 252 of his assemblages (84%) into 19 groups, adding a further 44 assemblages (15%) to these various groups as addenda and omitting the remaining three (1%) from further analysis. He consolidated these 19 groups into nine more manageable clusters, using accompanying artifacts to place these clustered groups into a series and propose an absolute chronology. The close correspondence between bead groups and datable artifacts confirmed the utility of this classification system to use single beads and especially bead assemblages to establish the likely dates of archaeological contexts. Callmer's study suggests that almost all Viking-Age assemblages of 10 or more beads can be located within a span of not more than 35 years and, in some cases, may be pinpointed to a single decade.

Callmer's Classification System

Callmer's system is rigorous but complex, and it makes use of terms rarely found in more recent studies. Consequently, before discussing the chronology that Callmer presented, it is necessary to reexamine his system in the terms of contemporary scholarship. A summary of his basic classes of beads is sufficient for present purposes.[6]

Callmer classified beads using straightforward descriptions of color, shape, and size. Color is the most important of these criteria since he uses color and translucency to organize both his classification tables and his discussion. Høilund Nielsen's work on Bornholm indicates that even this basic level of information can provide valuable datasets for analysis.

Difficulty arises, however, from a lack of an index for color and diaphaneity (Brugmann 2004:22-25). Callmer's terms focus on hue (red, orange, yellow, etc.), and these are occasionally expanded to indicate purity (e.g., greyish yellow) or depth (e.g., dark brown). Additionally, suggestions of translucency are embedded in these colors, particularly along the spectrum between green and blue: bluish-green beads tend to be translucent, turquoise beads are semi-translucent, and bluish-gray beads are opaque. Reference to a standard such as the *Munsell Bead Color Book* (Munsell Color 2012) would clarify this critical dimension of Callmer's classification system and elevate Viking-Age research to the standards of international bead studies (Table 3). It is also possible to convert Munsell values into the Natural Color System which is more commonly known in Scandinavia (Scandinavian Colour Institute 2008). Additionally, a more precise standard for measuring diaphaneity would aid classification and interpretation.

Callmer Class A comprises undecorated wound glass beads. These are subdivided into specific types according to color, diaphaneity, shape, proportions, and size. Class A undecorated wound beads are the most common Viking-Age beads with 4,047 examples comprising 27.1% of Callmer's overall inventory (N=14,944).

Callmer Class B comprises decorated wound glass beads. These are similarly organized according to the color of the base glass, but the color of decorative elements does not figure in the classification system. Callmer describes decorations according to the patterns of eyes and lines, generating a complex list of 332 distinct types. In practice, he lists no examples of 144 types and only one or two examples of an additional 103 types. These rare types could be removed, dramatically simplifying the classification system while rendering only a small number of beads unidentifiable. In particular, Callmer regularly treats B088 and B090 beads as a single type, which is significant in his discussion of later bead periods. Callmer identifies 1,274 Class B decorated wound beads in his assemblages (8.5%).

Callmer Class C comprises folded glass beads. These are probably best considered a subtype of Class A beads in which a single piece of glass is wrapped around a mandrel and the ends are fused together. These can be distinguished from Class A wound beads if the beadmaker left traces of the seam where the ends met but, in practice, it is difficult to distinguish a folded bead from a wound one. Callmer classifies only two beads (0.01%) as folded. Other researchers examining Viking-Age beads should exercise similar discretion.

Callmer Class D comprises blown segmented beads with thin walls and one or more segments. These tend to be large and hollow, often surviving only as small translucent shards. Callmer lists only seven Class D blown segmented beads (0.04%) without identifying specific types. One

Table 3. Colors of Viking-Age Beads.

Color	Number of Beads	Percent of all Beads	Translucent	Semi-Translucent	Opaque	Munsell Equivalent	Nearest NCS Sample Equivalent
Colorless	457	3.1%	82%	18%	0%		
White / Grayish White	1,113	7.6%	0%	10%	90%	N 9	1000-N
Black	248	1.7%	0%	0%	100%	N 1	9000-N
Yellow	745	5.1%	3%	16%	80%		
– Yellow	734	5.0%	4%	16%	80%	5.0Y 8/8	1050-Y
– Grayish Yellow	11	0.1%	0%	0%	100%	10.0YR 7/8	2050-Y20R
Orange	53	0.4%	0%	0%	100%	5.0YR 6/12	1080-Y40R
Red / Brown	347	2.4%	5%	1%	97%		
– Red	20	0.1%	0%	15%	80%	8.75R 4/14	1580-Y80R
– Brownish Red	315	2.1%	100%	0%	100%	7.5R 4/6	4040-Y90R
– Yellow Brown	7	0.0%	0%	0%	0%	2.5YR 2/2	8005-Y80R
– Dark Brown	5	0.0%	100%	0%	100%	10.0R 3/2	7010-Y90R
Purple (Malva)	157	1.1%	100%	0%	0%	10.0P 2/4	7020-R50B
Blue	2,862	19.5%	95%	3%	2%		
– Dark Blue	2,778	18.9%	98%	2%	0%	5.0PB 3/4	6020-R80B
– Forget-Me-Not	15	0.1%	0%	93%	7%	7.5B 6/6	2040-B10G
– Bluish Gray	69	0.5%	1%	0%	99%	7.5PB 5/6	4030-R70B
Teal	1,519	10.4%	63%	14%	24%		
– Bluish Green	421	2.9%	55%	44%	1%	5.0G 5/4	4030-B90G
– Bluish Green / Grayish Green	216	1.5%	100%	0%	0%	7.5GY 6/6	3040-G40Y
– Grayish Green	882	6.0%	57%	3%	40%	7.5GY 8/4	1030-G30Y
(Pale) Turquoise	279	1.9%	0%	100%	0%	5.0BG 8/2	1020-B70G
Green	1,137	7.7%	5%	91%	4%		
– Medium Green	1,132	7.7%	5%	91%	4%	10.0GY 5/10	2070-G20Y
– Dark Green	5	0.0%	0%	0%	100%	7.5GY 4/3	6030-G30Y
Silver	1,537	10.5%	57%	43%	0%		
+ Bluish Green	27	0.2%	100%	0%	0%		
+ Colorless	659	4.5%	0%	100%	0%		
+ Yellow Brown	851	5.8%	100%	0%	0%		
Specified	10,454	71.2%	35%	18%	19%		
Unspecified	4,220	28.8%					
Overall	14,674	100%					

occurs in Birka Grave 800 which Callmer dates to 885-915, and the remaining six occur in Birka Grave 1084 which Callmer dates to 960-980. Similar beads, however, are also encountered in settlement contexts such as at Kaupang (Wiker 2007).

Callmer Class E comprises drawn segmented beads. This class does not include wound segmented beads which were common during the late Iron Age, most often in translucent blue glass. The wound varieties may be identified by their irregular segment sizes as well as their large perforations which are typically at least 3-4 mm in diameter. In contrast, drawn segmented beads often have extremely small perforations less than 2 mm in diameter that are occasionally completely sealed. Scandinavian examples generally consist of between one and three segments although longer variants also occur. These beads likely originated in Muslim or Byzantine workshops, probably routed north via the Middle Danube (Jönsson and Hunner 1995; Sode et al. 2010; Staššiková-Štukovská and Plško 2015).

During the Viking Age, segmented beads were often made from two layers of glass, sometimes with a metallic dust or foil between them. Callmer cataloged all these metal-foil beads as silver-foil although many appear golden in color. He reserved the category yellow for true yellow segmented beads, never using it for gold-foil beads made from layers of translucent brown glass. This choice to conflate silver- and gold-foil beads seems appropriate, especially since it can often be difficult to distinguish silver- from gold-foil in deteriorated specimens. Many survive without their outer layer, making it impossible to identify the original surface appearance. Furthermore, in certain circumstances, the difference between silver and gold coloring may be caused merely by incidental heat applied during manufacture rather than divergent manufacturing processes. A hotter, oxidizing flame is needed to preserve the clear outer layer that allows the silver to shine through, while a cooler, reductive flame will cause the glass to turn amber and result in a golden sheen (Moa Råhlander 2017: pers. comm.). Because of the difficulties involved in classifying these beads precisely, most researchers would benefit most from comparing segmented beads only to Callmer's most common variants, although more precise descriptions are preferred when possible (Sode et al. 2010). Callmer identifies 2,290 Class E beads in his assemblages (15.3%), including five types with more than 100 specimens each (E020, 030, 060, 110, 140).

Callmer Class F comprises drawn cut beads. They tend to be smaller than most Viking-Age beads and are sometimes little more than extremely thin and small tubes, similar to many drawn beads from more modern contexts. All variants except one rare type (F080) are monochrome. Most are blue, green, or yellow. Drawn cut beads rarely show up singly but are frequently accompanied by large assemblages of similar beads. They may be easily distinguished by their longitudinal structure, with impurities in the glass stretching from end to end rather than wrapping around the body. One end is often flat while the other is slightly rounded. This unique shape shows that the beads were either slowly cooled or reheated to soften the edges. Among other reasons, this may have been done to prevent sharp edges that could cut necklace strings (Råhlander 2017: pers. comm.). These beads were imported from production centers in the Near East and were especially common at trading sites such as Kaupang (Wiker 2007). Callmer identifies 3,936 Class F beads in his assemblages (26%) including seven types with more than 100 specimens each (F011, 030, 031, 050, 051, 060, 070).

Callmer Class G and H comprise mosaic beads. Callmer called these beads composite beads which is currently not a commonly used term. Other researchers occasionally refer to these beads as millefiori (thousand flowers), but this term should instead be reserved only for instances where a bead incorporates an indisputably floral design.

Callmer subdivided Class G beads based on the inclusion of special elements such as single-color rings on each end (G001-2), blurred features (G020), blue/yellow checker patterns (G030-2), square-tiled diamond patterns (G040-1), multi-color parallel rings on each end typically paired with blue or green eye mosaics (G050), or the absence of these particular elements (G010-4). Class H beads are a subset of G050, typically composed of blue or green eye mosaic pieces but generally lacking bands or rings. Callmer identifies 220 Class G mosaic beads (1.5%) and four Class H mosaic beads (0.03%).

In practice, these divisions have yielded few meaningful results, with almost all variants being most common in Callmer's first period (790-820). The only common exceptions are G050 beads, which fall primarily into Callmer's second period (820-845). The criteria used to distinguish G050 beads from Class H beads are difficult to apply and the few examples of Class H beads should probably be classed together with the G050 beads.

A more useful classification could be derived from Alexander Pöche's (2005:146-147) classification system for the beads of Groß Strömkendorf which distinguishes most of the motifs commonly found in Iron-Age and Viking-Age Scandinavia. In addition, Reinhart Andrae (1973) has developed a detailed classification system for eye mosaic beads, including the variants which belong to Callmer's Class H, as well as pierced variants which belong to Callmer Class J, discussed below. The main distinction among these eye beads seems to be that individual eye mosaic pieces have borders that are predominantly either green or blue. Callmer (1991) traces the arrival of blue eye mosaic beads via the Danube and green eye mosaic beads via the Volga. Additionally, a third rare type of eye mosaic bead may be identified by its bright orange borders (Callmer 1977: Color Plate III B696O). These beads should be treated as a distinct group since they occur only during the late Viking Age whereas the other eye mosaic variants tend toward the early Viking Age.

These three eye bead styles – blue, green, and orange – should be distinguished in classifications or discussions with reference to Andrae's precise classification system where possible. For other variants, Armin Volkmann and Claudia Theune (2001) have identified numerous examples in continental cemeteries from the Merovingian period, and several examples have had their chemical composition identified (Hložeka and Trojek 2015).

Callmer Class J comprises pierced beads. Callmer only notes variants made from mosaic elements, where one piece or several fused pieces of mosaic glass have been heated and pierced with a pointed rod. These mosaic pieces are typically either green or blue eyes (J001-2) or square-tiled diamond patterns (J003-4). The classification of these beads could be meaningfully expanded to indicate whether they were built from eyes framed in either green or blue, and whether they consist of one or more pieces.

Additionally, pierced beads made from non-mosaic glass should be gathered into this group. A subtype of Class J beads should be created for round pierced beads of purple glass which are at present classified among wound variants as A154 or A155 beads (Ericsson-Borggren 1993, which was prepared with the collaboration of Callmer). Close inspection of these beads, however, reveals that they contain air bubbles that are nearly spherical and not stretched from winding or drawing. In later publications, Callmer (1991) treats these beads as indicators of oriental trade, and these beads often occur in the same contexts as pierced mosaic beads, as at Åhus. Callmer identifies 25 Class J pierced mosaic beads (1.7%) and to these should be added five pierced purple beads (0.03%) currently classified as types A154 and A155.

Callmer Class K comprises reticella beads. Reticella consists of various colors of glass formed into spirals, sometimes referred to as twisted stringers. Reticella beads typically consist of a single twisted stringer folded around a mandrel. This leaves the impression of stripes that circle through the perforation. Occasionally, multiple reticella pieces are joined side-by-side, typically with the glass wrapped in alternating directions, producing a herringbone effect much like S- and Z-twisted threads combined in fabric twill. These beads often give the loose impression of irregular eyes where the ends of the reticella pieces have been seamed together. Reticella beads occur in late Iron-Age assemblages across northern Europe, often in red and yellow. Early Viking-Age variants are more frequently blue wrapped with white or green wrapped with yellow. Callmer identifies nine Class K reticella beads (0.06%).

Callmer Class Q comprises cold-cut beads that form two common groups. The first group (n=23) consists of glass that has been cut into a faceted cube, similar to the many beads of rock crystal or carnelian discussed below. These beads tend to appear in blue or green glass. The second group (n=22) consists of green tubes, often with five or six sides. Large numbers of these beads have been found at Ribe, as well as at Åhus where they are classified as types Q052, Q060, and Q061 (Ericson-Borggren 1993). These beads have a high lead content tentatively associated with raw materials taken from the Taurus Mountains along the frontier between the Byzantine empire and the Abbasid caliphate (Sode et al. 2010). In some Scandinavian soils, these high-lead beads deteriorate considerably and may appear cylindrical or heavily decayed, sometimes giving the impression of splintering yellow wood as the structure begins to deteriorate. Callmer identifies 70 Class Q cold-cut beads (0.5%).

Callmer Class R comprises faience beads. Faience is composed of fused powdered quartz and is technically not a glass. It typically appears in opaque turquoise blue but can be distinguished from glass due to the distinctive shape of the beads, primarily large melons, as well as by how the material decays. Often the projecting ribs or gadroons will deteriorate and fade to white, while the receded areas between the ribs retain a rich turquoise color. Callmer identifies 50 Class R faience beads (0.3%).

Callmer Class S comprises rock-crystal beads. There is some evidence for the production of a small number of rough rock-crystal beads in Norway (Myhre 2005), but most were likely imported from the East, where they are thought to have ultimately derived from either Iran or India. Spherical and barrel variants tend to belong to either the early or late Viking Age, with smaller examples more likely dating to the late period. Tubes and faceted cubes may more frequently be ascribed to the mid-Viking Age. Daniel Hepp (2007) has published a thorough study of the rock-crystal and carnelian beads from Haithabu, which may be used as a reference to distinguish more precise types. Callmer identifies 691 Class S rock-crystal beads (4.6%).

Callmer Class T comprises carnelian beads. Carnelian, like rock crystal, is a variant of quartz, and these beads likewise arrived via eastern routes tied to Iran or India. These beads appear in similar shapes as the rock-crystal beads and have a similar chronology. It seems likely that the same workshops produced both rock-crystal and carnelian beads, and it is possible that they produced faceted cold-cut glass beads as well. In describing carnelian beads, Hepp's (2007) classifications should also be referenced, if possible. Callmer identifies 879 Class T carnelian beads (5.9%).

Callmer Class U comprises amethyst beads. These occur occasionally before the Viking Age, often in tear-drop shapes, but they became rare after 700 (Ljungkvist 1991:42). Callmer identifies only three Class U amethyst beads (0.02%).

Callmer Class V comprises jade beads. Callmer identifies a single jade bead from a burial at Överlandet in Haram, western Norway.

Callmer was unable to classify 1,373 beads (9.2%). Many of these were probably fragmented or decayed beyond recognition, but his classification system also excludes a number of beads of other materials which occur in Viking-Age burials. Most notably, amber beads were excluded from Callmer's classification system and a thorough study of amber beads and pendants remains wanting. Silver, bronze, wood, shell, jet, and garnet also occur and may be meaningfully classified (Resi 2011a, b). Callmer also chose to exclude pendants which would be a welcome addition to bead classification systems, along with spacer beads. Spacer beads and certain bronze pendants shaped like fish heads are common on Gotland, for which Lena Thunmark-Nylén (2006:180-182, 198-201) has produced a basic typology. It remains to be seen whether these Gotlandic types are similar to those found elsewhere.

Callmer's Chronology

Callmer grouped his assemblages according to the various proportions of different bead types, often relying only on the general class, such as the presence or absence of rock crystal and carnelian. In some cases, Callmer relied on the presence or absence of specific types, such as his hybrid type B088/90 which he identified as occurring in graves no earlier than 960. Callmer then used associated grave goods to place these assemblage groups in a series and suggest absolute dates, which he confirmed against a larger dataset in the later chapters of his text. In doing so, he needed to conflate several of his assemblage groups into larger bead period groups which he identified using the largest group name. This produced a confusing situation in which Callmer's bead periods occur in the order I, II, III, IV, VII, VIII, VI, IX, and XII (Table 4). To add clarity, I will instead refer to these bead periods as phases, listing Callmer's bead period and the assemblage variants it includes below.

Callmer Phase 1 (Bead Period I: 790-820)

Callmer Bead Period (BP) I. Assemblage Variants I.A, I.B, I.C, I.D

Callmer assigns 49 assemblages to this period, of which 24 (49%) derive from cremation contexts.[6] Assemblages range from 10 to 175 beads with a median of 33 and an average of 43. This period is defined by a prevalence of wound and mosaic beads (Figure 4).

Wound beads comprise at least 50% of most assemblages, totaling 85% of all period beads. Dark blue beads are most common, followed by beads of green and white. Slightly less than 20% of all wound beads are decorated, with eyes appearing somewhat more frequently than rings, which may be applied singly, side by side, or interwoven. Assemblages with undecorated turquoise beads (A291, 340, 341, 345) or including various white, black, or turquoise beads with rings (B021, 066, 531, 536, 538, 545, 610) are typically excluded from this period and should instead be regarded as belonging to the later period 885-915.

Mosaic beads are most common during this period, comprising about 5% of the assemblages. Callmer attributes to this phase three exceptional assemblages in which mosaic beads comprise more than 30%. These derive from northern Norway. In all assemblages from this phase, drawn beads are extremely rare, comprising about 1% of period beads and appearing only exceptionally in groups of more than one within a single assemblage. Rock-crystal and carnelian beads are generally absent.

This phase corresponds to Bornholm phases 2C and 2D (775-800+). R3C assemblages consisting of green, white, blue, and polychrome beads mixed with colorless and gold-foil beads were being deposited alongside R3D assemblages consisting of colorless, gold-foil, and silver-foil beads. These descriptions conflict slightly with Callmer's study, for which colorless and silver-foil beads each make up less than 2% of the period assemblages. The Bornholm phases are open-ended, however, and these beads become more prevalent in Callmer's later phases. This suggests that, although furnished burials were sparse on Bornholm during the Viking Age, they continued past Callmer's first phase, at least into his second (820-845).

This phase corresponds to Ribe Posthuset Phases F and G (790-820). Wasp beads, which were declining but still common in Ribe, are completely absent from Callmer's

Table 4. Callmer Assemblage Classification.

Bead Period	Bead Group	AB Wound	A Undecorated	B Decorated	EF Seg./ Drawn	E Segmented	F Drawn	G Mosaic	ST Rock/ Carn.	Note
I	I.a	>50%				0%		<30%	0%	1
790-820	I.b	>50%	>50%			<10%	<15%	<30%	0%	1
	I.c	>50%		>50%		<10%	<15%	<30%	0%	1
	I.d					<10%		>30%	0%	
II	I/II.a	>50%				10-25%	<15%	<30%	0%	1
820-845	I/II.b	>50%				25-50%	<15%	<30%	0%	1
	II.a		>30%			>50%	<10%	<30%	0%	2
	II.b		<30%			>50%	<10%	<30%	0%	2
III	II/III.a					>50%	10-50%	<30%	0%	2
845-860	II/III.b		30-50%			25-50%	10-50%	<30%	0%	
	III.a		<10%			10-25%	>50%	<30%	0%	
	III.b		<10%			<10%	>50%	<30%	0%	
	III.c		10-50%			<10%	>50%	<30%	0%	
IV	III/IV.a	<60%					>10%		<30%	
860-885	IV.a	<60%					<10%		<37.5%	
	V.a								>75%	3
VII	VII.a	>50%	<B		<10%			<30%	0%	4
885-915	VII.b	>50%	>B		<10%			<30%	0%	4
	VII.c	>50%				>10%	<10%	<30%	0%	4
	VII.d	>50%				<10%	>10%	<30%	0%	4
VIII	VIII.a	>50%							<50%	5
915-950	XI.a	<60%					<10%		>37.5%	
	X.a								50-75%	6
VI	V/VI.a						20-50%		≥0%	7
950-960	VI.a						>50%		≥0%	7
	VIII/IX.a	10-50%				20-50%			<50%	8
IX	IX/X.a	10-50%				20-50%			<50%	9
960-980	IX.a					>75%			<50%	
	IX.b					50-75%			<50%	
	X.b								50-75%	10
	V.b								>75%	11
XII	XII.a	>50%							<50%	12
980-1000										

1. A291, 340, 341, 345 < other A and/or A291, B021, 066, 531, 536, 538, 545, 610 absent.
2. Only E060, 110, 120, 140.
3. Early context.
4. A291, 340, 341, 345 > other A and/or A291, B021, 066, 531, 536, 538, 545, 610 present.
5. A001, 291, 341, 345 dominate (but A001<50%) and/or B011, 066, 545, 691 present.
6. Absence of B088, 090, E030, 03-1, 050. A171, 172, 177 not dominant.
7. Small F.
8. Lack of B088, 234. A171 not dominant.
9. B088, 090, 235 present or A171 dominant.
10. Presence of B088, 090 and/or dominance of A171, 172, 177 and/or presence of E030, 03-1,050.
11. Late context.
12. Dominance of A001(>40%), 020, 171.

Figure 4. Beads from grave 35 at Tuna i Badelunda, classified by Callmer as BP I (790–820), assemblage variant I.c. This assemblage variant is dominated by wound beads (Västmanlands läns museum 27651.)

inventory for this phase. The oriental beads also present an interesting contrast between Ribe and Callmer's burial inventories. In Ribe, 18% of the segmented beads are blue, the rest are metal-foil. Callmer, however, inventoried a single blue segmented bead, while the remaining 97% of segmented beads were silver-foil. Moreover, segmented beads comprise over 30% of the period beads at Ribe but are only found in 1.6% of the period burials. This leaves the impression that some styles of beads – in this case wasp beads and segmented beads – circulated in emporia but were not displayed by surrounding elites. Elites were still primarily displaying wound beads which may have been made locally or acquired through networks of patronage or trade. But the people living in Scandinavian emporia were instead surrounding themselves with beads newly arrived from the orient, appearing in drawn and segmented styles that could not be replicated by Scandinavian craftsworkers but were instead visibly identifiable as products made in the Near East.

Callmer Phase 2 (BP II: 820-845)
BP II (+ II/III). Assemblage Variants I/II.A, I/II.B, II.A, II.B

Callmer assigns 42 assemblages to this period, 17 of which (41%) derive from cremation contexts. Assemblages range from 13 to 91 beads with a median of 32 and an average of 37. These assemblages are somewhat smaller than in the preceding period. This period is defined by an increasing number of segmented beads, but drawn cut beads remain rare (Figure 5).

Wound beads decline to only 35% of assemblages, with green and white beads striking a more even balance with the still dominant blue. Decorated beads are slightly more common at just over 20%, with ring patterns occurring more frequently than eyes. Mosaic beads occur at a rate of about 4%. Pierced mosaic beads are most common during this period, although they represent less than 1% of the period beads.

Figure 5. Beads from grave 47 at Lousgård, Bornholm. Callmer classifies this assemblage as BP II (820-845), assemblage variant II.b, dominated by segmented beads of metal-foil or blue glass, while Høilund Nielsen classifies it as Group R3D (775-850) and links it to Bornholm phase 2C (775-800) (National Museum of Denmark C5710).

Segmented beads dominate this period, comprising over 40% of the period beads. About 80% of these are silver-foil; the remaining segmented beads are dark blue. Drawn cut beads also occur but only in small numbers, comprising only about 1% of the period beads. Blue is the most common color with a single occurrence of green. Cold-cut beads also appear during this period, typically as narrow cylinders or 5- or 6-sided tubes. Many of these have deteriorated and exhibit an opaque white or brown coating, although strong lighting will often reveal the bright green color of the underlying glass. Rock-crystal and carnelian beads are rare, at less than 2% of the period's assemblages.

This phase corresponds to Ribe Posthuset Phases H/I (820-850). Earlier oriental imports have gone into final decline, including segmented beads which are finally becoming common in elite graves. These beads drop from 31% to 4% of the period beads at Ribe, while rising from 2% to 44% in period graves. Instead, Ribe's assemblage is dominated by a new oriental import: drawn cut beads which rise from 5% to almost 30% of period assemblages. These beads, which characterize Høilund Nielsen's assemblage type R3E, also begin to appear in Callmer's grave inventories, but only at a rate of 1.2%.

Callmer Phase 3 (BP III: 845-860)

BP III (+ II/III, + III/IV). Assemblage Variants II/III.A, II/III.B, III.A, III.B., III.C, III/IV.A

Callmer assigns 29 assemblages to this period, of which 12 (41%) derive from cremation contexts. Assemblages range from 10 to 243 beads with a median of 54 and an average of 62. These assemblages include substantially more beads than preceding periods. This period is defined

Figure 6. Beads from grave 810 at Hedeby, Germany. Almost all are oriental imports. Due to the large proportions of segmented (61%) and drawn cut beads (29%), this assemblage may be classified with variants II/III.b and grouped with BP III (845-860) (Schleswig-Holsteine Landesmuseen Hedeby Grave 487/1960.)

by the frequent occurrence of drawn cut beads, often in combination with drawn segmented beads (Figure 6).

Wound beads decline to just 10% of assemblages. Green beads become prominent at about 30% of the wound beads, with blue and blue-green each making up an additional 20%. White also continues to occur. Decorated beads make up a larger percentage of wound beads than before, now comprising 25%. Rings remain the more common pattern for decoration, now more frequently occurring singly or side by side rather than interwoven. Mosaic beads and pierced mosaic beads fall to less than 1% of assemblages, while segmented beads decline to only about 10% of assemblages. About 67% of segmented beads are silver-foil, the remaining segmented beads are mostly blue.

Drawn cut beads make up more than 70% of all assemblages, and their dramatic increase accounts for the large assemblages of this period. More than half of them are blue, and most of the rest are yellow, although white and sometimes green specimens also occur. Cold-cut beads continue to occur at about the same rate as the previous phase, again comprising about 1% of assemblages. Rock-crystal and carnelian beads are rare, also constituting less than 1% of the period beads.

The chronology for Ribe falters around 850, as any later Viking-Age layers have been disturbed by subsequent activities. Nevertheless, more drawn cut beads were found in these disturbed layers than in all preceding phases combined, suggesting that they continued to circulate at Ribe at least through Callmer's third phase. Kaupang also offers a useful point of reference. Although no close chronological study of the Kaupang beads has yet been published, drawn cut beads occur throughout the stratified layers of Site Phase II, which lasted until about 850 (Pilø and Pedersen 2007; Wiker 2007). Callmer Phase 3 may therefore represent a point of convergence, as both rural elites and emporia residents encountered and engaged with similar beads. This is a strong indicator that long-distance exchange – although always a small fraction of medieval economics – had nevertheless taken on social significance as the source of a shared material culture throughout the diverse communities of Viking-Age Scandinavia.

Callmer Phase 4 (BP IV: 860-885)

BP IV (+ V.A). Assemblage Variants IV.A, V.A

Callmer assigns 38 assemblages to this period. Seventeen of these assemblages belong to Callmer's group V, which he recommended splitting, based solely on context, into an early group belonging to this period and a later group belonging to the period 960 to 980, further discussed below. Three assemblages (154, 182, and 191) should be reassigned to the later period due to accompanying artifacts dating to the late Viking Age. Another assemblage (221) should be similarly reassigned due to the presence of a particular type of bead (S006) which is otherwise almost exclusively associated with the late Viking Age (Figure 7).

Figure 7. Beads from grave 81 at Hedeby, Germany. Newly imported rock-crystal and carnelian beads dominate this assemblage, with a single blue drawn cut bead. This assemblage is typical of variant V.A, grouped into BP V (885-915) (SHLM, Hedeby Grave 64/1908.)

Of the remaining ten group V assemblages combined with the 21 group IV.A assemblages, 20 (59%) derive from cremation contexts, a dramatic increase from previous periods. Assemblages range from 10 to 402 beads with a median of 38 and an average of 54. This indicates that although some exceptional assemblages were much larger than in the previous period, assemblages in fact tended to be decreasing in size. This period is defined by the sudden appearance of rock-crystal and carnelian beads, as well as the rapid disappearance of drawn segmented and cut beads.

Wound beads again become common and constitute 40% of assemblages. Green is the most common color at about 33% of all wound beads and turquoise specimens comprises an additional 25%. These green or greenish beads are more frequently translucent than during earlier periods. White beads also remain common. More than 20% of wound beads are decorated, with rings occurring almost twice as often as eyes. Mosaic beads remain rare.

Segmented beads drop to only 2% of assemblages and drawn cut beads fall to 7%. Blue remains the most common color, followed by yellow, white, and green. Rock-crystal and carnelian beads jump to 40% of the period beads. In 12 burials (35%), these beads comprise over 75% of their assemblages and in four of these cases, the assemblages consist solely of rock-crystal and carnelian beads. Eleven of these burials were at Birka or in the surrounding areas of central Sweden, and the remaining one was located at Hedeby. Overall, carnelian beads occur about twice as frequently as rock crystal. A small number of faience beads are also present, although they still number well below 1% of the period beads.

The dramatic abandonment of glass beads for beads of rock crystal and carnelian marks an important turn in the Viking Age. The Ribe chronology has ceased by this point, and although Kaupang shows some evidence of occupation until about 930, the scarcity of rock crystal and carnelian suggests that it no longer functioned as a hub for long-distance exchange. Conversely, at Hedeby and Kaupang, the arrival of carnelian and rock crystal corresponds to the first major expansions of the excavated harbor areas (Ambrosiani et al. 1973:32, 236; Kalmring 2010:351-359, 664). Kalmring associates the expansion of the Hedeby harbor with an effort to accommodate larger vessels, which would have included an increased capacity for trade. The sudden presence of rock-crystal and carnelian beads in the harbor layers as well as in elite graves across Scandinavia demonstrates the expanding importance of maritime traffic and long-distance exchange during this period. This reinforces Christoph Kilger's (2008:228-235) arguments that the silver trade thrived throughout this period as well.

Callmer Phase 5 (BP VII: 885-915)

BP VII. Assemblage Variants VII.A, VII.B, VII.C, VII.D

Callmer assigns 36 assemblages to this period, of which 13 (36%) derive from cremation contexts. Assemblages range from 11 to 146 beads with a median of 22 and an average of 33. Despite the presence of a few large assemblages, most are the smallest of the Viking Age. This period is defined by the sudden end of rock crystal and carnelian and the return of wound beads (Figure 8).

Wound beads comprise 70% of period assemblages with green and turquoise specimens each exceeding 20%. White beads follow at about 15%. Beads in other colors occur occasionally. Over 25% of the beads are decorated, which is the highest frequency of decoration during the Viking Age. In particular, white, black, or turquoise beads with rings (B021, 066, 531, 536, 538, 545, 610) are characteristic of this period. Their presence, or in certain cases the prominence of undecorated turquoise beads (A291, 340, 341, 345), helps distinguish assemblages of this period from earlier assemblages dominated by wound beads.

Drawn segmented beads occur at a rate of 5%, and drawn cut beads reduce to less than 4%, occurring almost exclusively in blue and yellow. Mosaic beads are somewhat more frequent than in the preceding two periods, although

Figure 8. Beads from grave 497 at Hedeby, Germany. This assemblage may be associated with variant VII.a, BP VII (885-915). The green translucent beads with wavy rings, often alternating with straight rings, are especially characteristic of this period (SHLM, Hedeby Grave 188/1960.)

Figure 9. Beads from grave 77 at Hedeby, Germany. Callmer classifies this assemblage as variant X.A, BP VIII (915-950), based on the large number of rock-crystal and carnelian beads. This falls between variants IV.A and V.A, both of which are grouped into BP IV (860-885) (SHLM, Hedeby Grave 60/1908).

rebounding to only 2% of assemblages. Very few rock-crystal beads occur and carnelian beads are entirely absent.

The abandonment of oriental bead imports corresponds to the influx of Samanid silver that began during this period (Kilger 2008:235-240). Beads no longer served as a dominant long-distance exchange commodity and may even have been displaced as a means of exchange. Instead, there seems to have been a revival of local bead production. At present, few chemical studies are available to indicate the source of the glass used to make these beads, but there is evidence that glass production occurred at Hedeby, at least from recycled materials (Kronz et al. 2015).

Callmer Phase 6 (BP VIII: 915-950)

BP VIII (+ IX, + X.A). Assemblage Variants VIII.A, XI.A, X.A

Callmer assigns 27 assemblages to this period, of which 18 (67%) derive from cremation contexts. Assemblages range from 11 to 184 beads with a median of 29 and an average of 41. This is an overall increase in assemblage size from the preceding period and large assemblages are again more common. This period is defined by the return of rock-crystal and carnelian beads, mixed with a larger number of wound beads, including several diagnostic types decorated with rings (Figure 9).

Wound beads comprise over 50% of the period assemblages. Green remains the most common color, albeit at only about 25% of the wound beads. Colorless, white, red, and turquoise specimens are also common. The presence of certain turquoise and grayish-green beads (A001, 291, 341, 345) helps distinguish the assemblages of this period. About 15% of the wound beads are decorated. The presence of certain white, black, and green beads with rings (B011, 066, 545) or green beads with eyes (B691) also helps distinguish the assemblages of this period.

Drawn segmented, drawn cut, and mosaic beads occur rarely. Cold-cut and faience beads occur only exceptionally. Rock-crystal and carnelian beads each occur at a rate of about 13%, comprising 25% of the period beads. Most of these appear in styles that were already common between 860 and 885, predominantly tubes, faceted cubes, and spheres. The appearance, disappearance, and reappearance of rock-crystal and carnelian beads may reflect major changes in the structure of the Central Asian trade contingent on the rise of the Samanid emirate, which is similarly reflected in changing sources of silver imports (Kilger 2008).

Callmer Phase 7 (BP VI: 950-960)

BP VI (+ V/VI, + VIII.IX). Assemblage Variants V/VI.A, VI.A, VIII/IX.A

Callmer assigns 16 assemblages to this period of which 4 (25%) derive from cremation contexts. Assemblages range from 27 to an exceptional 1,216 beads with a median of 57 and an average of 195. Large assemblages seem to be common during this period with over half of the assemblages comprising more than 50 beads, four of which include over 300 beads. This period is defined by the dominance of small drawn cut beads (Figure 10).

Figure 10. Beads from grave 644 at Hedeby, Germany. This assemblage consists solely of small drawn cut beads, typical of variant VI.A, grouped with BP VI (950-960) (SHLM, Hedeby Grave 340/1960.)

Wound beads are extremely rare during this period, comprising less than 5% of the assemblages. Green remains the most common color, followed by white, blue, and turquoise. About 25% of wound beads are decorated, with rings being a somewhat more common design feature than eyes. A single mosaic bead was found in a grave in southwestern Sweden and a small group of cold-cut beads was found in a Birka grave.

Drawn cut beads comprise almost 80% of assemblages from this period. Almost 50% of these beads are green while blue comprises only about 15%. This is the opposite of earlier periods when most drawn cut beads were blue and green was only rarely encountered. Drawn segmented beads also occur during this period at a rate of about 10%.

Callmer Phase 8 (BP IX: 960-980)

BP IX (+ IX/X, + X.B, + V.B). Assemblage Variants IX/X.A, IX.A, IX.B, X.B, V.B

Callmer assigns 49 assemblages to this period. Additionally, at least four assemblages dominated by rock crystal and carnelian and likely stemming from late contexts should probably be included in this period. Of these 53 assemblages, 19 (36%) derive from cremation contexts. Assemblages range from 10 to 136 beads with a median of 28 and an average of 35. These numbers represent a significant reduction from the massive displays of the previous period. This period is defined by a large number of segmented beads mixed with rock crystal and carnelian (Figure 11).

Wound beads comprise just over 10% of assemblages. Blue beads are again more prominent than green, although no single color dominates this period. Almost 30% of wound beads are decorated. Black beads decorated with both eyes and lines (B088/90) are diagnostic types for this period.

Figure 11. Beads from grave BØ at Stengade, Denmark. The large black bead with eyes and interwoven rings belongs to type B088/90, which is characteristic of variant IX/X.a, grouped with BP IX (960-980) (Langelands Museum 8277).

Drawn cut beads almost disappear during this period, dropping to only 1% of assemblages. Drawn segmented beads become much more common, comprising over 50% of period beads. Silver-foil beads dominate at 67%, but yellow and blue both make up more than 10% of the period's segmented beads. Rock crystal and carnelian make up 20% of period beads with both occurring at about the same rate.

Callmer Phase 9 (BP XII: 980-1000)

BP XII. Assemblage Variant XII.A

Callmer assigns 10 assemblages to this period of which six (60%) derive from cremation contexts. Assemblages range from 10 to 90 beads with a median of 29 and an average of 32. The relatively small number of assemblages that Callmer was able to assign to this period suggests that burials with grave goods were already becoming rare. This is the last phase of Callmer's sequence. It is defined by the return of wound beads with some continuation of drawn segmented beads and beads of rock crystal and carnelian (Figure 12).

Wound beads comprise over 60% of period assemblages. Translucent colorless beads (A001), opaque white beads (A020), and translucent blue beads (A171) are diagnostic of the period. Red beads are also present in substantial numbers, but green beads disappear almost entirely. Only about 15% of wound beads are decorated, which is the lowest rate of decoration during the Viking Age. White and

Figure 12. Beads from grave 79 at Tuna i Badelunda, classified by Callmer as BP XII (980-1000), assemblage variant XII.a. In addition to the two B088/90 black decorated specimens, there are also two large drawn melon beads which are characteristic of the late Viking Age (Västmanlands läns museum 27651).

blue beads are the most likely to be decorated, with a slight preference for eyes over rings.

Drawn segmented beads occur at a rate of just over 5% of assemblages. Half of these are colorless while most of the remainder are silver foil. A single yellow drawn cut bead can be assigned to this period. Rock-crystal and carnelian beads occur in about equal numbers, comprising a combined total of 10% of the period assemblages.

Discussion

Further study of other chronological contexts would complement this study, giving researchers insights into how women selected beads from the varieties that were available. Urban sites provide the most immediate comparative context, although chronologies are often lacking for the later Viking Age. The Ribe stratigraphy offers a tight chronology of beads through the early decades of the Viking Age. A stratigraphic study of the beads from Kaupang could further this urban bead chronology into the late 800s (Gaut 2011; Wiker 2007). Ongoing work on the stratigraphy has unraveled the early layers from Birka (Ambrosiani 2013), and a forthcoming volume focused on the later stratigraphy is eagerly anticipated. Hedeby has also been the subject of rigorous studies, although chronologies tend to be based on typologies rather than on stratigraphic sequences (Steppuhn 1998). Several south Baltic sites should also be included with these studies, including especially Groß Strömkendorff/Reric (Pöche 2001, 2005), Janów Pomorski/Truso (Dekówna and Purowski 2012), and Szczecin/Wolin (Olczak and Jasiewiczowa 1963; Stanisławski 2003). Russian sites such as Staraya Ladoga would also be welcome additions but are beyond my linguistic abilities.

Callmer's chronology is now also in a position to be reassessed in terms of bead circulation outside Scandinavia. Viking-Age beads in Britain have received an initial treatment by Megan Hickey (2014), and both Ireland (O'Sullivan 2013) and Iceland (Hreiðarsdóttir 2005) have unpublished catalogs of beads classified according to Callmer's typologies. The beads from Ireland hold rich potential for advancing our understanding of the chronology of Norse activity there, whereas the beads from Iceland provide a firm chronological key, revealing which bead types were still in circulation after settlement began in 871±2.

Callmer omitted Gotland from his study, although he later provided comments in a short contribution to the *Wikingerzeit Gotlands* volumes (Callmer 2006). The bead finds from Gotland have proven especially rich, although no chronological analysis has yet been published (Carlsson 2003). I am, however, prepared to offer some initial comments after my own examination of almost 3,000 beads at the Gotland Museum in the spring of 2017, with reference to several key publications (Rundkvist 2003a, 2003b; Thunmark-Nylén 2006).

Through much of the late Iron Age, Gotland bead assemblages look similar to those from mainland Sweden and Bornholm, with the additional inclusion of local limestone beads. The growth of an early emporium at Paviken parallels developments at Åhus and Ribe and suggests that the material culture of Gotland maintained links to Scandinavia into the early Viking Age.

Gotlanders, however, soon forged their own connections eastward, bringing in varieties of oriental beads differing from those seen in other parts of Scandinavia (*see* cover). Few segmented or drawn cut beads appear, and rock crystal and carnelian are similarly scarce. Instead, Gotlanders began using large numbers of cowrie shell beads which ultimately came from the Indian Ocean (Trotzig 1988). Cowrie beads continue into the late Viking Age, when B088/090 beads also begin to appear, showing reintegration with the long-distance networks that served the rest of Scandinavia. At some point during the later Viking Age, a new port developed at Fröjel near the defunct site of Paviken and this was in turn overshadowed by the medieval development of Visby. The late Viking Age and early medieval assemblages from Gotland have few parallels in the rest of Scandinavia, but this is mainly due to the abandonment of beads in other areas of Scandinavia as Gotlanders sought to maintain links to the bead-wearing cultures of the East.

CONCLUSION

Callmer's study has demonstrated that bead assemblages changed significantly over the course of the Viking Age and this has been broadly upheld by subsequent research. Høilund Nielsen's late Iron-Age chronologies complement Callmer's study and add temporal depth to the chronologies of elite assemblages, while the rich stratigraphy of Ribe also offers a perspective on bead use in a different kind of community. Together, these studies show that beads performed a central role in the Viking-Age creation of communities and networks to facilitate craft production and material exchange. They also reveal that not all Scandinavians participated in these transformations in the same ways. The parallel chronologies of pre-Viking burials and emporia show how elite demand shaped bead production and imports, sometimes benefitting beadmakers and importers, and sometimes demanding that they adapt to the circumstances around them. Meanwhile, the development of emporia and new networks of exchange opened opportunities for communication and mobility, and the widespread occurrence of beads throughout Scandinavia indicates how deeply these effects permeated the societies of the Viking Age.

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ENDNOTES

1. Feveile and Jensen (2006) published two sets of data derived from two different methods of counting artifacts. Although the counting methodologies are never fully elaborated, it seems that one key difference lay in how contexts that could not be assigned to specific phases were tallied into the site totals. Additionally, the high number of fragmentary beads could be counted in many ways. These figures are therefore only suggestive and not absolute. In my discussion, I rely especially on the tables presented in the focused discussion of glass artifacts (Feveile and Jensen 2006:147-149).

2. One green tube bead and one drawn cut bead may be attributed to Phase C, but Phase E is unique for the variety and increasing number of imported beads.

3. There are minor discrepancies between the totals given for each assemblage and the number of beads in the inventories that Callmer provides. When discussing assemblages, I use the numbers that Callmer indicates as the assemblage totals, but when discussing specific classes or types of beads, I derive my numbers from his inventory lists.

4. Callmer also included a grave from Sandviken in this period (assemblage 130; GLM 15667), without identifying the burial rite. This grave should be counted as an inhumation burial (Sandviken 54:1). I am grateful for the help of Maria Björck, Avdelningschef Kulturmiljö, Länsmuseet Gävleborg, in establishing the context of this find.

5. Two outliers have been omitted from these averages: Callmer no. 67 (University Museum of Bergen, no. B 11769), a non-expertly excavated cremation from Fjørtoft in western Norway yielding 365 beads, and Callmer no. 93 (Tromsø University Museum, no. Ts 5281), an expertly excavated inhumation from Steigen in northern Norway yielding 1,216 beads.

6. Since Callmer's classification system has long been out of print and is not widely available, I have created an online appendix (Delvaux 2017) to this article which presents the system with updated terminology, reorganized for digital use, and incorporating chronological information. Hosted by Harvard Dataverse, the appendix may be downloaded as a spreadsheet file at doi:10.7910/DVN/RODUZG. I thank Johan Callmer for granting permission to reproduce these data, and likewise thank Barbara Mento, Chelcie Juliet Rowell, and Carli Spina of the Boston College Libraries for their support.

REFERENCES CITED

Adamsen, Christian, Ulla Lund Hansen, Finn Ole Nielsen, and Margrethe Watt (eds.)

2009 *Sorte Muld: Wealth, Power and Religion at an Iron Age Central Settlement on Bornholm*. Bornholms Museum, Rønne.

Ambrosiani, Björn

2013 *Excavations in the Black Earth 1990-1995. Stratigraphy Vol. 1. Part One: The Site and the Shore. Part Two: The Bronze Caster's Workshop*. Birka Studies 9. The Birka Project, Stockholm.

Ambrosiani, Björn, Birgit Arrhenius, Kristina Danielsson, Ola Kyhlberg, and Gunnel Werner

1973 Birka. Svarta jordens hamnområde. Arkeologisk undersökning 1970-71. Rapport C1 1973. Riksantikvarieämbetet, Stockholm.

Andersen, Jan Holme and Torben Sode

2010 The Glass Bead Material. In *Ribe Excavations 1970-76*, Vol. 6, edited by Mogens Bencard and Helge Brinch Madsen, pp. 17-128. Jysk Arkæologisk Selskab, Aarhus.

Barrett, James H.

2015 Maritime Societies and the Transformation of the Viking Age and Medieval World. In *Maritime Societies of the Viking and Medieval World*, edited by James H. Barrett and Sarah Jane Gibbon, pp. 1-13. Maney Publishing, Leeds.

Becker, Carl Johan

1953 Zwei Frauengräber des 7. Jahrhunderts aus Nørre Sandegård, Bornholm. *Acta Archaeologica* 24:127-155.

Brugmann, Birte

2004 *Glass Beads from Early Anglo-Saxon Graves: A Study of the Provenance and Chronology of Glass Beads from Early Anglo-Saxon Graves, Based on Visual Examination*. Oxbow, Oxford.

Callmer, Johan

1977 *Trade Beads and Bead Trade in Scandinavia ca. 800-1000 A.D.* Rudolf Habelt, Bonn.

1991 Beads as a Criterion of Shifting Trade and Exchange Connections. *Studien zur Sachsenforschung* 7:25-38.

1997 Beads and Bead Production in Scandinavia and the Baltic Region C. AD 600-1100: A General Outline. In *Perlen: Archäologie, Techniken, Analysen* edited by Uta von Freeden and Alfred Wieczorek, pp. 197-202. Kolloquien zur Vor- und Frühgeschichte 1.

2002 North-European Trading Centres and the Early Medieval Craftsman. Craftsmen at Åhus, North-eastern Scania, Sweden ca. AD 750-850+. In *Central Places in the Migration and Merovingian Periods. Papers from the 52nd Sachsensymposium*, edited by Birgitta Hårdh and Lars Larsson, pp. 125-157. Uppåkrastudier 6. Almqvist and Wiksell International, Stockholm.

2006 Gotlands Perlenmaterial ca. 800-1100 in vergleichendem Licht. In *Die Wikingerzeit Gotlands*, Vol. III.1, Text, by Lena Thunmark-Nylén, pp. 196-197. Almqvist and Wiksell International, Stockholm.

Callmer, Johan and Julian Henderson

1991 Glassworking at Åhus, S. Sweden (Eighth Century AD). *Laborativ Arkeologi* 5:143-154.

Carlsson, Dan

2003 Viking Beads from Gotland. *Viking Heritage Magazine* 3:22-23.

Dekówna, Maria and Tomasz Purowski

2012 Znaleziska związane ze szklarstwem oraz okazy z kwarcu ze stanowiska Janów Pomorski 1 (Glass and Quartz Finds from Janów Pomorski site 1). In *Janów Pomorski, Stan. 1. Wyniki ratowniczych badań archeologicznych w latach 2007-2008*, Vol. I:3 *Analizy*, edited by Mateusz Bogucki and Beata Jurkiewicz, pp. 65-260. Muzeum Archeologiczno-Historyczne w Elblągu, Elbląg.

Delvaux, Matthew C.

2017 Viking-Age Bead Classification System (Callmer 1977). Harvard Dataverse; doi:10.7910/DVN/RODUZG, accessed 27 November 2017.

Effros, Bonnie

2017 The Enduring Attraction of the Pirenne Thesis. *Speculum* 92:184-208.

Ericson-Borggren, Tyra

1993 Arkeologisk undersökning m.m. inom Åhus 42:84 m.fl. [1989-1991], Åhus sn, Kristianstads kommun, Skåne. Rapport 1993:12. Kristianstads läns museum, Kristianstad.

Erikson, Bo G.

2015 *Kungen av Birka. Hjalmar Stolpe – arkeolog och etnograf*. Atlantis, Stockholm.

Feveile, Claus

2006 Ribe on the North Side of the River, 8th-12th Century – Overview and Interpretation. In *Det Ældste Ribe. Udgravninger på nordsiden af Ribe Å 1984-2000*, Vol. 1.1, edited by Claus Feveile, pp. 65-91. Jysk Arkæologisk Selskab, Aarhus.

Feveile, Claus and Stig Jensen

2006 ASR 9 Posthuset. In *Det Ældste Ribe. Udgravninger på nordsiden af Ribe Å 1984-2000*, Vol. 1.2, edited by Claus Feveile, pp. 119-189. Jysk Arkæologisk Selskab, Aarhus.

Friedrich, Matthias

2016 *Archäologische Chronologie und historische Interpretation. Die Merowingerzeit in Süddeutschland*. Ergänzungsbände zum Reallexikon der Germanischen Altertumskunde 96.

Gaut, Bjarne

2011 Vessel Glass and Evidence of Glassworking. In *Things from the Town: Artefacts and Inhabitants in Viking-age Kaupang*, edited by Dagfinn Skre, pp. 169-279. Kaupang Excavation Project Publication Series 3. University of Oslo, Oslo.

Hamerow, Helena

2016 Furnished Female Burial in Seventh-Century England: Gender and Sacral Authority in the Conversion Period. *Early Medieval Europe* 24:423-447.

Henderson, Julian

2013 *Ancient Glass: An Interdisciplinary Exploration*. Cambridge University Press, Cambridge.

Hepp, Daniel A.

2007 Die Bergkristall- und Karneolperlen von Haithabu und Schleswig: Ein Beitrag zu Handel und Handewerk im südlichen Ostseeraum. In *Das archäologische Fundmaterial* 8, edited by Christian Radtke, pp. 13-181. Berichte über die Ausgrabungen in Haithabu 36.

Hickey, Megan Kathleen

2014 Perler fra vikingtiden (Beads of the Viking-Age). A Study of the Social and Economic Patterns in the Appearance of Beads from Viking-Age Sites in Britain. M.A. thesis. Department of Archaeology, University of York, York.

Hložeka, Martin, and Tomáš Trojek

2015 Millefiori Glasswork Technique in the Migration Period: Investigation of Beads with the Use of Nondestructive X-Ray Fluorescence Micro-Analysis. *Radiation Physics and Chemistry* 116:332-334.

Hodges, Richard, and David Whitehouse

1983 *Mohammed, Charlemagne and the Origins of Europe: Archaeology and the Pirenne Thesis*. Cornell University Press, Ithaca.

Høilund Nielsen, Karen

1987 Zur Chronologie der Jüngeren germanischen Eisenzeit auf Bornholm. Untersuchungen zu Schmuckgarnituren. *Acta Archaeologica* 57:47-86.

1997 Die frühmittelalterlichen Perlen Skandinaviens. Chronologische Untersuchungen. In *Perlen: Archäologie, Techniken, Analysen*, edited by Uta von Freeden and Alfried Wieczorek, pp. 187-196. Kolloquien zur Vor- und Frühgeschichte 1.

Hreiðarsdóttir, Elín Ósk

2005 Íslenskar perlur frá víkingaöld: með viðauka um perlur frá síðari öldum. M.A. thesis. Department of Archaeology, University of Iceland, Reykjavik.

Jönsson, Maibritt and Pete Hunner

1995 Gold-Foil Beads. In *Glass Beads: Cultural History, Technology, Experiment and Analogy*, edited by Marianne Rasmussen, Ulla Lund Hansen, and Ulf Näsman, pp. 113-116. Historical-Archaeological Experimental Centre, Lejre.

Jørgensen, Lars

1990 *Bækkegård and Glasergård: Two Cemeteries from the Late Iron Age on Bornholm*. Akademisk forlag, Copenhagen.

Jørgensen, Lars and Anne Nørgård Jørgensen

1997 *Nørre Sandegård Vest: A Cemetery from the 6th-8th Centuries on Bornholm*. Det Kongelige Nordiske Oldskriftselskab, Copenhagen.

Kalmring, Sven

2010 *Der Hafen von Haithabu*. Wachholtz, Neumünster.

Karn, Amanda

2014a Paviken 2013. Rapport över 2013 års utgrävning av den vikingatida hamnplatsen Paviken, Västergarns socken. Rapport Arendus 2014:8. Arendus AB, Visby.

2014b Paviken 2014. Arkeologisk Undersökning, Stora Mafrids 5:12, Västergarn socken, Gotland. Rapport Arendus 2014:27. Arendus AB, Visby.

2015 Paviken 2015. Arkeologisk Undersökning, Lilla Mafrids 1:69, Västergarn socken, Gotland. Rapport Arendus 2015:29. Arendus AB, Visby.

Kilger, Christoph

2008 Kaupang from Afar: Aspects of the Interpretation of Dirham Finds in Northern and Eastern Europe between the Late 8th and Early 10th Centuries. In *Means of Exchange: Dealing with Silver in the Viking Age*, edited by Dagfinn Skre, pp. 199-252. Kaupang Excavation Project Publication Series 2.

Koch, Ursula

2001 *Das alamannisch-fränkische Gräberfeld bei Pleidelsheim*. Konrad Theiss Verlag, Stuttgart.

2007 Die Grabfunde – Bausteine der Chronologie – Indikatoren der sozialen Stellung. In *Mannheim vor der Stadtgründung*, Teil I, Band 2, *Archäologie II: Von der Völkerwanderung bis zur Frühen Neuzeit. Aus der Mannheimer Namenkunde*, edited by Hansjörg Probst, pp. 118-191. Verlag Friedrich Pustet, Regensburg.

Kronz, Andreas, Volker Hilberg, Klaus Simon, and Karl Hans Wedepohl

2015 Glas aus Haithabu. *Zeitschrift für Archäologie des Mittelalters* 43:39-58.

Lagerholm, Eva

2009 En pärla gör ingen kvinna? En statistisk jämförelse mellan osteologisk bedömda gravar och dess gravgåvor under yngre järnåldern. B.A. thesis. Institutionen för kultur och kommunikation, Södertörns högskola, Huddinge.

Ljungkvist, John

2009 Continental Imports to Scandinavia: Patterns and Changes between AD 400 and 800. In *Foreigners in Early Medieval Europe: Thirteen International Studies on Early Medieval Mobility*, edited by Dieter Quast, pp. 29-49. Monographien des Römisch-Germanischen Zentralmuseums 78.

Lundström, Per

1981 *De kommo vida … Vikingars hamn vid Paviken på Gotland*. Risberg, Uddevalla.

Lyngstrøm, Henriette

1989 Lousgaard – éthundrede år efter J. A. Jørgensen og E. Vedel. *Aarøger for nordisk Oldkyndighed og Historie* 1989:115-169.

Mannion, Mags

2015 *Glass Beads from Early Medieval Ireland: Classification, Dating, Social Performance*. Archaeopress, Oxford.

McCormick, Michael

2001 *The Origins of the European Economy: Communications and Commerce, A.D. 300-900*. Cambridge University Press, Cambridge.

Munsell Color

2012 *Munsell Bead Color Book*. Pantone/Munsell, Grand Rapids.

Myhre, Bjørn

2005 Produksjon av bergkrystallperler i Suldal- og Røldalsheiene i yngre jernalder. *K.A.N.: Kvinner I arkeologi i Norge* 25:76-91.

Näsman, Ulf

2000 Exchange and Politics: The Eighth-Early Ninth Century in Denmark. In *The Long Eighth Century*, edited by Inge Lyse Hansen and Chris Wickham, pp. 35-68. Brill, Leiden.

O'Sullivan, Joanne

2013 The Viking Age Glass Beads of Ireland and their North Atlantic Context. Ph.D. thesis. University College Cork.

2015 Strung Along: Re-Evaluating Gendered Views of Viking-Age Beads. *Medieval Archaeology* 59(1):73-86.

Olczak, Jerzy and Elżbieta Jasiewiczowa

1963 *Szklarstwo wczesnośredniowiecznego Wolina* (Glass Production in Early Medieval Wolin). Muzeum Pomorza Zachodniego, Szczecin.

Ørsnes, Mogens

1966 *Form og stil i Sydskandinaviens yngre germanske jernalder*. Nationalmuseet, Copenhagen.

Pilø, Lars and Unn Pedersen

2007 The Settlement: Artefacts and Site Periods. In *Kaupang in Skiringssal*, edited by Dagfinn Skre, pp. 179-190. Kaupang Excavation Project Publication Series 1.

Pöche, Alexander

2001 Die Glasfunde des frühmittelalterlichen Handelsplatzes von Groß Strömkendorf bei Wismar. Ph.D. dissertation. Christian-Albrechts-Universität, Kiel.

2005 Perlen, Trichtergläser, Tesserae. Spuren des Glashandels und Glashandwerks auf dem frühgeschichtilchen Handelsplatz von Groß Strömkendorf, Landkreis Nordwestmecklenburg. Archäologisches Landesmuseum Mecklenburg-Vorpommern, Schwerin.

Resi, Heid Gjøstein

2011a Amber and Jet. In *Things from the Town: Artefacts and Inhabitants in Viking-age Kaupang*, edited by Dagfinn Skre, pp. 107-128. Kaupang Excavation Project Publication Series 3.

2011b Gemstones: Cornelian, Rock Crystal, Amethyst, Fluorspar and Garnet. In *Things from the Town: Artefacts and Inhabitants in Viking-age Kaupang*, edited by Dagfinn Skre, pp. 143-166. Kaupang Excavation Project Publication Series 3.

Rundkvist, Martin

2003a *Barshalder 1: A Cemetery in Grötlingbo and Fide Parishes, Gotland, Sweden, c. AD 1-1100. Excavations and Finds 1826-1971*. University of Stockholm, Stockholm.

2003b *Barshalder 2: Studies of Late Iron Age Gotland*. University of Stockholm, Stockholm.

Sasse, Barbara and Claudia Theune

1996 Perlen als Leittypen der Merowingerzeit. *Germania* 74:187-231.

1997 Perlen der Merowingerzeit. Eine Forschungsgeschichte. In *Perlen: Archäologie, Techniken, Analysen*, edited by Uta von Freeden and Alfried Wieczorek, pp. 117-124. Kolloquien zur Vor- und Frühgeschichte 1.

Scandinavian Colour Institute

2008 NCS – Munsell Translation Key, 2nd edition, revised. Scandinavian Colour Institute AB, Stockholm.

Sindbæk, Søren

2009 Open Access, Nodal Points, and Central Places: Maritime Communication and Locational Principles for Coastal Sites in South Scandinavia, c. AD 400-1200. *Estonian Journal of Archaeology* 13:96-109.

Sode, Torben

2004 Glass Bead Making Technology. In *Ribe Excavations 1970-76*, Vol. 5, edited by Mogens Bencard, Aino Kann Rasmussen, and Helge Brinch Madsen, pp. 17-128. Jysk Arkæologisk Selskab, Aarhus.

Sode, Torben, Claus Feveile, and Ulrich Schnell

2010 An Investigation on Segmented, Metal-foiled Glass Beads and Blown, Mirrored Glass Beads from Ribe, Denmark. In *Zwischen Fjorden und Steppe. Festschrift für Johan Callmer zum 65. Geburtstag*, edited by Claudia Theune, Felix Biermann, Ruth Struwe, and Gerson H. Jeute, pp. 319-328. Verlag Marie Leidorf, Rahden.

Stanisławski, Błażej M.

2003 The Glass Beads from Viking Age Wolin. *Viking Heritage Magazine* 3:21.

Staššiková-Štukovská, Danica and Alfonz Plško

2015 Differences between the Findings of Segmented Beads in Skeleton Graves from the Region of Middle Danube Dated to 7th-11th Centuries. In *Annales du 19e Congrès de l'Association Internationale pour l'Histoire de Verre, Piran 2012*, pp. 389-399.

Stauch, Eva

2004 *Wenigumstadt. Ein Bestattungsplatz der Völkerwanderungszeit und des frühen Mittelalters im nördlichen Odenwaldvorland*. Rudolf Habelt, Bonn.

Steppuhn, Peter

1998 *Die Glasfunde von Haithabu*. Wachholz, Neumünster.

Svanberg, Fredrik

2003 *Death Rituals in South-East Scandinavia, AD 800-1000*. Decolonizing the Viking Age 2. Almqvist and Wiksell International, Stockholm.

Thedéen, Susanne

2008 Who's That Girl? The Cultural Construction of Girlhood and the Transition to Womanhood in Viking Age Gotland. *Childhood in the Past* 1:78-93.

Thunmark-Nylén, Lena

2006 *Die Wikingerzeit Gotlands*, Vol. III.1, Text, by Lena Thunmark-Nylén, pp. 196-197. Almqvist and Wiksell International, Stockholm.

Trotzig, Gustaf

1988 Beads Made of Cowrie Shells from the Red Sea and the Indian Ocean Found on Gotland. In *Trade and Exchange in Prehistory: Studies in Honour of Berta Stjernquist*, edited by Birgitta Hårdh, Lars Larsson, Deborah Olausson, and Rolf Petré, pp. 287-294. Lunds Universitets Historiska Museum, Lund.

Vedel, Emil

1878 Nyere Undersøgelser angaaende Bornholms Oldtid. *Aarbøger for nordisk Oldkyndighed og Historie* 1878:74-258.

1886 *Bornholms Oldtidsminder og Oldsager*. Thieles Bogtrykkeri, Copenhagen.

1890 Bornholmske Undersøgelser med særligt Hensyn til den senere Jernalder. *Aarbøger for nordisk Oldkyndighed og Historie* 1890:1-104.

1897 *Efterskrift til Bornholms Oldtidsminder og Oldsager*. Copenhagen.

Vinsrygg, Synnøve

1979 Merovingartid i Nord-Noreg. Arkeologiske avhandlinger. Ph.D. dissertation. Universitetet i Bergen, Bergen.

Volkmann, Armin and Claudia Theune

2001 Merowingerzeitliche Millefioriperlen in Mitteleuropa. *Ethnographisch-Archäologische Zeitschrift* 42:521-553.

Whitehouse, David

2003 "Things that travelled": The Surprising Case of Raw Glass. *Early Medieval Europe* 12:301-305.

Wickham, Chris

2005 *Framing the Early Middle Ages: Europe and the Mediterranean, 400-800*. Oxford University Press, Oxford.

Wiker, Gry

2007 Monochrome Blue Kaupang-beads – Local Manufacture or Import? In *Innere Strukturen von Siedlungen und Gräberfeldern als Spiegel gesellschaftlicher Wirklichkeit? Akten des 57. Internationalen Sachsensymposions vom 26. bis 30. August 2006 in Münster*, edited by Christoph Grünewald and Torsten Capelle, pp. 137-143. Aschendorff, Münster.

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AN XRF COMPOSITIONAL ANALYSIS OF OPAQUE WHITE GLASS BEADS FROM 17TH-CENTURY MISSION SANTA CATALINA DE GUALE, GEORGIA

Elliot H. Blair

Previous analyses of the elemental composition of white glass beads have shown that the opacifier used during glass manufacture is temporally diagnostic, with a transition from tin to antimony to arsenic to fluorine. To date, most researchers using this fact for chronological purposes have focused on British, Dutch, and French contact sites in the northeastern United States and Canada. Many of these studies have relied on expensive, and sometimes minimally destructive, techniques. X-ray fluorescence spectrometry is a widely available, non-destructive technique that can be used to identify glass opacifiers extremely rapidly and inexpensively. This technique was used to analyze 783 specimens of four varieties of drawn white glass beads from burial contexts at Mission Santa Catalina de Guale, Georgia, demonstrating that the "opacifer-dating" method is also applicable to Spanish colonial sites in the southeastern United States.

INTRODUCTION

Glass beads have long been one of the most important artifact classes available to historical archaeologists, allowing investigators to address questions of trade and economy, religion, adornment, and mortuary practices. As objects of personal adornment that circulated widely they have considerable interpretive potential (Spector 1976) and can be used to explore complicated issues of embodied identity and colonial relationships (Hamell 1983, 1987; Loren 2009, 2010; Turgeon 2004). Of a more foundational nature, one of the most common, and more critical, roles in archaeology that glass beads have served is that of chronological marker (e.g., DeCorse 1989; Little 2010; Smith 1983). This is somewhat paradoxical for, despite their importance for this purpose, "glass beads, by and large, are extremely hard to date, and the vast majority possess no distinguishing features...." (Noël Hume 2001:54). This lack of distinguishing features means that a variety of approaches have been utilized to explore the chronological potential of glass beads.

As recently outlined by Marcoux (2012), this includes studies that have utilized quantitative frequency seriations (e.g., Kent 1983, 1984; Polhemus 1987), more qualitative assemblage-level sequencing (e.g., Wray 1983), approaches that identify the circulation dates for specific beads types that can serve as index fossils (e.g., Smith 1983), and Marcoux's (2012) own multivariate correspondence analysis method. Despite the success of all these approaches, each is limited by an inability to fully utilize the "non-diagnostic" beads – often with long periods of circulation – that tend to dominate most archaeological assemblages. Indeed, Marcoux (2012) excluded simple seed beads from his seriation "because they compose such a significant portion of every assemblage that they drown out the chronologically significant variability in the other bead types." These "non-diagnostic" bead types, however, are actually a largely untapped resource for dating purposes, underscoring Marvin Smith's (2002:60) observation that "the full potential of glass beads as chronological indicators has scarcely begun to be realized.

One approach that has emerged in recent decades that has both increased the potential of beads as chronological indicators and increased the utility of "non-diagnostic" types is the use of compositional analyses (e.g., Bonneau et al. 2014; Hancock 2005, 2013). As Kenneth Kidd (1983:3) noted, compositional analysis, combined with archaeological and archival investigations, is essential to illuminating past networks of bead manufacture and exchange – particularly compositional approaches that facilitate very large sample sizes and non-destructive approaches (*see also* Sprague 1985:100).

This article explores this potential by discussing the results of an x-ray fluorescence spectrometry (XRF) analysis of drawn white glass beads recovered from the cemetery of Mission Santa Catalina de Guale (SCDG), a 17th-century Franciscan mission located on St. Catherines Island, Georgia. This includes Kidd and Kidd (2012 [1970]) varieties IIa13, IIa14, IVa11, and IVa13. I begin by arguing that XRF is an ideal method for non-destructively identifying chronologically significant glass opacifiers in large numbers of beads. I follow this by reviewing the evidence that supports the use of glass opacifiers as chronological markers, emphasizing both archaeometric and historical evidence. I conclude by presenting the results of the SCDG analyses, discussing how the compositional data neatly articulate with previous date estimates based on bead stylistic attributes (e.g., Smith 1983).

X-RAY FLUORESCENCE SPECTROMETRY AND GLASS BEADS

Numerous methods have been productively used for the compositional analysis of archaeological glass (for an overview of these methods, *see* Bonneau et al. 2014), including instrumental neutron activation (INAA) (e.g., Davison 1972; Glascock 2013; Hancock 2005; Hancock et al. 1994; Kenyon et al. 1995), laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS) (e.g., Dussubieux et al. 2009; Gratuze 2013; Popelka et al. 2005; Robertshaw et al. 2010; Walder 2013), proton induced x-ray emission (PIXE) (e.g., Biron and Verità 2012; Gan et al. 2009; Kuisma-Kursula 1999; Šmit et al. 2012; Zucchiatti et al. 2007), and XRF (e.g., Karklins 1983; Hoffmann 1994; Polikreti et al. 2011; Shugar and O'Connor 2008; Veiga and Figueiredo 2002). The different techniques have various advantages and disadvantages, including relative cost, availability, destructiveness, sensitivity, and range of detectable elements (Bonneau et al. 2014).

For example, while INAA has been productively used for bead analysis and has excellent precision, accuracy, and sensitivity to many elements, several important elements for interpreting glass chemistries cannot be easily determined. These include lead, phosphorus, and bismuth. Both lead and phosphorus are important opacifying ingredients (Moretti and Hreglich 2013) and bismuth can be used as a marker for identifying the location of raw material procurement (e.g., Soulier et al. 1996). Additionally INAA is expensive, there are few research facilities where this analysis can be conducted, and as a bulk analytical technique, the method is not appropriate for multi-colored compound and complex bead varieties.

LA-ICP-MS solves some of these difficulties, for example, having the capability to identify lead, phosphorus, and bismuth concentrations. The technique is also more readily available than INAA and can perform spot analyses on compound and complex beads. The technique, however, is still relatively expensive, time consuming, and is minimally destructive to the archaeological specimen.

Like these other techniques, XRF[1] also has its limitations (*see* Hunt and Speakman 2015; Shackley 2010; Shugar 2013; Speakman et al. 2011; Speakman and Shackley 2013). For example, XRF is primarily a surface-only analysis, meaning glass corrosion can be a significant hurdle (Kaiser and Shugar 2012). Like INAA, XRF is also a bulk analytical technique and thus is not appropriate for multi-colored beads. Additionally, depending on instrumental parameters, XRF can have difficulty detecting many low-Z elements, including many elements important in the manufacture of glass, such as sodium and magnesium. The method also requires the creation of custom empirical calibrations using matrix-matched reference standards in order to obtain quantitative results. These, however, are extremely challenging to create because of the limited numbers of glass certified reference standards. Additionally, while many portable XRF instruments offer out-of-the-box fundamental parameters approaches to quantification, the results produced using these methods have not been shown to be valid or reliable for archaeological research purposes (Dybowski 2012; Hunt and Speakman 2015).

Despite these limitations, the use of XRF has a number of benefits. First, the instrumentation is becoming increasingly available, resulting in extremely low analytical costs. These reduced costs, along with very rapid data collection (about three minutes per sample) allow increasingly large sample sizes to be analyzed. Second, the analysis is completely non-destructive, an important consideration when one is working with museum specimens or collaborating with descendent communities.

XRF was selected for this project for all of the reasons just discussed: the need for non-destructive analysis of funerary objects, and the low cost and speed of analysis allowing for a large sample size (n=783). Additionally, the quantitative calibration concerns were side-stepped by focusing on an analytical question that could be addressed entirely by presence/absence information: what element was used to make each bead opaque?

GLASS OPACIFIERS AS TEMPORAL MARKERS

The compositional analysis of glass beads identifies the elemental content of the glass used to manufacture them, generally dividable into glass formers (e.g., silicon), modifiers and stabilizers (e.g., sodium, potassium, calcium), colorants (e.g., copper, cobalt, manganese), and opacifiers (e.g., tin, antimony, arsenic, fluorine). Patterned variation of these ingredients can successfully be used to identify place of manufacture and source of raw materials, and the variability in these elements often also has temporal implications. The difficulty, however, in making temporal inferences from glass composition is that many glass ingredients vary according to the vagaries of raw material source and the practices of specific regional glass houses (Blair 2015a, 2016; McCray 1999a, 1999b); isolating compositional variability that primarily represents chronology, rather than one of these other factors, is profoundly difficult (Blair 2015a, 2016; Fitzgerald et al. 1995). The one exception to this – for beads of European manufacture dating to the 16th-19th centuries – is the glass opacifier. Numerous lines of evidence, both archaeometric and documentary, indicate that the choice of opacifier is independent of place of manufacture or raw material source.

Archaeometric Analyses of Glass Bead Opacifiers

The general sequence of glass opacifiers used in European glass production has been generally understood since the early analyses of Turner and Rooksby (1959, 1963) and Rooksby (1962). During the era of Roman glassmaking, calcium antimonate was the primary opacifier before being completely replaced by the use of a lead-tin calx, perhaps as early as the 12th century (Tite et al. 2008; Verità 2014). Lead-tin then remained the primary glass opacifier until sometime during the 17th century when it was replaced by antimony-based opacifiers, including both lead antimonate and calcium antimonate. Later, antimony was replaced by arsenic and then fluorine. Bone ash (calcium phosphate) has also been documented as an opacifier from the 14th century onward (Moretti and Hreglich 2013).

This sequence was first recognized as applicable to glass beads in a series of pioneering articles by Ron Hancock and his colleagues (Hancock 2005, 2013; Hancock et al. 1997, 1999; Moreau et al. 2002, 2006; Sempowski et al. 2000). In their original study, they analyzed 284 beads from 15 archaeological sites in Ontario thought to have short occupation periods (Hancock et al. 1997). They concluded that antimony replaced tin sometime in the late 17th century and that arsenic first appeared during the late 18th century. Fluorine was found to be an ingredient during the 19th and 20th centuries. In a subsequent study, a similar sequence was established for the Seneca region of New York (Sempowski et al. 2000). They postulated that the transition from tin to antimony was a gradual process, with both tin and antimony beads in circulation between 1625 and 1675, with tin finally disappearing as an ingredient by 1675.

A number of subsequent studies have produced compositional data for white glass beads (e.g., Bonneau et al. 2013; Dussubieux and Karklins 2016; Shugar and O'Connor 2008; Walder 2015). Table 1 synthesizes the data derived from a number of such studies. Samples included in the table were selected to include sites from the Americas and from European manufacturing locales, with a strong preference for studies that specifically note the bead type and glass color being analyzed. This synthesis of white bead opacifier data is useful for refining our understanding of the timing of glass bead opacifier transitions. Indeed, such refinement is needed because many of the studies just mentioned rely primarily on the archaeological *site* as the unit of analysis. Such coarse-grained resolution may well mask finer temporal variability across a site. For example, Sempowski et al. (2000) document both tin and antimony-rich beads on sites dated to 1625-1640, 1640-1655, and 1655-1675, and suggest that this correlates with a slow transition from tin to antimony during this period. Recently, however, Marcoux (2012) has argued that individual burial contexts are a better unit of analysis for refining the chronological resolution of glass beads, mitigating the confounding issue of occupational palimpsests (*see* Polhemus 1983, 1987).

Evidence from Recipe Books

Besides archaeometric data, one of the most important sources available for helping to interpret the evidence obtained via glass compositional analysis is glass recipe books. During the 16th and 17th centuries, glassmaking was primarily a skill that was learned and perfected through practice and experience (McCray 1999a, 1999b). This was primarily due to two factors. First, glassmaking and beadmaking during the 16th and 17th centuries was controlled by manufacturing guilds, operating within an apprenticeship system (Trivellato 2006). Second, the guild system was incredibly secretive and trade secrets were vigorously protected. While individual glass houses maintained internal recipe books, with few exceptions (e.g., Neri 1612, 1662 [1612]) these were not published for public consumption.[2] Many of these books, however, have been preserved and subsequently published, providing important insights into glassmaking practices, recipes, and ingredients and how they changed over time (Moretti and Hreglich 1984, 2013; Moretti et al. 2005).

Three recipe books in particular provide important evidence of glassmaking practices during the 16th and 17th centuries (Moretti and Hreglich 2005, 2013; Toninato and Moretti 1992). The chronologically earliest of these is an anonymous Venetian manuscript, initially transcribed by Moretti and Toninato (2001) and recently published and annotated in English (Watts and Moretti 2011). The volume was likely originally assembled between 1536 and 1567, and might be a copy of somewhat earlier recipes. The next is the aforementioned Neri volume, written by the Florentine

Table 1. Chronological Sequence for Opacifiers in White Glass Beads.

Site	Approximate Date	Location	Number of Samples				Source
			Sn	Sb	As	Other	
Middelburg	late 16th - early 17th centuries	Netherlands	4	1			Karklins et al. 2001
Cameron	1595-1610	Eastern Seneca, NY	8				Sempowski et al. 2000
Smith-Saeger	1600-1625	Ontario	4				Hancock et al. 1997
Chicoutimi	1600-1625	Quebec	x				Moreau and Hancock 2010
Dutch Hollow	1610-1625	Western Seneca, NY	27				Sempowski et al. 2000
Factory Hollow	1610-1625	Eastern Seneca, NY	5				Sempowski et al. 2000
Auger	1615-1630	Ontario	91				Hancock et al. 1997, 1999
Asd/Kg9; Kg10	1621-1657	Amsterdam	45	5			Bradley 2014; Karklins et al. 2002
Warren	1625-1640	Eastern Seneca, NY	10	5			Sempowski et al. 2000
Cornish	1625-1640	Eastern Seneca, NY	5	5			Sempowski et al. 2000
Bosley Mills	1625-1640	Western Seneca, NY	1	1			Sempowski et al. 2000
Hammersmith Embankment	1625-1650	London, England	8				Dussubieux and Karklins 2016; Karklins et al. 2015
Train	1625-1650	Ontario	2				Hancock et al. 1997
Orchid	1625-1650	Ontario	17				Hancock et al. 1997
Tipu	pre-ca. 1638-1641	Belize	x				Hancock and Graham 2006
Steele	1640-1655	Eastern Seneca, NY	5				Sempowski et al. 2000
Power House	1640-1655	Western Seneca, NY	5	5			Sempowski et al. 2000
Menzis	1640-1655	Western Seneca, NY		3			Sempowski et al. 2000
Dann	1655-1675	Western Seneca, NY	13	9			Sempowski et al. 2000
Marsh	1655-1675	Eastern Seneca, NY	2	17			Sempowski et al. 2000
Gillett Grove	17th century	Iowa		1			Walder 2015
Mormon Print Shop	17th century	Michigan		1			Walder 2015
Bead Hill	1670-1690	Ontario		2		2	Hancock et al. 1997
Beale	1675-1687	Eastern Seneca, NY		5			Sempowski et al. 2000
Boughton Hill	1675-1687	Eastern Seneca, NY		32			Sempowski et al. 2000
Rochester Junction	1675-1687	Western Seneca, NY		10			Sempowski et al. 2000
La Belle	1686	Texas		6/3			Walder 2015; Perttula and Glascock 2017
Snyder/McClure	1690-1710	Western Seneca, NY		15			Sempowski et al. 2000

Table 1. Continued.

Site	Approximate Date	Location	Number of Samples				Source
			Sn	Sb	As	Other	
Premier Palais	1700-1750	Quebec		2			Moreau et al. 2006
Dorion	1700-1800	Ontario		5			Hancock et al. 1997
Ashuapmushuan	1700-1800	Quebec		344			Moreau et al. 2002
Fort Michilimackinac	ca. 1715-1761	Michigan		11			Walder 2015
Magasins du Roy	ca. 1750-1760	Quebec		45			Moreau et al. 2006
Old Fort Niagara	mid-18th century	New York		324		6	Shugar and O'Connor 2008
Armours Point	1750-1800	Eastern Great Lakes		8			Hancock et al. 1997
Moose Factory III	1760-1850	Ontario		20	5		Hancock et al. 1997
Fort St. Joseph	1796-1814	Ontario		19	8		Hancock et al. 1997
Fort Malden	1797-1813	Ontario		8	9		Hancock et al. 1997
Sullivans Island	late 18th - late 19th centuries	Washington		x	x		Burgess and Dussubieux 2007
Fort Malden	1813-?	Ontario		15	6		Hancock et al. 1997
Dewar	ca. 1830	Ontario		3	12		Hancock et al. 1997
Camp Kitchi	1836-1856	Ontario		4	2	7 (bone ash?)	Hancock et al. 1997
Mohawk Village	1840-1860	Ontario		0	8		Hancock et al. 1997
Moose Factory I	1850+	Ontario		4	12	2	Hancock et al. 1997
Modern Souvenir	1903-1926	Ontario			5		Hancock et al. 1997

priest Antonio Neri and originally published in 1612 (Neri 1612). The final volume is the Darduin recipe book (Zecchin 1986). This volume contains several sets of recipes primarily compiled by Giovanni Darduin, a Muranese glassmaker and a later, unknown individual. The first section of the volume contains 16th-century recipes attributed to Giovanni's father, Nicolò Darduin (d. 1599), as well as Giovanni's own recipes that he continued to add to the volume until ca. 1654. Giovanni also transcribed and included an additional set of recipes from an anonymous 1523 document. The final portion of the manuscript, in different handwriting, was added by an unknown individual between 1693 and 1712 (Verità 1986).

These recipe books are particularly important for documenting different practices for producing opaque glass, including the use of tin dioxide, calcium antimonate, lead antimonate, lead arsenate, and bone ash (calcium phosphate). For my purposes, the temporal change in glass opacifiers is particularly relevant to this discussion. The primary opacifier for Venetian glasses, from the 14th century until the early- to mid-17th century, was tin dioxide, generally added to the glass mixture as calcined lead and tin. Three recipes in the anonymous Venetian manuscript describe the manufacture of white glass using this process (Watts and Moretti 2011:22), and the technique is repeatedly mentioned by Neri (2003 [1612], 2004 [1612], 2007 [1612]) and included in the Darduin manuscript.

At some point during the 17th century, however, the use of a lead-tin opacifier ceased and antimony-based opacifiers (both calcium antimonate and lead antimonate) came into use. For example, only one recipe in the 16th-century anonymous Venetian recipe book discusses opacification using calcium antimonate, and that recipe (XXXVI) is for an unusual silver mosaic glass (Watts and Moretti 2011:64). While calcium antimonate had been used as an opacifier in Roman times (Mass et al. 1996; Rooksby 1962; Turner and Rooksby 1959, 1961, 1963), with few exceptions it does not appear at all in the early Venetian recipe books. Antonio Neri

(2004 [1612]) only mentions its use for chalcedony glass and other specialized glasses, not as an opacifier. The Darduin manuscript contains the first mention (recipe CXLIV) of an opaque glass manufactured with lead antimonate in a recipe that dates to the mid-17th century. Commenting on this, Zecchin (1986:182 [translation mine]) states:

> This and the following are the first two recipes that use antimony as opacifiers in the glass in place of the traditional calc of lead and tin. As also indicated in the recipe, this substitution was dictated, rather than to improve the quality of the product, for economic reasons, probably because of the high cost of tin at the time. Antimony was a new component for the Venetian glass, which he had not used at least until the beginning of the 17th century.

Other glass opacifiers mentioned in the documents include bone ash (Watts and Moretti 2011), indicated by a high phosphorus content, and lead arsenate. The latter was first noted in a recipe dating 1 June 1693 (Zecchin 1986).

GLASS BEADS OF MISSION SANTA CATALINA DE GUALE

Santa Catalina de Guale was a Franciscan mission located on St. Catherines Island, Georgia. Following several sporadic, and generally failed, missionization attempts during the 16th century – most notably the 1595-1597 mission that was destroyed during the 1597 Guale rebellion (Blair and Thomas 2014; Francis and Kole 2011) – Santa Catalina was firmly established in its archaeologically known location by 1605. The mission was in operation until 1680 when, under attack from the British-allied Westos, the site was abandoned and the community relocated southward to Sapelo Island (Worth 2007, 2009a, 2009b). The original location of Mission Santa Catalina at Wamassee Head on St. Catherines Island was conclusively identified by David Hurst Thomas and the American Museum of Natural History in 1981, and over the next decade a number of structures were excavated, including the mission church, friary, and kitchen (Thomas 1987, 1988a, 1988b, 1993, 2010a).

Excavations beneath the floor of the church by Clark Spencer Larsen (1990) revealed the mission cemetery which contained a minimum of 431 Guale neophytes. These individuals were all buried in Catholic fashion: supine, feet oriented towards the altar, and arms crossed over the chest or abdomen. Almost all burials appear to have been interred in a simple shroud cloth; with few exceptions, coffins were absent. Recovered with these burials was an unusually large assemblage of grave furnishings, including whole majolica vessels, bells, chunky stones, Catholic devotional medals, religious medallions, finger rings, and nearly 70,000 trade beads (Blair et al. 2009; Thomas 1988a, 2010b).

The beads excavated at Mission Santa Catalina were primarily made of glass but also jet, amber, carnelian, and rock crystal. These objects were manufactured around the globe, likely including Venice, Amsterdam, Bohemia, China, India, and the Baltic region (Blair 2015a; Blair et al. 2009). Because of the historically well-documented dates for the mission cemetery (ca. 1605-1680), studies of this bead assemblage have generally focused on questions of origins, manufacture, exchange, and social networks, rather than chronology (Blair 2015a, 2015b, 2016, 2017). Lingering questions, however, about changing burial practices throughout the mission period (McEwan 2001; Thomas 1988a) have prompted more sustained examinations of bead chronology at Mission Santa Catalina.

Bead Chronology at Mission Santa Catalina

The beads recovered at Mission Santa Catalina have been previously evaluated for their temporal potential (Blair 2009:157-159). At that time, while also commenting on the possibilities of compositional analysis for dating purposes, several observations were made about specific bead types present in the assemblage:

1) Numerous eye beads (Kidd and Kidd type IIg) are present in the SCDG assemblage. Smith (1987:33) argues that these no longer circulated in Spanish-colonial contexts after ca. 1630.

2) Many charlottes (faceted seed beads; Kidd and Kidd IIf) are also present in the assemblage and also appear to date no later than the early 17th century (Smith et al. 1994:39).

3) Several blue beads with red-on-white stripes (IIbb24, IIbb27) are found in the SCDG assemblage. Kidd variety IIbb24 does not appear in the Susquehanna sequence until 1718-1743, while the very similar variety IIbb27 dates from 1575-1600 (Kent 1983:80-81).

4) A cobalt-blue bead with alternating red-and-white stripes (IIb71) is thought to be diagnostic of the early 17th century (Smith 1983:150, 1990:223).

5) Seed beads of compound construction, found in the thousands at SCDG, are most common from 1600 to 1630 (Smith 1987:33).

Despite the presence of a number of bead varieties in the SCDG assemblage that evidence suggests date earlier than 1630, they are relatively scarce compared to the enormous quantities of non-diagnostic beads of simple construction (e.g., IIa7, IIa13, IIa40, IIa55). Additionally, many of the temporally diagnostic compound and complex varieties are restricted in distribution to only a handful of the presumed high-status burials in the mission cemetery. That is, the majority of individuals buried in the cemetery were not found with temporally diagnostic bead varieties. This was not unexpected. Smith (1987:33) notes that there are no bead varieties that are temporally diagnostic for the 1630-1670 period. This does not, however, mean that burials found with only a few beads of non-diagnostic types must date to the period 1630-1670. Such burials could easily date to any time during the 1605-1680 period when Mission Santa Catalina was in use.

COMPOSITIONAL ANALYSIS OF MISSION SANTA CATALINA BEADS

In 2007, I initiated a project to examine the elemental composition of the glass beads recovered at Mission Santa Catalina. While this project was initially designed to evaluate hypotheses about the production origins of certain bead varieties found at SCDG, particularly several hypothesized to have been manufactured in Bohemia and China (Francis 2009a:100, note 3, 2009b:84, note 8), it later developed into a broader study of the circulation and consumption of beads at the mission, using glass composition as a key metric in the identification of distinct social networks at SCDG (Blair 2015a, 2015b, 2016, 2017). Throughout, however, the project has evaluated the possibility of using elemental composition to refine our understanding of the SCDG chronology.

XRF Analysis of White Beads: Methods and Materials

The beads analyzed in this study consist of simple and compound white beads of Kidd varieties IIa13, IIa14, IVa11, and IVa13. All are of drawn manufacture.

IIa13 (AMNH Type 23; n=180). Of simple construction, these are opaque white (2.5 PB 10/0, 4.7Y 9/4, 4.5Y 9/1) and includes barrel, olive, oval, and spherical specimens. The beads are 3.51-7.99 mm in diameter and 2.51-13.0 mm in length. They were likely manufactured by members of the Paternostri guild in Venice; possibly also in France and the Netherlands (Francis 2009d, 2009e).

IIa14 (AMNH Type 15; n=33). Of simple construction, these are opaque white (4.5Y 9/1, 2.5PB 10/0) and ring shaped. They are 2.60-3.50 mm in diameter and less than 2.51 mm in length. This variety is thought to have been primarily manufactured in Venice by members of the Margareteri guild and are often referred to as simple white seed beads (Francis 2009c).

IVa11 (AMNH Type 38b; n=149). Of compound construction, these are composed of opaque white (4.5Y 9/1, 2.5PB 10/0) glass sandwiched between a transparent colorless core and a thin, clear exterior coat. The beads are ring and barrel shaped, ranging from less than 2.60 to 7.99 mm in diameter and from less than 2.51 mm to 4.50 mm in length. This variety, erroneously combined with type IVa13 in Blair et al. (2009), has been suggested to date to the period 1560-1630 (Smith n.d.). It is thought to have been manufactured by the Margareteri beadmaking guild in Venice (Francis 2009c).

IVa13 (AMNH Type 38a; n=421). Of compound construction, this variety is made of an opaque white (4.5Y 9/1, 2.5PB 10/0) glass with a transparent colorless core. In some specimens the white glass is heavily eroded and has developed a light yellow (4.3Y 9/7) hue. The beads are highly unstable and the opaque layer has eroded completely in some cases, leaving a separated core. The beads are ring and barrel shaped, ranging from less than 2.60 mm to 7.99 mm in diameter and from less than 2.51 mm to 4.50 mm in length. This variety was erroneously combined with type IVa11 in Blair et al. (2009). Smith (n.d.) suggests that this specific drawn, white, compound configuration post-dates 1630. It is thought to have been manufactured by the Margareteri beadmaking guild in Venice (Francis 2009c).

The elemental analysis of a sample of these beads was carried out using an evolving, multi-technique strategy. Samples were selected from all burial contexts with opaque white beads. For burial contexts with large numbers of beads, up to 50 specimens of each variety were selected for analysis. The initial analysis of the beads (n=783) was conducted using a Bruker Tracer III-V portable x-ray fluorescence spectrometer. Each bead was analyzed under vacuum for 180 seconds at 40 kV and 3 µA using a 0.001" Cu, 0.001" Ti, 0.012" Al filter. This analysis yielded spectral data for elements K, Ca, Ti, Mn, Fe, Co, Ni, Cu, Zn, As, Sr, Sn, Sb, and Pb. Net area under the peak values for each element were then extracted from each bead spectra in Artax 7, using a Bayesian deconvolution and Gaussian curve fitting method. These values were then exported to JMP 11 for exploratory data analysis. Additional compositional analyses using laser ablation - inductively coupled plasma - mass spectrometry (LA-ICP-MS)[3] were also conducted on a subsample of the SCDG beads in order to confirm the patterning identified via XRF analysis (Blair 2015b).

XRF Analysis Results

The XRF analysis of the Mission Santa Catalina white glass beads indicates that only two opacifiers were used to opacify them: 288 beads were opacified with lead-tin and 495 with calcium antimonate (Table 2). No beads were opacified with lead antimonate, lead arsenate, or bone

Table 2. Distribution of Bead Opacifiers in the Mission Santa Catalina Cemetery.

Individual / Burial	IIa13		IIa14		IVa11		IVa13		Additional Temporal Data
	Pb-Sn	Sb	Pb-Sn	Sb	Pb-Sn	Sb	Pb-Sn	Sb	
47	2	2							None
65	1								Bead types IIbb27 and IIb56 (pre-ca. 1630) present
70					37		1		None
77								22	None
86	1							50	None
88								2	Burial intrudes into Ind. 383
90		13						37	None
93								52	None
102				14				37	None
107								5	None
127		1							None
134								1	None
138	4								1 type IIf bead (pre-1630)
139 / 140				6				11	None
142		1						1	None
163		15						3	None
186	14								None
207					1				Stratigraphically earlier than Ind. 208
208	2				2				Numerous IIf beads, plus compound and complex varieties present; Ictucknee blue-on-white bowl, 1600-1650 (Deagan 1987:64-65)
212 / 218				1	1				None
226				10					Post-dates Ind. 228
228				2					Pre-dates Ind. 226
238		1						14	None
243								50	None
276		19						23	Dominated by wound varieties; stratigraphically late burial
282					18				Numerous IIf beads, plus compound and complex varieties
295 / 296								50	None

Table 2. Continued.

Individual / Burial	IIa13		IIa14		IVa11		IVa13		Additional Temporal Data
	Pb-Sn	Sb	Pb-Sn	Sb	Pb-Sn	Sb	Pb-Sn	Sb	
307	51				54		10		Stratigraphically earlier than Ind. 208; numerous IIf and compound varieties; pre-ca. 1630/40 and pre-ca. 1650 ceramics
318	30								Found with numerous pre-1630 artifacts
348 / 349 / 350	4				5				Found with numerous pre-1630 artifacts
363 / 364	5								None
383								2	Pre-dates Ind. 88
394								50	None
Burial B	14				30				Stratigraphically pre-dates Ind. 307 and 208; numerous faceted (IIf), compound, and and complex varieties
Burial E					1				Numerous eye (IIg) and complex (IIb56) beads
Total	**128**	**52**	**0**	**33**	**149**	**0**	**11**	**410**	**783**

ash. Figure 1 shows the spectral difference between these opacifiers. The spectrum in black shows the characteristic lead and tin peaks, while the spectrum in gray shows the distinct signature of antimony, indicating the ease with which bead opacifiers can be identified using XRF. All the analyzed beads fall into one of these categories with no evidence of mixed opacifiers or glass recycling, though the concentrations of the opacifying elements vary widely. This variation is attributable to bead variety. Beads of simple construction (e.g., IIa13) exhibit the highest elemental concentrations. The reduced amounts of tin and antimony found in compound varieties IVa11and IVa13 are the result of opacifier "dilution" caused by the combined bulk analysis of white opaque glass and the non-opacified clear glass layers.

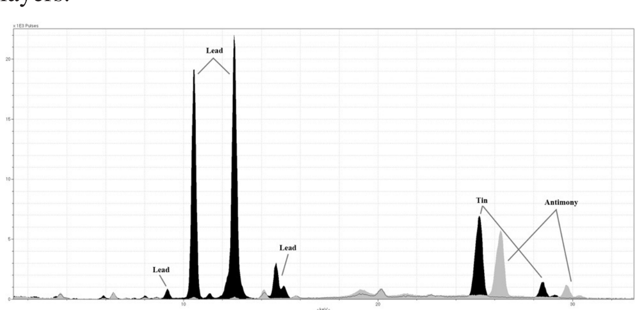

Figure 1. XRF spectra of two IIa13 beads from Mission Santa Catalina. The spectrum in black represents lead and tin; that in gray represents antimony.

Additionally, as I have explored elsewhere (Blair 2015a, 2015b, 2016), there is also considerable patterning in the SCDG XRF data that is not linked to opacifier choice (e.g., strontium, potassium, manganese, and iron). This variation, however, seems to have no clear and sustained relationship to chronology, but instead is primarily related to raw material sources and the specific practices of individual glass houses.

An interesting pattern emerges from the data in terms of bead variety. First, while IIa13 and IVa13 beads are split between the two opacifiers, all analyzed IIa14 bead are opacified with antimony and all IVa11 beads are opacified with lead-tin. This is consistent with Smith's (n.d.) observation that compound white glass beads with thick clear layers (IVa11) date earlier than those with thick white layers (IVa13).

The data presented in Table 2 also have significant temporal implications. With the exception of individual no. 47, found with both lead-tin and antimony beads, the remaining burials all have single-opacifier assemblages.[4] Indeed, the lack of mixed-opacifier assemblages in the Mission Santa Catalina cemetery strongly suggests that the transition from lead-tin to calcium antimonate was a relatively rapid process (*see* discussion below). Looking at Table 2, it is also clear that all burial contexts found with bead varieties and other artifacts dating prior to 1630 are only found with beads opacified with lead-tin, supporting the temporal transition discussed earlier.

DISCUSSION

The analysis presented here has several important implications – some methodological, some specifically for Mission Santa Catalina and the southeastern United States, and some for thinking about bead chronology and interpreting the temporal position of "non-diagnostic" bead types more generally. First, the analysis demonstrates that XRF can be a highly effective technique for identifying the presence/absence of specific bead opacifiers. Because beads can be relatively dated based on the presence/absence of different opacifiers, XRF is an appropriate method for non-destructively analyzing very large samples at very low costs. While XRF, like all analytical techniques, has its limitations, the speed, cost, and non-destructive capability make it an excellent choice for this purpose.

This analysis also establishes that the opacifier chronology established at Northeastern archaeological sites (Sempowski et al. 2000) is also applicable to Spanish contexts in the Southeast. This is no surprise. All drawn beads circulating in North America during the 16th and 17th centuries likely came from the same manufacturing centers, primarily Venice (Karklins 2012:81). During the 17th century, an extensive trade in Dutch-made beads also occurred in both the Northeast and Southeast, though these products are difficult to distinguish and are largely derivative of their Venetian counterparts (Baart 1988; Francis 2009d; Hulst et al. 2012; Karklins 1974, 1983; Kenyon and Fitzgerald 1986; van der Sleen 1963a, 1963b).

Establishing the opacifier sequence as temporally valid for the Southeast also has other significant implications for understanding bead chronology in the region. Most importantly it provides another line of evidence that supports Smith's pioneering bead chronology (Smith 1983, 1987). As is evident in Table 2, burial contexts containing bead varieties that Smith dated prior to 1630 are *only* found in association with lead-tin opacified white beads. Some assemblages with lead-tin beads, however, lack beads diagnostic of the earlier period. Does this indicate that the lead-tin opacifier post-dates 1630, or is this merely indicative of the smaller quantities of good index fossil bead types in circulation? This raises the important issue: when and why did the transition from lead-tin to antimony occur?

Regarding the why question, Sempowsi et al. (2000) suggest the change was related to either the availability or cost of tin. Social and functional reasons for the change are also possible, but it seems probable that economics are the most likely factor. Hancock (2013:464) has noted that the amount of tin used in opaque white glass decreased over time, as glassmakers realized that lesser quantities were sufficient to produce opaque glass. This same pattern has also been documented for opaque turquoise-blue glass in the Southeast (Dalton-Carriger and Blair 2013, 2015). Similarly, as discussed above, Luigi Zecchin's (1986) analysis of the recipes in the Darduin manuscript suggests that the expense of tin likely led to its replacement by antimony.

If cost and economic concerns are the reason for the opacifier change, then it is highly significant that the ca. 1630 bead stylistic changes noted by Smith (1983, 1987), specifically the general disappearance of many complex and compound bead varieties, correlates with the documented use of a cheaper opacifier (Table 2). The trend toward simple beads and cheaper ingredients is consistent with an industry looking to cut costs in the production of inexpensive trade goods for colonial markets.

While Sempowski et al. (2000) suggest that there was a gradual transition in opacifier use, based upon several sites in the Northeast with mixed assemblages, the data from Mission Santa Catalina suggests a more rapid transition, perhaps as early as ca. 1630. The absence of burials possessing beads of both opacifier types suggests that lead-tin and antimony beads were not circulating simultaneously at SCDG. Additionally, stratigraphic relationships between burial pits at SCDG indicate that no burials with lead-tin-opacified beads are intrusive into burials with antimony-opacified beads. That is, all stratigraphically intersecting burial pits are consistent with the lead-tin to antimony transition.

A 1630 date for the opacifier transition is also largely consistent with the meta-analysis presented in Table 1. Several sites, however, do cause problems for this hypothesis; primarily the Steel and Marsh sites in the Eastern Seneca sequence and the Power House and Dann sites in the Western Seneca sequence. The high number of tin-opacified beads at the Dann site (ca. 1655-1675) in particular is problematic for this interpretation. How do we account for mixed assemblages found at sites spanning several decades in the Northeast? Perhaps the transition was indeed gradual but, of course, multiple site components, heirlooming, and the circulation of older beads could easily account for the presence of mixed assemblages, even over several decades. More likely, however, I suspect the issue will resolve itself if, as suggested by Marcoux (2012:159), short-duration contexts, rather than sites, are used as the primary unit of analysis in order to better establish bead contemporaneity. Additionally, some of the later sites in the Seneca sequence have not yet had the intensive temporal reevaluations that the earlier sites have had (Saunders and

Sempowski 1991; Sempowski and Saunders 2001; Wray et al. 1987, 1991). Such reanalysis could help clarify the timing of this transition.

CONCLUSION

The elemental composition of glass beads is an important but underutilized method for extracting chronological information from archaeological sites. XRF, in particular, as a fast, cheap, and non-destructive technology that can provide large samples of compositional data to sequence archaeological sites and features, should be more extensively utilized. At Mission Santa Catalina de Guale, the use of XRF on a large sample of white glass beads demonstrates that the opacifier sequence identified at Northeastern archaeological sites and in historic glass recipe books is also applicable to Spanish colonial sites in the Southeast. Additionally, while not fully explored here, the bead compositional data from the mission has significant potential for exploring temporal and social patterns within the site (Blair 2015a, 2015b, 2016, 2017). Indeed, the large sample sizes made accessible through the use of XRF should expand the possibilities of using glass beads to explore micro-scale intra-site patterns.

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ENDNOTES

1. In this discussion, I have chosen not to distinguish between the use of benchtop ED-XRF instruments and portable XRF. Although there are, of course, some practical differences between instruments, both "are subject to the same limitations... particularly with respect to sample preparation, instrument calibration, and ability to accurately quantify low-Z elements" (Hunt and Speakman 2015:626).

2. The importance of Antonio Neri's (1612) work for European glassmaking is widely acknowledged and is highlighted by the enormous number of editions and translations that have appeared over the last few centuries (Boer and Engle 2010; Engle 2014; Grazzini 2012; Turner 1963). At the same time, this complex and extensive sequence of editions and translations – beginning with Christopher Merret's 1662 English translation (Neri 1662 [1612]) – has actually resulted in an under-appreciation for the importance of Neri's writing for the history of beadmaking due to the repeated mistranslation of specific beadmaking terminology. Dillon (1907:183, n.1), for example, notes that *canne di conterie* (beadmaking canes) was translated by Merret as "rails for counting houses." This and similar errors were perpetuated in all subsequent editions based on Merret's translation, serving to delete any mention of glass beads from Neri's work (*see* discussions in Dillon 1907; Engle 2014; Francis 1988; Zecchin 1964) and leading many scholars to believe he had little to contribute to the topic (e.g., Turgeon 2001:66). Fortunately, Engle's recent three-volume translation of Neri has corrected these mistranslations and omissions (Neri 2003 [1612], 2004 [1612], 2007 [1612]).

3. These analyses were conducted at The Field Museum's Elemental Analysis Facility with the gracious assistance of Dr. Laure Dussubieux. These results will be presented in detail elsewhere.

4. Individuals no. 212 and 218 are another exception, but being a multiple burial with unclear temporal relationships, a mixed assemblage is not unexpected.

REFERENCES CITED

Baart, Jan

1988 Glass Bead Sites in Amsterdam. *Historical Archaeology* 22(1):67-75.

Biron, Isabelle and Marco Verità

2012 Analytical Investigation on Renaissance Venetian Enamelled Glasses from the Louvre Collections. *Journal of Archaeological Science* 39(8):2706-2713.

Blair, Elliot H.

2009 The Distribution and Dating of Beads from St. Catherines Island. In *The Beads of St. Catherines Island*, edited by Elliot H. Blair, Lorann S.A. Pendleton, and Peter Francis, Jr., pp. 125-166. Anthropological Papers of the American Museum of Natural History 89.

2015a Glass Beads and Global Itineraries. In *Things in Motion: Object Itineraries in Archaeological Practice*, edited by Rosemary A. Joyce and Susan Gillespie, pp. 81-99. School for Advanced Research Press, Santa Fe.

2015b Making Mission Communities: Population Aggregation, Social Networks, and Communities of Practice at 17th Century Mission Santa Catalina De Guale. Ph.D. dissertation. Department of Anthropology, University of California, Berkeley.

2016 Glass Beads and Constellations of Practice. In *Knowledge in Motion: Constellations of Learning across Time and Place*, edited by Andrew P. Roddick and Ann B. Stahl, pp. 97-125. University of Arizona Press, Tucson.

2017 Modeling Consumption: A Social Network Analysis of Mission Santa Catalina De Guale. In *Material Worlds: Archaeology, Consumption, and the Road to Modernity*, edited by Barbara J. Heath, Eleanor E. Breen, and Lori A. Lee, pp. 9-34. Routledge, New York.

Blair, Elliot H., Lorann S. A. Pendleton, and Peter Francis, Jr.

2009 *The Beads of St. Catherines Island*. Anthropological Papers of the American Museum of Natural History 89.

Blair, Elliot H. and David Hurst Thomas

2014 The Guale Uprising of 1597: An Archaeological Perspective from Mission Santa Catalina De Guale (Georgia). In *Indigenous Landscapes and Spanish Missions: New Perspectives from Archaeology and Ethnohistory*, edited by Lee M. Panich and Tsim D. Schneider, pp. 25-40. University of Arizona Press, Tucson.

Boer, Pieter and Paul Engle

2010 Antonio Neri: An Annotated Bibliography of Primary References. *Journal of Glass Studies* 52:51-67.

Bonneau, Adelphine, Jean-François Moreau, Réginald Auger, Ron G.V. Hancock, and Bertrand Émard

2013 Analyses physico-chimiques des perles de traite en verre de facture européenne: Quelles instrumentations pour quels résultats? *Archéologiques* 26:109-132.

Bonneau, Adelphine, Jean-François Moreau, Ron G.V. Hancock, and Karlis Karklins

2014 Archaeometrical Analysis of Glass Beads: Potential, Limitations, and Results. *Beads: Journal of the Society of Bead Researchers* 26:35-46.

Bradley, James W.

2014 Glass Beads from Champlain's Habitation on Saint Croix Island, Maine, 1604-1613. *Beads: Journal of the Society of Bead Researchers* 26:47-63.

Burgess, Laurie E. and Laure Dussubieux

2007 Chemical Composition of Late 18th- and 19th-Century Glass Beads from Western North America: Clues to Sourcing Beads. *Beads: Journal of the Society of Bead Researchers* 19:58-73.

Dalton-Carriger, Jessica and Elliot H. Blair

2013 Compositional Analysis of Glass Trade Beads from the Interior Southeast. Paper presented at the 70th Annual Southeastern Archaeological Conference, 6-10 November, Tampa.

2015 Answering Chronological and Regional Interaction Questions Via Pxrf and La-Icp-Ms Analyses in the Interior Southeast. Paper presented at the 80th Annual Society for American Archaeology Conference, 15-19 April, San Francisco.

Davison, Claire Crawford

1972 Glass Beads in African Archaeology: Results of Neutron Activation Analysis, Supplemented by Results of X-Ray Fluorescence Analysis. Ph.D. dissertation. Department of Anthropology, University of California, Berkeley.

Deagan, Kathleen A.

1987 *Artifacts of the Spanish Colonies of Florida and the Caribbean. Volume 1: Ceramics, Glassware, and Beads*. Smithsonian Institution Press, Washington, D.C.

DeCorse, Christopher R.

1989 Beads as Chronological Indicators in West African Archaeology: A Reexamination. *Beads: Journal of the Society of Bead Researchers* 1:41-53.

Dillon, Edward

1907 *Glass*. Methuen, London.

Dussubieux, Laure and Karlis Karklins

2016 Glass Bead Production in Europe during the 17th Century: Elemental Analysis of Glass Material Found in London and Amsterdam. *Journal of Archaeological Science: Reports* 5:574-589.

Dussubieux, Laure, Peter Robertshaw, and Micheal D. Glascock

2009 LA-ICP-MS Analysis of African Glass Beads: Laboratory Inter-Comparison with an Emphasis on the Impact of Corrosion on Data Interpretation. *International Journal of Mass Spectrometry* 284(1-3):152-161.

Dybowski, Daniel G.

2012 PXRF/WDXRF Inter-Unit Data Comparison of Arizona Obsidian Samples. *Journal of Arizona Archaeology* 2(1):15-21.

Engle, Paul

2014 *Conciatore, the Life and Times of 17th Century Glassmaker Antonio Neri*. Heiden and Engle, Hubbardston, MA.

Fitzgerald, William R., Dean H. Knight, and Allison Bain
1995 Untanglers of Matters Temporal and Cultural: Glass Beads and the Early Contact Period Huron Ball Site. *Canadian Journal of Archaeology/Journal Canadien d'Archéologie* 19:117-138.

Francis, J. Michael and Kathleen M. Kole
2011 *Murder and Martyrdom in Spanish Florida: Don Juan and the Guale Uprising of 1597*. Anthropological Papers of the American Museum of Natural History 95.

Francis, Peter, Jr.
1988 *The Glass Trade Beads of Europe: Their Manufacture, Their History, and Their Identification*. The World of Beads Monograph Series 8. Lake Placid.
2009a Glass Beads from Other Manufacturing Centers. In *The Beads of St. Catherines Island*, edited by Elliot H. Blair, Lorann S.A. Pendleton, and Peter Francis, Jr., pp. 97-100. Anthropological Papers of the American Museum of Natural History 89.
2009b The Glass Beads of China. In *The Beads of St. Catherines Island*, edited by Elliot H. Blair, Lorann S.A. Pendleton, and Peter Francis, Jr., pp. 81-84. Anthropological Papers of the American Museum of Natural History 89.
2009c The Glass Beads of the *Margariteri* of Venice. In *The Beads of St. Catherines Island*, edited by Elliot H. Blair, Lorann S.A. Pendleton, and Peter Francis, Jr., pp. 59-64. Anthropological Papers of the American Museum of Natural History 89.
2009d The Glass Beads of the *Paternostri* of the Netherlands and France. In *The Beads of St. Catherines Island*, edited by Elliot H. Blair, Lorann S.A. Pendleton, and Peter Francis, Jr., pp. 73-80. Anthropological Papers of the American Museum of Natural History 89.
2009e The Glass Beads of the *Paternostri* of Venice. In *The Beads of St. Catherines Island*, edited by Elliot H. Blair, Lorann S.A. Pendleton, and Peter Francis, Jr., pp. 65-71. Anthropological Papers of the American Museum of Natural History 89.

Gan, FuXi, HuanSheng Cheng, YongQing Hu, Bo Ma, and DongHong Gu
2009 Study on the Most Early Glass Eye-Beads in China Unearthed from Xu Jialing Tomb in Xichuan of Henan Province, China. *Science in China Series E: Technological Sciences* 52(4):922-927.

Glascock, Michael D.
2013 Application of Neutron Activation Analysis to Archaeological Studies of Natural and Man-Made Glasses. In *Modern Methods for Analysing Archaeological and Historical Glass*, edited by Koen Janssens, pp. 185-199. John Wiley and Sons, Chichester.

Gratuze, Bernard
2013 Glass Characterisation Using Laser Ablation Inductively Coupled Plasma Mass Spectrometry Methods. In *Modern Methods for Analysing Archaeological and Historical Glass*, edited by Koen Janssens, pp. 201-234. John Wiley and Sons, Chichester.

Grazzini, Maria Grazia
2012 Discorso sopra la Chimica: The Paracelsian Philosophy of Antonio Neri. *Nuncius* 27(2):411-467.

Hamell, George R.
1983 Trading in Metaphors: The Magic of Beads. In *Proceedings of the 1982 Glass Trade Bead Conference*, edited by Charles F. Hayes, III, pp. 5-28. Rochester Museum and Science Center, Research Records 16.
1987 Strawberries, Floating Islands, and Rabbit Captains: Mythical Realities and European Contact in the Northeast During the Sixteenth and Seventeenth Centuries. *Journal of Canadian Studies* 21(4):72-94.

Hancock, Ron G.V.
2005 Elemental Analysis of North American Glass Trade Beads. *Beads: Journal of the Society of Bead Researchers* 17:52-57.
2013 European Glass Trade Beads in Northeastern North America. In *Modern Methods for Analysing Archaeological and Historical Glass*, edited by Koen Janssens, pp. 459-471. John Wiley and Sons, Chichester.

Hancock, Ron G.V., Suasan Aufreiter, and Ian Kenyon
1997 European White Glass Trade Beads as Chronological Markers. In *Materials Issues in Art and Archaeology V*, edited by Pamela B. Vandiver, James R. Druzik, John F. Merkel, and John Stewart, pp. 181-191. Materials Research Society, Pittsburgh.

Hancock, Ron G.V., Susan Aufreiter, Ian Kenyon, and Martha Latta
1999 White Glass Beads from the Auger Site, Southern Ontario, Canada. *Journal of Archaeological Science* 26(8):907-912.

Hancock, Ron G.V., A. Chafe, and Ian Kenyon
1994 Neutron Activation Analysis of Sixteenth- and Seventeenth-Century European Blue Glass Trade Beads from the Eastern Great Lakes Area of North America. *Archaeometry* 36(2):253-266.

Hancock, Ron G.V. and Elizabeth Graham
2006 Evidence for the Period of Distribution of European Glass

Beads at the Spanish Mission of Tipu in Belize. In *34th International Symposium on Archaeometry, 3-7 May 2004, Zaragoza, Spain*, edited by Josefina Pérez-Arantegui, pp. 483-487. Institución Fernando el Católico, Zaragoza.

Hoffmann, Peter

1994 Analytical Determination of Colouring Elements and of their Compounds in Glass Beads from Graveyards of the Merowings Time. *Fresenius' Journal of Analytical Chemistry* 349(4):320-333.

Hulst, Michel, Jerzy Gawronski, Ranjith Jayasena, and Jørgen Veerkamp

2012 Glasshouse De Twee Rozen (Amsterdam, Netherlands): 17th Century Glass Production in Venetian Style. In *Le verre en Lorraine et dans les régions voisines*, edited by Arveiller and Hubert Cabart, pp. 1-10. Éditions Monique Mergoil, Montagnac.

Hunt, Alice M.W. and Robert J. Speakman

2015 Portable XRF Analysis of Archaeological Sediments and Ceramics. *Journal of Archaeological Science* 53:626-638.

Kaiser, Bruce and Aaron N. Shugar

2012 Glass Analysis Utilizing Handheld X-Ray Fluorescence. In *Studies in Archaeological Science: Handheld XRF for Art and Archaeology*, edited by Aaron N. Shugar and Jennifer L. Mass, pp. 449-470. Leuven University Press, Leuven.

Karklins, Karlis

1974 Seventeenth Century Dutch Beads. *Historical Archaeology* 8:54-82.

1983 Dutch Trade Beads in North America. In *Proceedings of the 1982 Glass Trade Beads Conference*, edited by Charles F. Hayes, III, pp. 111-126. Rochester Museum and Science Center, Research Records 16.

2012 Guide to the Description and Classification of Glass Beads Found in the Americas. *Beads: Journal of the Society of Bead Researchers* 24:62-90.

Karklins, Karlis, Laure Dussubieux, and Ron G. V. Hancock

2015 A 17th-Century Glass Bead Factory at Hammersmith Embankment, London, England. *Beads: Journal of the Society of Bead Researchers* 27:16-24.

Karklins, K., R.G.V. Hancock, J. Baart, M.L. Sempowski, J.-F. Moreau, D. Barham, S. Aufreiter, and I. Kenyon

2002 Analysis of Glass Beads and Glass Recovered from an Early 17th-Century Glassmaking House in Amsterdam. In *Archaeological Chemistry: Materials, Methods and Meaning*, edited by K.A. Jakes, pp. 110-127. American Chemical Society, Symposium Series 831.

Karklins, K., J. Kottman, R.G.V. Hancock, M.L. Sempowski, A.W. Nohe, J.-F. Moreau, S. Aufreiter, and I. Kenyon

2001 On the Chemical Variability of Middelburg Glass Beads and Rods. In *Australasian Connections and New Directions, Proceedings of the 7th Australasian Archaeometry Conference*, edited by M. Jones and P. Sheppard, pp. 187-195. Department of Anthropology, The University of Auckland, Auckland, New Zealand.

Kent, Barry C.

1983 The Susquehanna Bead Sequence. In *Proceedings of the 1982 Glass Trade Bead Conference*, edited by Charles F. Hayes, III, pp. 75-81. Rochester Museum and Science Center, Research Records 16.

1984 *Susquehanna's Indians*. Pennsylvania Historical and Museum Commission, Anthropological Series 6.

Kenyon, Ian and William Fitzgerald

1986 Dutch Glass Beads in the Northeast: An Ontario Perspective. *Man in the Northeast* 32:1-34.

Kenyon, Ian, Ronald G. V. Hancock, and Susan Aufreiter

1995 Neutron Activation Analysis of AD 1660-1930 European Copper-Coloured Blue Glass Trade Beads from Ontario, Canada. *Archaeometry* 37(2):323-337.

Kidd, Kenneth E.

1983 Problems in Glass Trade Bead Research. In *Proceedings of the 1982 Glass Trade Bead Conference*, edited by Charles F. Hayes, III, pp. 1-4. Rochester Museum and Science Center, Research Records 16.

Kidd, Kenneth E. and Martha Ann Kidd

2012 [1970] A Classification System for Glass Beads for the Use of Field Archaeologists. *Beads: Journal of the Society of Bead Researchers* 24:39-61.

Kuisma-Kursula, Pirkko

1999 PIXE and SEM Studies of Old Finnish and European Glass and European Oyster *Ostrea edulis*. Ph.D. dissertation. Department of Physics, University of Helsinki.

Larsen, Clark Spencer

1990 *The Archaeology of Mission Santa Catalina De Guale, 2: Biocultural Interpretations of a Population in Transition*. Anthropological Papers of the American Museum of Natural History 63(2).

Little, Keith J.

2010 Sixteenth-Century Glass Bead Chronology in Southeastern North America. *Southeastern Archaeology* 29(1):222-232.

Loren, Diana DiPaolo

2009 Material Manipulations: Beads and Cloth in the French Colonies. In *The Materiality of Individuality: Archaeological Studies of Individual Lives*, edited by Carolyn L. White, pp. 109-124. Springer, New York.

2010 *The Archaeology of Clothing and Bodily Adornment in Colonial America*. University Press of Florida, Gainesville.

Marcoux, Jon Bernard

2012 Glass Trade Beads from the English Colonial Period in the Southeast, ca. A.D. 1607-1783. *Southeastern Archaeology* 31(2):157-184.

Mass, Jennifer L., Richard E. Stone, and Mark T. Wypyski

1996 An Investigation of the Antimony-Containing Minerals Used by the Romans to Prepare Opaque Colored Glasses. *Materials Research Society Symposium Proceedings* 462:193-204.

McCray, W. Patrick

1999a Creating Networks of Skill: Technology Transfer and the Glass Industry in Venice. *Journal of European Economic History* 28(2):301-334.

1999b *Glassmaking in Renaissance Venice: The Fragile Craft*. Ashgate, Aldershot.

McEwan, Bonnie G.

2001 The Spiritual Conquest of La Florida. *American Anthropologist* 103(3):633-644.

Moreau, Jean-François and Ron G. V. Hancock

2010 "Un siècle d'approvisionnement: 1550-1650:" de la préhistoire à l'histoire au site du poste de traite de Chicoutimi. *Archéologiques* 23:84-98.

Moreau, Jean-François, Ron G. V. Hancock, Suasan Aufreiter, and Ian Kenyon

2002 Late French (1700-1750) to Early English (1750-1800) Regime White Glass Trade Beads from a Presumed Decorated Bag Found at the Ashuapmushuan Site (Eastern Central Québec), Canada. In *Archaeometry 98, Proceedings of the 31st Symposium*, edited by E. Jerem and K.T. Biro, pp. 613-619. BAR International Series 1043.

Moreau, Jean-François, Ron G.V. Hancock, and M. Moussette

2006 Toward a Chrono-Seriation Method Based on European Trade White Beads in Northeastern North America. In *34th International Symposium on Archaeometry, 3-7 May 2004, Zaragoza, Spain*, edited by J. Pérez-Arantegui, pp. 85-90. Institución Fernando el Católico, Zaragoza.

Moretti, Cesare and Sandro Hreglich

1984 Opacification and Coloring of Glass with Special Additives. 1: Survey of 18th and 19th Century Recipe Books. *Rivista della Stazione Sperimentale del Vetro* 14(1):17-22.

2005 Opaque Glass Manufacturing Techniques Used by Venetian Glassmakers Between the 15th and 20th Centuries. *Rivista della Stazione Sperimentale del Vetro* 35(5):28-32.

2013 Raw Materials, Recipes and Procedures Used for Glass Making. In *Modern Methods for Analysing Archaeological and Historical Glass*, edited by Koen Janssens, pp. 23-47. John Wiley and Sons, Chichester.

Moretti, Cesare, Carlo Stefano Salerno, and Sabina Tommasi Ferroni

2005 The Heritage of Recipes Exported by Venetian Glass Masters Revealed in a Seventeenth-Century Manuscript. In *Annales du 16e Congres de l'Association Internationale pour l'Histoire du Verre, London, 7-13 September, 2003*, pp. 241-243. Nottingham.

Moretti, Cesare and Tullio Toninato

2001 *Ricettario vetrario del Rinascimento: Trascrizione da un manoscritto anonimo veneziano*. Marsilio Editori, Venezia.

Neri, Antonio

1612 *L'arte Vetraria Distinta in Libri Sette*. Nella Stamperia de' Giunti, Florence.

1662 [1612] *The Art of Glass, Wherein Are Shown the Wayes to Make and Colour Glass, Pastes, Enamels, Lakes, and Other Curiosities. Written in Italian by Antonio Neri, and Translated into English, with Some Observations on the Author*. Translated by Christopher Merret. Octavian Pulleyn, London.

2003 [1612] *L'arte Vetraria, the Art of Glass, Vol. I*. Translated and annotated by Paul Engle. Heiden and Engle, Hubbardston, MA.

2004 [1612] *L'arte Vetraria, the Art of Glass, Vol. II*. Translated and annotated by Paul Engle. Heiden and Engle, Hubbardston, MA.

2007 [1612] *L'arte Vetraria, the Art of Glass, Vol. III*. Translated and annotated by Paul Engle. Heiden and Engle, Hubbardston, MA.

Noël Hume, Ivor

2001 *A Guide to Artifacts of Colonial America*. University of Pennsylvania Press, Philadelphia.

Perttula, Timothy K. and Michael D. Glascock

2017 Glass Beads. In *La Belle: The Archaeology of a Seventeenth-Century Vessel of New World Colonization*, edited by James E. Bruseth, Amy A. Borgens, Bradford M. Jones, and Eric D. Ray, pp. 509-530. Texas A&M University Press, College Station.

Polhemus, Richard

1983 Tennessee Bead Seriation. In *Proceedings of the 1982 Glass Trade Beads Conference*, edited by Charles F. Hayes, III, pp. 145. Rochester Museum and Science Center, Research Records 16.

1987 *The Toqua Site: 40MR6: A Late Mississippian, Dallas Phase Town*. Department of Anthropology, University of Tennessee, Knoxville, Report of Investigations 41.

Polikreti, Kyriaki, Joanne M. A. Murphy, Vasilike Kantarelou, and Andreas Germanos Karydas

2011 XRF Analysis of Glass Beads from the Mycenaean Palace of Nestor at Pylos, Peloponnesus, Greece: New Insight into the LBA Glass Trade. *Journal of Archaeological Science* 38(11):2889-2896.

Popelka, Rachel S., Michael D. Glascock, Peter Robertshaw, and Marilee Wood

2005 Laser Ablation-ICP-MS of African Glass Trade Beads. In *Laser Ablation ICP-MS in Archaeological Research*, edited by Robert J. Speakman and Hector Neff, pp. 85-93. University of New Mexico Press, Albuquerque.

Robertshaw, Peter, Marilee Wood, Erik Melchiorre, Rachel S. Popelka-Filcoff, and Michael D. Glascock

2010 Southern African Glass Beads: Chemistry, Glass Sources and Patterns of Trade. *Journal of Archaeological Science* 37(8):1898-1912.

Rooksby, H.P.

1962 Opacifiers in Opal Glasses. *Journal of Science and Technology* 29(1):20-26.

Saunders, Lorraine P. and Martha L. Sempowski

1991 The Seneca Site Sequence and Chronology: The Baby or the Bathwater. *The Bulletin: Journal of the New York State Archaeological Association* 102:13-26.

Sempowski, Martha L., A.W. Nohe, Jean-François Moreau, Ian Kenyon, Karlis Karklins, Susan Aufreiter, and Ron G.V. Hancock

2000 On the Transition from Tin-Rich to Antimony-Rich European White Soda-Glass Trade Beads for the Senecas of Northeastern North America. *Journal of Radioanalytical and Nuclear Chemistry* 244(3):559-566.

Sempowski, Martha L. and Lorraine P. Saunders

2001 *Dutch Hollow and Factory Hollow: The Advent of Dutch Trade among the Seneca*. Charles F. Wray Series in Seneca Archaeology 3. Rochester Museum and Science Center, Research Records 24.

Shackley, M. Steven

2010 Is There Reliability and Validity in Portable X-Ray Fluorescence Spectrometry (pXRF)? *The SAA Archaeological Record* 10(5):17-20, 44.

Shugar, Aaron N.

2013 Portable X-Ray Fluorescence and Archaeology: Limitations of the Instrument and Suggested Methods to Achieve Desired Results. In *Archaeological Chemistry VIII*, edited by Ruth Ann Armitage and James H. Burton, pp. 173-193. ACS Symposium Series 1147.

Shugar, Aaron N. and Aeriel O'Connor

2008 The Analysis of 18th Century Glass Beads from Fort Niagara: Insight into Compositional Variation and Manufacturing Techniques. *Northeast Historical Archaeology* 37(1):58-68.

van der Sleen, W.G.N.

1963a Bead-Making in Seventeenth-Century Amsterdam. *Archaeology* 16(1):260-263.

1963b A Bead Factory in Amsterdam in the Seventeenth Century. *Man* LXIII:172-173.

Šmit, Žiga, Timotej Knific, David Jezeršek and Janka Istenič

2012 Analysis of Early Medieval Glass Beads – Glass in the Transition Period. *Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms* 278:8-14.

Smith, Marvin T.

1983 Chronology from Glass Beads: The Spanish Period in the Southeast, 1513-1670. In *Proceedings of the 1982 Glass Trade Bead Conference*, edited by Charles F. Hayes, III, pp. 147-158. Rochester Museum and Science Center, Research Records 16.

1987 *Archaeology of Aboriginal Culture Change*. University Press of Florida, Gainesville.

1990 Glass Beads from the Goldsmith Oliver 2 Site. In *Goldsmith Oliver 2 (3pu306): A Protohistoric Archaeological Site near Little Rock, Arkansas*, edited by M.D. Jeter, K.H. Cande, and J.J. Mintz, pp. 217-223. Arkansas Archaeological Survey, Project Reports 631 and 656.

2002 Eighteenth-Century Glass Beads in the French Colonial Trade. *Historical Archaeology* 36:55-61.

n.d. *European Artifacts from the Plum Grove Site, 40WG17*. Manuscript on file with the author.

Smith, Marvin T., Elizabeth A. Graham, and David M. Pendergast

1994 European Beads from Spanish Colonial Lamanai and Tipu, Belize. *Beads: Journal of the Society of Bead Researchers* 6:21-47.

Soulier, I., B. Gratuze, and J. N. Barrandon

1996 The Origin of Cobalt Blue Pigments in French Glass from the Bronze Age to the Eighteenth Century. In *Archaeometry '94: Proceedings of the 29th International Symposium on Archaeometry, Ankara, 9-14 May 1994*, edited by Ş. Demirci, A.M. Özer, and G.D. Summers, pp. 133-140. Túbítak, Ankara.

Speakman, Robert J., Nicole C. Little, Darrell Creel, Myles R. Miller, and Javier G. Iñañez

2011 Sourcing Ceramics with Portable XRF Spectrometers? A Comparison with INAA Using Mimbres Pottery from the American Southwest. *Journal of Archaeological Science* 38:3483-3496.

Speakman, Robert J. and M. Steven Shackley

2013 Silo Science and Portable XRF in Archaeology: A Response to Frahm. *Journal of Archaeological Science* 40:1435-1443.

Spector, Janet D.

1976 The Interpretive Potential of Glass Beads in Historic Archaeology. *Historical Archaeology* 10:17-27.

Sprague, Roderick

1985 Glass Trade Beads: A Progress Report. *Historical Archaeology* 19(2):87-105.

Thomas, David Hurst

1987 *The Archaeology of Mission Santa Catalina De Guale: 1. Search and Discovery*. Anthropological Papers of the American Museum of Natural History 63(2).

1988a Saints and Soldiers at Santa Catalina. Hispanic Design for Colonial America. In *The Recovery of Meaning. Historical Archaeology in the Eastern United States*, edited by Mark P. Leone and Parker B. Potter, Jr., pp. 73-140. Smithsonian Institution Press, Washington, D.C.

1988b *St. Catherines. An Island in Time*. Georgia Humanties Council, Atlanta.

1993 The Archaeology of Mission Santa Catalina De Guale: Our First 15 Years. In *The Spanish Missions of La Florida*, edited by Bonnie G. McEwan, pp. 1-34. University Press of Florida, Gainesville.

2010a The Cultural Geography of Santa Catalina De Guale. In *Mission and Pueblo of Santa Catalina De Guale: A Comparative Zooarchaeological Analysis*, edited by Elizabeth J. Reitz, Barnet Pavao-Zuckerman, Daniel C. Weinand, and Gwyneth A. Duncan, pp. 31-44. Anthropological Papers of the American Museum of Natural History 91.

2010b Indian Agency in Spanish Florida: Some New Findings from Mission Santa Catalina De Guale. *Journal of Global Initiatives* 5(1):99-112.

Tite, M., T. Pradell, and A. Shortland

2008 Discovery, Production and Use of Tin-Based Opacifiers in Glasses, Enamels and Glazes from the Late Iron Age Onwards: A Reassessment. *Archaeometry* 50(1):67-84.

Toninato, Tullio and Cesare Moretti

1992 Muranese Recipe Books (16th-20th Centuries). *Rivista della Stazione Sperimentale del Vetro* 22(4):197-202.

Trivellato, Francesca

2006 Murano Glass, Continuity and Transformation (1400-1800). In *At the Centre of the Old World: Trade and Manufacturing in Venice and on the Venetian Mainland (1400-1800)*, edited by Paolo Lanaro, pp. 143-184. Centre for Reformation and Renaissance Studies, Toronto.

Turgeon, Laurier

2001 French Beads in France and Northeastern North America during the Sixteenth Century. *Historical Archaeology* 35(4):58-82.

2004 Beads, Bodies and Regimes of Value. From France to North America, Ca. 1500-Ca. 1650. In *The Archaeology of Contact in Settler Societies*, edited by Tim Murray, pp. 19-47. Cambridge University Press, Cambridge.

Turner, W.E.S.

1963 The Tercentenary of Neri-Merrett's *The Art of Glass*. In *Advances in Glass Technology, Part 2*, edited by Frederick R. Matson and Guy E. Rindone, pp. 181-202. Plenum Press, New York.

Turner, W.E.S. and H.P. Rooksby

1959 A Study of the Opalising Agents in Ancient Opal Glasses throughout Three Thousand Four Hundred Years. *Glastechnische Berichte* 7:17-29.

1961 Further Historical Studies Based on X-Ray Diffraction Methods of the Reagents Employed in Making Opal and Opaque Glasses. *Jahrbuch des Römisch-Germanischen Zentralmuseums* 8:1-16.

1963 A Study of the Opalizing Agents in Ancient Glasses throughout 3400 Years: Part II. In *Advances in Glass Technology, Part 2*, edited by Frederick R. Matson and Guy E. Rindone, pp. 306-307. Plenum Press, New York.

Veiga, J.P. and M.O. Figueiredo

2002 Sixteenth Century Tubular Glass Beads: Non-Destructive Chemical Characterization Using Synchrotron Radiation XRF. *X-Ray Spectrometry* 31(4):300-304.

Verità, Marco

1986 Technology of Venetian Glassmaking and the Contents of the Darduin Notebook. In *Il ricettario Darduin: Un codice vetrario del Seicento trascritto e commentato*, edited by Luigi Zecchin, pp. 24-33. Arsenale, Venice.

2014 Secrets and Innovations of Venetian Glass between the 15th and the 17th Centuries: Raw Materials, Glass Melting and Artefacts. *ATTI: Classe di Scienze Fisiche, Matematiche e Naturali: Study Days on Venetian Glass: Approximately 1600's*, edited by Rosa Barovier and Cristina Tonini, pp. 53-68. Istituto Veneto di Scienze, Lettere ed Arti, Venice.

Walder, Heather

2013 Stylistic and Chemical Investigation of Turquoise-Blue Glass Artifacts from the Contact Era of Wisconsin. *Midcontinental Journal of Archaeology* 38(1):119-142.

2015 "…a Thousand Beads to Each Nation:" Exchange, Interactions, and Technological Practices in the Upper Great Lakes c. 1630-1730. Ph.D. dissertation. Department of Anthropology University of Wisconsin, Madison.

Watts, David C. and Cesare Moretti

2011 *Glass Recipes of the Renaissance: Transcriptions of an Anonymous Venetian Manuscript*. Watts Publishing, London.

Worth, John E.

2007 *The Struggle for the Georgia Coast: An Eighteenth-Century Spanish Retrospective on Guale and Mocama*. University of Alabama Press, Tuscaloosa.

2009a Ethnicity and Ceramics on the Southeastern Atlantic Coast: An Ethnohistorical Analysis. In *From Santa Elena to St. Augustine: Indigenous Ceramic Variability (A.D. 1400-1700)*, edited by Kathleen Deagan and David Hurst Thomas, pp. 179-207. Anthropological Papers of the American Museum of Natural History 90.

2009b Razing Florida: The Indian Slave Trade and the Devastation of Spanish Florida, 1659-1715. In *Mapping the Mississippian Shatter Zone*, edited by Robbie Ethridge and Sheri M. Shuck-Hall, pp. 295-311. University of Nebraska Press, Lincoln.

Wray, Charles F.

1983 Seneca Glass Trade Beads C. A.D. 1550-1820. In *Proceedings of the 1982 Glass Trade Bead Conference*, edited by Charles F. Hayes, III, pp. 41-49. Rochester Museum and Science Center, Research Records 16.

Wray, Charles F., Martha L. Sempowski, and Lorraine P. Saunders

1991 *Tram and Cameron: Two Early Contact Era Seneca Sites*. Charles F. Wray Series in Seneca Archaeology 2. Rochester Museum and Science Center, Research Records 21.

Wray, Charles F., Martha L. Sempowski, Lorraine P. Saunders, and Gian Carlo Cervone

1987 *The Adams and Culbertson Sites*. Charles F. Wray Series in Seneca Archaeology 1. Rochester Museum and Science Center, Research Records 19.

Zecchin, Luigi

1964 Antonio Neri e le conterie. *Vetro e Silicati* 8:21-24.

1986 *Il ricettario Darduin: Un codice vetrario del Seicento trascritto e commentato*. Arsenale, Venice.

Zucchiatti, Alessandro, Lucia Canonica, Paolo Prati, Aurora Cagnana, Stefano Roascio, and Aurelio Climent Font

2007 PIXE Analysis of V-XVI Century Glasses from the Archaeological Site of San Martino Di Ovaro (Italy). *Journal of Cultural Heritage* 8(3):307-314.

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ANTIQUE CLOISONNÉ JAPANESE BEADS

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Intricate cloisonné beads in Japan track the 19th-century upheavals in technological development and society. While late Edo Japan had developed its own aesthetic based upon Chinese sources, the Meiji quest for Western technology produced a uniquely Japanese cloisonné industry unmatched elsewhere in the world. Cloisonné beads mirror this change, beginning in the 1830s with decorative motifs derived from Ming cloisonné and Edo glass beads, and morphing throughout the Meiji era into tiny masterpieces demonstrating a uniquely Japanese art form captured in advanced enamel technology.

INTRODUCTION

Current art history consensus is that the technique of cloisonné was introduced into China from the West during the 14th-century Yuan Dynasty, and that Chinese artists quickly adapted it to produce distinctly Chinese works over the subsequent 400 years (Quette 2011).

Cloisonné is a difficult art form, often requiring a production team to encompass the required skills: technical glassmaking chemistry, metallurgy, kiln construction and firing knowledge, artistic talent in sculpture and surface design, and precision execution of manual tasks. Using fine flat wires, a design is drawn upon a copper or copper-alloy base to create a mosaic of small enclosed areas called cloisons. Enamel powders consisting of ground glass and various other chemicals and minerals are packed into the cloisons, and the object is then fired in a kiln until the powder melts. The powder shrinks as it melts, thus the cloisons need to be refilled and refired a number of times until the enamel is level with the tops of the cloisons. Using a graduated variety of grinding stones and polishing powders, the piece is ground and polished until the enamel and the wire edges form a smooth surface. Some enamel formulas permit a final firing to fire polish the surface to a high glassy luster, although this was typically not done with the enamels and firing temperatures available prior to around the end of the 19th century.

At least one Chinese connoisseur was apparently initially somewhat sniffy about cloisonné. Beatrice Quette (2011:7) cites Cao Zhao's *The Essential Criteria of Antiquities*, published in 1388:

> The body is made of copper; for the decoration in five colors, molten substances are used, similar to inlay work from the Frankish Lands. I have seen incense burners, flower vases, boxes, small bowls, and the like, appropriate for a lady's chamber but not for the study of a scholar of cool, reticent taste.

Nonetheless, the rich unfading colors of cloisonné secured its continuing popularity among the Chinese for centuries, largely under the patronage of the imperial courts due to its complex production process and expense. Under the 18th-century Qianlong emperor much cloisonné was produced, such as impressive temple and court furnishings as well as luxurious personal items such as bowls, cups, burners and tools for incense, and desk paraphernalia for writing. But nowhere is the production of cloisonné beads mentioned in any sort of literature until the late 19th century, and no verifiable examples of cloisonné beads can be found in either China or Japan prior to their appearance in Japan in the early 19th century.

The divergent reactions of China and Japan to the disruptions, disasters, and economic turmoil caused by European incursions during the 19th century sent the two countries on surprising and radically different paths with respect to cloisonné production – a 19th-century blossoming of the cloisonné art form in Japan, versus a beleaguered and struggling cloisonné tradition in China as the Qing dynasty was driven to collapse. In their little way, beads illustrate this divergence in 19th-century Chinese and Japanese approaches to cloisonné. While Japan developed fine cloisonné beads during the 19th century, the Chinese relentlessly ignored the possibility.

Sumptuary regulations controlled what colors and materials could be used for the Qing court necklaces and hat finial beads required to be worn by the various ranks of officials. Perhaps cloisonné was viewed as more suitable

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for palace, temple, and household furnishings, and wearing brightly colored cloisonné beads would have been perceived with disdain, similar to how we might regard wearing a necklace of drawer pulls or cabinet knobs. More likely, the copper base required for cloisonné enamel may have been deemed unsuitable for court necklace beads, where silver and gold were the preferred metals. Silver court-necklace beads do feature intricate cloisonné-like designs of various floral and auspicious symbols, worked in a fine, twisted wire and enameled with glassy blue, purple, and occasional touches of yellow, green, and white. These enamels were fired once to melt them and, unlike cloisonné, required no further refilling of the cloisons or grinding and polishing. Such beads might be more accurately described as enameled silver rather than cloisonné, even though the twisted wires do form separate cloisons.

EDO JAPAN (1602-1868)

Cloisonné was appreciated in Edo Japan in various ways, despite being a relatively uncommon decorative technique often confined to flat surfaces, possibly to allow for better enamel control during firing (Schneider (2010:15-21). Captain Brinkley, writing in 1902, asserts:

> One thing, however, is certain; namely, that until the nineteenth century enamels were employed by the Japanese decorators for accessory purposes only. No such things were manufactured such as vases, plaques, censers, or bowls having their surface covered with enamels either in the *champlevé* or *cloisonné* style (Brinkley 1902:330).

He nonetheless mentions beads (ojime) as cloisonné products in Edo Japan prior to the 19th century:

> For such purposes as the decoration of *kugi-kakushi* (metal ornaments used to conceal the heads of nails in the interiors of houses), beads (*ojime*), and clasps (*kagami-buta* and *kana-mono*) for pouches, recessed handles of sliding-doors, or metal caps and plates on wood-work, vitrifiable pastes, whether translucid or opaque, seemed suitable (Brinkley 1902:331).

Sifting the literature for elusive references to early Japanese cloisonné beads, Fredric Schneider (2010:295) notes this comment hidden in the very last pages in Brinkley:

> **Hiratsuka,** Mohei. 19th cent. (d. 1840.) A worker in cloisonné enamel who used translucid pastes for making ojime, Kagami-buta and Kama-mono [pouch clasps].
>
> **Hiratsuka,** Kinnosuke. Present day. Son of Hiratsuka, Mohei. A skilled worker in cloisonné enamels. Remarkable for having introduced (1887) the style known as Hirata-jippo; namely, enamel designs suspended in the reticulations of silver vases chiseled *à jour* (Brinkley 1902:12-13, following index).

Schneider's more exhaustive survey allows a more expansive view than expressed by Brinkley:

> …by the early nineteenth century cloisonné and enameling, though relatively rare, had become part of Japan's decorative arts tradition, including architectural elements, items for the scholar's desk, household and temple objects, sword furniture, and ojime and netsuke sartorial adornment (Schneider 2010:19).

Despite the reference to the mysterious Hiratsuka as a cloisonné beadmaker, historical accounts attribute the development of a cloisonné industry in Japan for the purpose of decorating three-dimensional objects to one man – Kaji Tsunekichi (1803-1883) – in the 1830s (Brinkley 1902:333-334). Struggling single-handedly to reverse engineer what was likely a Ming Chinese bowl, his determination reinvented cloisonné in Japan. Lawrence Coben and Dorothy Ferster describe in detail the vicissitudes of the early Japanese cloisonné workshops. They present a convincing case for how the economic, social, and political situation in 19th-century Japan enabled the Japanese cloisonné artists to create the art form anew, free from the traditional constraints of the Chinese imperial workshops (Coben and Ferster 1982).

The relationship between cloisonné and glass industry knowledge is crucial, as cloisonné enamels are a form of glass. Kaji Tsunekichi could thus tap for expertise an already existing Japanese glass industry that knew how to build and fire kilns, where to find minerals, and forge the necessary metal tools. Coben and Ferster (1982:31) cite an amusing account of an apprentice to a cloisonné master searching the city of Nagoya until he found the shop where his master bought the blue glass used in his "secret" background enamel. One wonders if these early Japanese cloisonné enamels were similar to those made by women in Mauritania by grinding glass to a fine powder and adding a bit of ground feldspar as flux to make their Kiffa beads. Greater technical refinements ensued and by the 1850s, Kaji Tsunekichi's work had achieved sponsorship from the *Tokugawa daimyo* of his home area in the Nagoya area and cloisonné production had spread as his pupils opened their own ateliers.

Glass beads were already popular in Japan for many uses in the early 19th century (Blair 1973:194), including Buddhist prayer beads, as ojime (the little bead used to secure the cords in the Japanese inro pouch accessory set), and for women's hair ornaments (*kanzashi*). Thus, once cloisonné beads could be manufactured, a local market for them likely already existed. One example of what could be an early cloisonné ojime (Figure 1) features simple circumferential bands of red, white, and turquoise, reminiscent of similar stripes on the glass beads also used as ojime in the Edo Period (Blair 1973:227).

Figure 1. An early white, red, and turquoise cloisonné ojime shows design affinity with an Edo glass ojime (Helmsley 2014).

Schneider (2010:26) discusses these early enamels that in Japanese are termed *doro shippo*:

> In comparison to later work, these doro shippo pieces used lower fired enamels... with a more limited opaque palette, generally of dull and subdued colors... often emphasizing deep green, and incapable of polishing to a hard, mirror-like surface.... Because the pieces were fired at a relatively low temperature and the enamels did not melt well, they usually emerged from the kiln with a wavy enamel surface and severe pitting, and thus often required grinding after each of the many firings needed to complete a piece.... The enamels did not adhere well to the metal substrate and had a coefficient of expansion that tended to leave cracks when fired; therefore, closely-spaced wires were required over the entire surface to hold the enamels properly in place and prevent cracking even when the design did not warrant them.

Another Japanese use for cloisonné beads appears in Coben and Ferster (1982:72), where Plate 11 shows a pair of scroll weights by Kaji Tsunekichi dated to 1854-1859. These large beads (3.5 cm diameter) feature a turquoise background enamel covered with finely wired leaf scrolls, flowers with two-tone petals in red and pink and dark blue and white, blossom petals arranged in rows or tiny trefoils, and a geometric net in the "four-directions" pattern of ovals forming connected circles. The peony-type flowers are reminiscent of Chinese cloisonné, where flower petals are often blends of two or more hues. The patches of tiny geometric patterns are a distinguishing feature of larger doro shippo pieces, very much resembling patches of textile patterns from which they are believed to have been derived (Schneider 2010:27). Although difficult to be certain from only viewing a photo, the enamel colors appear to be the doro shippo hues of turquoise blue, deep pink, red, dark blue, light yellow, white, and purple. Distinctive tiny cloud motifs that resemble paperclips are arranged at right angles to form the "four-directions" net of circles; identical tiny clouds may be seen in many larger mid-19th-century Japanese doro shippo works (Figures 2-3). The surface is matte.

Figure 2. a-b) Doro shippo ojime pre-1870 with indented petals on the pink blossom, a typical Japanese motif; c-d) ojime likely post-1870 with tripartite motifs in b-d. All ca. 15 mm in length (photo by author).

The collection of the Victoria & Albert Museum in London contains an early cloisonné inro, ojime, and netsuke ensemble (Figure 4) dated to ca. 1800-1850 (Irvine 2011:18). The inro and netsuke pieces feature two different designs that appear derived from the Ming Chinese cloisonné admired by Kaji, such as lotus flowers and leaf scrolls. The ojime, however, is worked in a distinctly different manner, with a pattern of swirls and dots reminiscent of Edo glass beads. The red enamel portion has not been filled to the level of the wires, but instead left a bit sunken and fire-polished to

Figure 3. a-b) Doro shippo ojime pre-1870; c-d) ojime likely post-1870. Tiny dots and spirals forming an edge border are a distinctive feature of Japanese cloisonné; 4-5 mm hole diameter (photo by author).

the glassy shine acquired in the kiln – an attractive contrast to the matte enamels, but not at all similar to Ming-inspired motifs on the inro and netsuke. Gregory Irvine (2017: pers. comm.) observes that the unmatched styles of the wirework and enameling in the three pieces of this ensemble indicate the likelihood that it is an assemblage, and not the work of a single artist. Thus is apparent a divergence in overall style between what seem to be Ming-inspired floral and leaf motifs combined with tiny geometric patches, versus the stripes and murrine seen on Edo glass beads. These stripes and dots perhaps represent continuance of earlier indigenous ojime designs produced prior to Kaji Tsunekichi.

Unique to Japanese cloisonné beads is a tripartite composition demonstrated both in small motifs and in the overall arrangement of a design. Perhaps this relates to an artistic tradition reflected in the designs of *mon* (crests) and hexagonal patterns in textiles (Figure 2,b-d).

The first documented works of Japanese cloisonné to appear in Europe were at the 1867 International Exhibition in Paris where 27 such items were exhibited. Of these the Victoria & Albert Museum acquired a small cylindrical three-tiered box, a kettle, and 10 ojime beads (Irvine 2011:78) (Figure 5). Apart from the pair of scroll weights mentioned above, these are the only dated pre-Meiji cloisonné beads from Japan. Their technical aspects are impressive; minute and fine wire designs, often with two colors in the same cloison – green or blue on yellow, red

Figure 4. Cloisonné inro, ojime, and netsuke ensemble. The ojime design appears more in the tradition of Edo glass beads, in contrast to the lotus and leafy vine motifs derived from Ming cloisonné (©Victoria & Albert Museum, M.235:1-1912).

or blue or purple on white – indicating at least two enamel applications and firings. Applying the minute wires and filling the tiny cloisons on beads scarcely 13 mm in diameter must have required keen eyesight and a very steady hand. Background enamels are hard to discern, but appear to be a patchwork of red, blue, dark green, purple, or a murky dark green/white mix. The doro shippo enamel is pitted and still shows parallel striations from polishing.

Stefany Tomalin (2013) has a long Liberty-necklace-style sautoire of similar beads in two sizes (12 mm and 18-20 mm), and Frederick Chavez has dozens in a variety of sizes (Figures 6-7). The Tomalin and Chavez beads generally seem to feature tidier wirework patterns and a smoother polish, and seem to be iterations of the same style as the 1867 beads, only more carefully worked. Like the Victoria & Albert beads and the Kaji Tsunekichi scroll weights, they combine floral and geometric motifs. The design and enamel similarities make it difficult to believe that these beads are not the work of a single atelier, perhaps even a single artist. There is such a comparative plethora of these beads, could

Figure 5. Ten cloisonné ojime acquired at the International Exhibition of 1867 in Paris (©Victoria & Albert Museum, 613-1868).

Figure 6. Japanese cloisonné beads in the style of those in the V&A Museum collection showing floral patterns with bi-colored petals (Frederick Bourguet-Chavez collection).

Figure 7. Japanese cloisonné beads in the style of those in the V&A Museum collection showing patches of tiny geometric textile-inspired patterns (Frederick Bourguet-Chavez collection).

they perhaps have been initially conceived as suitable for strands of Buddhist prayer beads, not individual ojime? In his book describing his collection of Japanese enamels, James Lord Bowes (1886:84) lists: "189. A collection of Beads (judzu), the entire surfaces of which are enamelled. They were used in the rosaries of the monks in Japan."

Gregory Irvine mentions that the Liberty store, established in 1875, was one of the major dealers in Japanese art in London. Perhaps these more carefully worked beads were later productions encouraged by the initial 1867 sale and exported to London? Also noted by Irvine (2011:78-79) is that the Victoria & Albert paid an "extraordinary" price of £60 for the small 1867 cylindrical box, so perhaps the beads carried a similarly high price that encouraged further production and export.

POST-MEIJI JAPAN (1868-ONWARD)

Doro shippo works for export tapered off after the late 1870s, after German glass chemist Gottfried Wagener was hired by the Japanese Meiji government to modernize their glaze and enamel industries. New high-fired enamels were developed in numerous colors, with smooth unpitted surfaces that could be polished to a high gloss. This was a turning point in the history of Japanese cloisonné, and marked a radical divergence not only between Chinese and Japanese works, but between Western and Japanese cloisonné. Fredric Schneider (2010:50) notes: "After they absorbed Wagener's enamel developments in the late 1870s, Japanese cloisonné artists almost immediately surpassed European efforts." Schneider (2010:119) discusses the development of goldstone, speckled, and mottled enamels which appear often in Kyoto-style cloisonné. Transparent enamels saw increasing use by the late 1870s.

Cloisonné beads continued to be scarce in the years following the 1870s, although the examples of ojime and kanzashi that appear to be from these decades are well made (some exceptionally so) with precise wirework and neatly applied enamels in new colors that could be smoothly polished. The Meiji government banned Buddhism and promoted Shinto as the state religion, so demand for sumptuous Buddhist prayer beads presumably lessened. Likely as a result of the change in Japanese dress that the government encouraged during the Meiji push for modernization, inro sets and kanzashi were not appropriate accessories for Western suits and short haircuts, and seem to have been relegated to a use similar to the Western tuxedo – for fancy dress only. Perhaps because of a connection with elegant dress, fine cloisonné beads for ojime and kanzashi, while uncommon, continued to be made from the 1880s through the 1920s. They display technical and stylistic innovations and virtuosity similar to those seen in contemporary larger works, such as the use of tapered and sculpted wires of different sizes, gold and silver wires, silver substrate, hundreds of enamel hues and tones, and glossy transparent enamels. Fredric Schneider (2010:189) relates:

> An early twentieth century Ando Japanese-language flier, circa 1904, advertised rings, bracelets, hairpins, hair ornaments, combs, hatpins, cuff links, buttons, buckles, pins, and beads, made to the customer's design, so there must have been demand in the domestic market and/or from retailers for resale to foreigners, although few such pieces marked Ando survive.

What did these Ando beads look like? Nobody knows.

A mysterious string of 29 beads strung on red inro cord (Figure 8) appears to feature post-1870 enamel. Colors include pink, red, light yellow, green, turquoise, blue, white, black (deep cobalt blue when edges examined with penlight and loupe), and chocolate brown. The brown enamel distinguishes these beads from Chinese enamels, where opaque brown is not used in ca. 1900 works (*see also* Figures 2,d, 3,d). The better control of pitting and polish also distinguish these beads from earlier doro shippo efforts. The overall design features two repeating patterns: 1) a double circle motif alternating with a five-petal blossom, and 2) a "four-directions" motif alternating with a blossom of six petals of two alternating colors. The designs of the collar motifs around the holes also differ between the two patterns. The tiny elements of which the motifs are composed are very precisely placed, in a manner similar to the brocade-patterned borders that can be seen on larger works dated to the 1870s-1880s. Despite the repetitive designs, the motifs are often colored differently, apparently according to the whim of the enamelist. At least one flower features bicolored petals (red and white) in the style of the older Victoria & Albert doro shippo beads. While the beads appear to be of a more casual quality than the intricate Victoria & Albert beads, care was nonetheless taken in their manufacture. The cord appears to have been reknotted in a few places, and the ends are cut but not finished. Such a matched set of beads suggests that they were not intended to be ojime, which generally appear to be individually crafted, not produced in quantity. But what was their purpose? Prayer beads? A cincture? Decoration? Tourist item? Another mystery, unsolved.

Figure 8. Inro cord with 29 15-mm beads. While the typically Japanese design motifs repeat, the beads show individual color variations (photo by author)

As mentioned above, a tripartite arrangement of tiny motifs or overall design is characteristic of many Japanese cloisonné beads. Likewise, a pentagonal version of flower petals or star points appears that is less often encountered in 19th-century Chinese work. Perhaps reflecting the importance of cherry blossoms in Japanese iconography, these tiny petals are often indented on their outer edges in the same manner as cherry-blossom petals. A distinctly Japanese design is a row of very tiny dots frequently appearing as reinforcement for the edges of the enamel work (Coben and Ferster 1982:235). Russian twisted-wire cloisonné work can feature similar edge dots, but they are much larger and not so closely spaced. A similar edge reinforcing motif is a row of tight spirals, which seems particularly favored and adopted by the Inaba atelier (Figures 2,c, 3,c, 9). Kanzashi can be found worked in the colorful Kyoto-style of cloisonné popular from the 1890s to the 1920s, with a distinctive diaper of spirals against a black background. In more carefully worked pieces these spirals are tightly coiled and precisely placed, whereas more common pieces show loose spirals randomly arranged.

Wirework in later Japanese cloisonné beads reflects an expanded repertoire of wire design techniques and materials. Silver and gold are used in addition to copper, different widths and a flattened twist appear, wires are shaped into sculptural curves and tapered ends, all of which are noticeably different from the uniform flattened or fine twisted wires that continued in standard use in Chinese cloisonné (Schneider 2010:126-132). Schneider (2010:127) notes:

> The twisted-wire, chain-link-like effect was first employed by the Hiratas, though only occasionally. The technique was used somewhat more often on ceramic substrate cloisonné pieces probably made no later than the 1870s, indicating an early-Meiji-era date for the initial use of twisted wires on post-

Figure 9. Small Inaba dish with matching dot and spiral motifs on the ojime (photo by author).

1830 wares. These efforts pre-date the less frequent use of this technique by Kaji-tradition workers on metal-substrate.

Examples of flat-twisted-wire use in Japanese cloisonné can be found in pieces such as small vases with an overall decorative style and enamels indicating late Meiji or Taisho (1912-1926) production. A unique bead in the collection of Frederick Chavez features flat twisted wire as an important element in the overall design (Figure 10).

Figure 10. Simple yet sophisticated design featuring twisted wire and matte enamels in bright colors (Frederick Bourguet-Chavez collection).

A masterpiece of unsurpassed Late Meiji-early Taisho cloisonné artistry is a rare ojime (Figure 11) in the collection of Fredric Schneider, where within the confines of the surface of a small bead are depicted magical items from the treasure ship of Japanese folklore: Hotei's bag of fortune, Daikokuten's mallet, the lucky rain cape and hat of invisibility, and treasures such as a branch of coral, rhinoceros horn, pearls, and gems. The combination of the tiny sculpted and twisted precious-metal wires with transparent and opaque enamels against a black background conveys the impression of tiny three-dimensional objects floating in space (Schneider 2010: C-2).

Figure 11. Ojime depicting four treasures from Japanese folklore (courtesy/copyright, Fredric T. Schneider).

Unlike the stereotypical Ming leaf scrolls and lotus and peony patterns seen in doro shippo beads, later Japanese cloisonné beads display the detailed naturalism of their contemporary larger Japanese vases featuring cascades of wisteria and lush floral gardens (Figures 12-14). The silver oval bead in Figure 12 depicts, with hair-fine wires, a wisteria vine on one side and a grape vine on the other. Could this have been designed as a stylish watch fob for the waistcoat of a Western-style 3-piece suit, or perhaps for an elegant kanzashi?

A superb example of a cloisonné inro, netsuke, and ojime ensemble (the inro attributed to Kumeno Teitaro, ca.1890-1900) can be seen in an exhibit catalog published by the Los Angeles County Museum of Art (Singer 2017:58).

Figure 12. Bead with fine sculptural silver wires delineating naturalistic vines (courtesy/copyright, Fredric T. Schneider).

The ojime features a tiny spray of purple wisteria and green leaves against a bright engraved silver background covered with pale-lime transparent enamel. Figure 13 illustrates a somewhat similar bead worked in silver with opaque enamel leaves and wisteria blossoms floating above a transparent aqua ground.

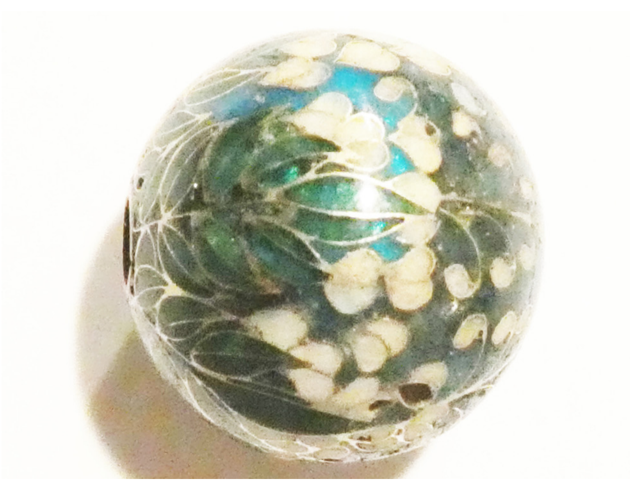

Figure 13. Wisteria sprays worked in opaque and transparent enamels in silver wire upon a silver background (courtesy/copyright, Fredric T. Schneider).

The two kanzashi in Figure 14, with hairstick styles typical of the 1920s, display a painterly technique mixing opaque and transparent enamel for a more lush representation of the flower petals. Curiously, half a century later, this mixed application of opaque and transparent enamels was a prominent feature of the cloisonné work of Ming-Chiao Kuo of Taiwan, a painter and art professor (Figure 15).

Figure 14. Kanzashi styles from around the 1920s (courtesy/copyright, Fredric T. Schneider).

Figure 15. The large (28mm) bead was originally mounted as a kanzashi; from the Kuo Cloisonne atelier, Taiwan, ca. 1975-1985. The smaller (14mm) beads are similar in size to Japanese ojime, but lack the larger holes necessary to accommodate inro cord (photo by author).

Another uniquely Japanese cloisonné technique is lacquer cloisonné, produced around 1875-1890 for export items such as vases and small boxes. The technique used urushi lacquer instead of enamel to fill the cloisons and thus could be hardened in a warm, moist curing cabinet instead of having to be fired in a kiln (Schneider 2010:230-231). A few rare ojime can be found featuring this lacquer cloisonné (Figures 16-17).

Figure 16. Lacquer ojime with tiny, neatly applied motifs reminiscent of the doro shippo style of decoration (courtesy/copyright, Fredric T. Schneider).

Figure 17. Lacquer cloisonné (17 mm diameter); composition and motifs are in the style of larger lacquer cloisonné works produced in the 1890s (photo by author).

After the 1920s, cloisonné bead production in Japan seems to have ceased. Ironically, China then picked up the manufacture of these beads. But that is another story.

CONCLUSION

Despite the comparative rarity of antique Japanese cloisonné beads, their designs and enamels demonstrate the mid-19th-century shift in Japan to modernize technology and incorporate innovative materials and methods. These uniquely original beads represent a distinctively Japanese contribution to the world of art.

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REFERENCES CITED

Blair, Dorothy

1973 *A History of Glass in Japan*. Kodansha International, Tokyo, and the Corning Museum of Glass, Corning.

Bowes, James L.

1886 *Japanese Enamels, with Illustrations from the Examples in the Bowes Collection*. Bernard Quaritch, London. https://archive.org/details/japaneseenamelsw00bowe, accessed 26 October 2017.

Brinkley, Captain F.

1902 *Japan: Its History, Arts and Literature. Vol. VII: Pictorial and Applied Art*. J.B. Millet, Boston and Tokyo.

Coben, Lawrence A. and Dorothy C. Ferster

1982 *Japanese Cloisonné: History, Technique and Appreciation*. John Weatherhill, New York and Tokyo.

Helmsley, Melissa

2014 Ojime collection necklace. Bead Collector Network, 23 May 2014; http://beadcollector.net/cgi-bin/anyboard.cgi?fvp=/openforum/&cmd=get&cG=9393236353&zu=3939323635&v=2&gV=0&p=

Quette, Beatrice (ed.)

2011 *Cloisonné: Chinese Enamels from the Yuan, Ming, and Qing Dynasties*. Yale University Press, New Haven.

Schneider, Fredric T.

2010 *The Art of Japanese Cloisonné Enamel: History, Techniques and Artists, 1600 to the Present*. McFarland, Jefferson, NC.

Singer, Robert T.

2017 *Polished to Perfection: Japanese Cloisonné from the Collection of Donald K. Gerber and Sueann E. Sherry*. Los Angeles County Museum of Art, Los Angeles.

Tomalin, Stefany

2013 Antique Chinese Cloisonne Beads. Bead Collector Network, 23 May 2013; http://beadcollector.net/cgi-bin/anyboard.cgi?fvp=/openforum/&cmd=iYz&aK 93634&iZz=93634&gV=0&kQz=&aO=1&iWz=0

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MAINLAND CHINESE EXPORT BEADWORK

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For centuries China has exported its products around the world. Chinese export porcelain, silverware, lacquerware, glassware, furnishings, textiles, and paintings have been documented in countless publications. Other categories are less well documented. Thanks to Peter Francis and other researchers, we know that China has been exporting glass beads for centuries as well. Little is known about Chinese export beadwork, a category that did not formally exist until 2007, when Hwei-Fe'n Cheah hypothesized that, in the late 19th or early 20th century, China exported beadwork to Southeast Asia's Peranakan Chinese market. Here I expand the scope of this emerging field of research by first exploring possible historical precedents dating to the Ming (1368-1644) and early Qing (1644-1911) dynasties and then discussing seven examples of Chinese export beadwork found in Europe and North America. Most of the pieces feature glass beads. Where possible, the results of chemical compositional analysis are provided. Five of the pieces are marked "China" or "Made in China" which establish a definitive origin.

DEFINING CHINESE EXPORT BEADWORK

"Chinese export beadwork" may be defined as a class of beaded objects made in China and shipped to other countries. By "beaded objects," we mean objects composed of or embellished with beads that are strung, embroidered, netted, plaited, twined, or woven, typically with thread, string, or wire. In most cases, we assume, such objects were produced in quantity and sold for profit through merchants, traders, workshop operators, or others motivated by a desire to appeal to foreign markets. According to this definition, beaded objects carried in small quantities from China to other countries by individuals not affiliated with manufacture or trade would not qualify as "export beadwork." This definition is subject to refinement as research proceeds.

POSSIBLE HISTORICAL PRECEDENTS

We begin with three pieces of beadwork that bespeak China's long history of contact with other countries. The beads are made of glass whose chemical composition has apparently not been studied. Although the pieces cannot be regarded as examples of Chinese export beadwork per se unless more information comes to light, they are worth describing here because they illustrate the aesthetic and technical sophistication of China's beadwork in centuries past while establishing relatively early precedents for its appearance in foreign countries. It is not known whether the three pieces are one-of-a-kind curiosities or tokens of widely circulated types, culled from China's burgeoning Ming- and Qing-dynasty markets for luxury goods catering to newly affluent merchant families aspiring to imitate the object acquisition and display practices of high-ranking elites (Brook 1998:76-76, 78) using "culturally prestigious goods to make social statements about themselves" (Clunas 1991:104). "The Pearl Sewn Shirt," an anonymous fictional story composed during the Ming dynasty, explicitly connects at least one merchant family with a memorable piece of luxury beadwork (Birch 1958:39-96).[1]

Early Examples in Japan

Two early Chinese beadwork pieces were discovered in Zen Buddhist temples in Japan. Both are composed largely or wholly of what scholars believe are Chinese glass beads and attributed to the Ming dynasty, which was nearly coeval with Japan's Muromachi (ca. 1336-1573) and Momoyama (1573-1615) periods. How the pieces came to Japan is not known. The intricacies of Sino-Japanese maritime trade in the 14th-17th centuries lie beyond the reach of this paper, but several developments should be noted. In 1401, Japan resumed its tribute trade with China, sending Japanese products on Japanese ships to China, later to return carrying Chinese goods. Between 1401 and 1547, "as many as 20 trade missions traveled from Japan to China," each being "headed by a Zen Buddhist monk from one of the 'five great Zen Buddhist temples of Kyoto,'" among them Tenryū-ji, which will be mentioned again shortly (Wikipedia 2017b). It stands to reason that the monks' positions of authority might have conferred access to Chinese luxury goods or contact with Chinese patrons of Buddhism, already accustomed to donating gifts or funds to Buddhist temples within China. Alternatively, pieces of Chinese beadwork could have been transported to Japan on Chinese imperial ships or on Chinese merchant vessels flouting the ban on maritime trade first imposed in 1371 by Zhu Yuanzhang, China's Hongwu emperor and founder of the Ming dynasty. The ban was not lifted until 1567.

Calligraphic Panel

The first piece, a rectangular panel of netted or plaited glass beads,[2] was found in a box at the Hōryūji temple in Nara, Japan.[3] It is now housed at the Tokyo National Museum where it is considered Important Cultural Property (Blair 1973:398) and dated to the 14-17th centuries (Tokyo National Museum 2017: pers. comm.). The panel measures ca. 61 cm long by 9.7 cm wide (Figure 1). The beads are small, about 2 mm in diameter, with visible bubbles, "corrugated bodies," and "long, irregular projections where the glass source was drawn away." These are common visual characteristics of Chinese wound glass beads, also known as "coil beads" (Francis 2002: Fig. 8.1). The panel's color scheme expresses Ming dynasty tastes, favoring rose reds and greens (Tokyo National Museum 2017: pers. comm.). The presence of an inscription is also consistent with Ming era material and visual culture. As historian Craig Clunas (2007:84-111) notes, "Ming space contained writing to an unprecedented degree," visible on cloth banners, paper scrolls, banknotes, metal ingots, silk clothing, furnishings, and other surfaces. Illiterate or semi-literate viewers might "believe that characters had a quasi-sacred value."

The seven Chinese (or Japanese *kanji*) characters that flow vertically down the panel are written in running script, a style often used to convey personal or emotional subject matter. Together they form a sentence which may represent a line from a poem or poetic couplet: *kan chu dan qing chang bing bing*, which may also be transliterated as *kan chu dan qing chang yong yong*. At least three translations are possible: 1) To look upon a work of art brings endless longing, 2) Let us look upon this painting/work of art, eternally luminous, and 3) To look upon this painting/work of art brings endless happiness.

Whatever its intended meaning, the line evokes an aesthetic experience; e.g., looking at a work of art – or something that can be likened to a work of art. The Chinese literary or historical connections of the line, if any, are difficult to retrieve. Several of the scholars I consulted during

Figure 1. Calligraphic beadwork ornament for a portable shrine, Ming dynasty, 69 x 10 cm (courtesy of The Tokyo National Museum, cat. no. N-129).

initial research for this paper wondered whether the beaded panel had originally been part of a pair, with a mate that also bore a seven-character line complementing the meaning of the first (Jonathan Chaves 2007: pers. comm.; Kenneth J. DeWoskin 2002: pers. comm.; Jeffrey A. Keller 2007: pers. comm.; Cary Y. Liu 2007: pers. comm.; Anthony C. Yu 2005: pers. comm.; Xue Lei 2007: pers. comm.). Prototypes in other media are not hard to find, especially given the beaded panel's vertical orientation. *Thriving Southern Capital*, a ca. 1600 Chinese painting on silk depicting scenes from the then-capital of Nanjing (Clunas 2007: Fig. 66) illustrates vertical calligraphic banners inscribed in a more prosaic script style befitting the banners' street-side locale.

As it happens, Japanese scholars believe that the beaded panel may have been one of four calligraphic panels attached to the corners of a ceremonial *mikoshi*, a portable shrine used to carry the bones of the Buddha or the statue of Prince Shōtoku (574-622) (National Institutes for Cultural Heritage 2017). A fervent devotee of Buddhism, Prince Shōtoku was made regent of Japan in 593; he is traditionally credited with founding Hōryūji temple in 607 (Blair 1973:63-64). Assuming this interpretation is correct, the panels may have suffered considerable wear and tear over time, sufficient to warrant disposal in three cases.

Figure 2. Detail of the shrine's beadwork ornament showing wound glass beads ca. 2 mm in diameter, united in a net or plait that inclines beads at right angles.

This diminutive panel represents a significant achievement in the history of beadwork as it employs a rectilinear beading technique – a right-angle net or plait with four beads per cell – to render a series of highly curvilinear calligraphic characters.[4] No doubt the small size of the beads helped mediate the incongruity between technique and motif, but occasional anomalies – five or six beads per cell, instead of four – demonstrate that the beadworker had to make adjustments to delineate the characters as accurately as possible (Figure 2). For the most part, the execution is masterful, the characters vivid, the strokes correct. As the earliest surviving example of Chinese characters executed in beadwork,[5] the panel is splendid. The limitations of such an undertaking, however, are apparent in the inscription's final two *bing bing* (or *yong yong*) characters. At least three interpretations are possible, corresponding to the three translations provided above.[6] Had the beading technique and script style been better aligned, the ambiguity might have been reduced or eliminated. Technique and inscription are far better suited in several smaller Qing-dynasty examples (*see* National Palace Museum 1986: Figures 154-156, 315, 324; Palace Museum 1992: Figure 233).

The two Chinese art forms represented in the calligraphic panel are similarly incongruous, insofar as beadwork – a minor craft form occupying a low position in the Chinese hierarchy of arts – is made to express calligraphy, traditionally considered the highest art form in China, a veritable "embodiment of civilization's values" (Clunas 2007:93). The temporalities of the two practices are also incongruous. While seconds were spent to compose in ink the inscription that likely served as a template for the beadwork panel, hours or days were devoted to transposing the inscription into beadwork; in the process, "an elite untrammeled spontaneity" is "constrained in a technology of painstaking care and artisanal know-how" (Clunas 2007:109). Indeed, while the ability to compose characters in running script entails a level of literacy requiring many years and much education, beadwork – in China as elsewhere – requires neither much training nor even basic literacy, only a detail-oriented mind, fine motor coordination, and in this case, a high degree of embodied skill, the result of years of experience. Further, a calligrapher who writes in running script traditionally composes from the soul; it is a deeply subjective practice yielding a tangible "heart print" (Fu et al. 1977:127). The artisan(s) who beaded the inscription may have worked from a more practical impulse, perhaps one as simple as earning a living or pleasing a patron. Two final points of contrast between beading technique and subject matter emerge when we compare the elegant curves of the running script characters with the larger, clumsier curves of the foliate wirework motifs edging the bottom of the panel, and the simple bilateral symmetry of the wirework motifs with the characters' subtler asymmetries.

Multicomponent Lantern

A second possible historical precedent for Chinese export beadwork is an enormous lantern (Figure 3) measuring 128 x 105 cm and comprising an estimated 150,000 multicolor wound glass beads embellishing nested iron or bronze wire frameworks (Tokyo National Museum 2004:284). Blackened by centuries of smoke from oil lamps or candles, the lantern was discovered hanging in the great hall of Nanzenji, a Zen Buddhist temple in Kyoto. According to old texts found at Nanzenji, the lantern, known as *Ruritou* in Japanese (*ruri*: glass, lapis lazuli; *tou*: light, lantern) (Patrick Kirby 2017: pers. comm.), originated in Ming-dynasty China during the 14th-17th centuries and originally hung in the mausoleum of the Japanese Emperor Kameyama (1249-1305) who helped found Nanzenji in 1291 following his entry into the Zen Buddhist priesthood in 1289. In 1704, the lantern was donated to Nanzenji by Tenryūji, another Zen temple previously mentioned, which opened in Kyoto in 1345 (Tokyo National Museum 2004:284).

Figure 3. *Ruritou*, a multicomponent lantern, Ming Dynasty, 128 x 105 cm; collection of Nanzenji Temple, Kyoto (courtesy of Kyoto National Museum and Nanzenji Temple).

In 2004, an illustrated discussion commemorating the lantern's restoration at the Bijutsu-in Institute in Kyoto was posted on a Japanese beadworkers' website (www.suzuranart.com). Three technicians at the Bijutsu-in devoted 700 hours to the project over the course of one year (Patrick Kirby 2017: pers. comm., per Bijutsu-in staff member). All of the beadwork components were cut apart and reworked. Batch by batch, the beads were cleaned ultrasonically which revealed their true color (pers. obs.). Being monochrome, wound, and fairly small, averaging from 2 x 3 mm to 3 x 4 mm (Patrick Kirby 2017: pers. comm., per Bijutsu-in staff member), the beads may well be the successors of "the earliest identifiable Chinese glass beads found outside China," which "flooded the [Asian maritime] market just as Indo-Pacific beads were disappearing in the twelfth century" (Francis 2002:76-77). As the restoration process continued, 7,000-8,000 beads were made to replace those that had cracked or crumbled, requiring months of difficult trial and error (Kaori Stearney 2017: pers. comm.). When completed, the lantern was returned to its customary place at Nanzenji.

The lantern's outermost structure is octagonal in shape, with an equatorial band divided into eight rectangular niches surmounted by a dome divided into eight triangular niches. All of the niches are filled with panels of beads plaited on wire, reproducing the original single-thread plaiting techniques (Patrick Kirby 2017: pers. comm., per Bijutsu-in staff member).[7] While the rectangular niches are worked in a hexagonal plait using beads that appear to be oblate in shape and relatively smooth (Figure 4), the triangular niches are worked in a technique that is difficult to discern, using beads that appear to be somewhat larger and rougher, possibly double-coil beads or two single beads stitched as one (pers. obs.). It might make sense to use larger, rougher beads in the triangular niches at the top of the lantern because the latter are largely hidden from view. Portions of the wire frame between the niches are wrapped with tiny glass beads

Figure 4. Detail of *ruritou* showing reconstructed panel of hexagonal bead plaiting in one rectangular niche (courtesy of Kyoto National Museum and Nanzenji Temple).

strung on wire; some of them may be as small as 1 mm in diameter (Patrick Kirby 2017: pers. comm., per Bijutsu-in staff member).

Small bead-and-wire pendants, themselves bedecked with pendants and tassels, are suspended from eight gilded, hooked wire arms that ornament the frame between the rectangular niches. The arms appear to be strung with oblate wood beads, re-gilded during the restoration process (Kaori Stearney 2017: pers. comm.). A gilded wood finial in the shape of a gourd, a symbol of fecundity in China, tops the dome of the octagonal outer framework, while many long, single-strand bead tassels ending in gilt pendants hang from its lower edge. The lantern's hemispherical middle structure is also subdivided into niches of various shapes, beaded in large, open, free-form star or flower motifs (Figure 5) strikingly reminiscent of beaded elements on headdresses of noblewomen in certain Ming-dynasty paintings (Gao 2001: Fig. 478; cf. Hong Kong Heritage Museum 2002: Fig. 80). Long beaded tassels accent the lower edge of the lantern's middle structure as well. The small innermost structure, while difficult to see, appears to consist of a rectangular wirework cartouche, sparingly beaded in geometric motifs, which either supports or formerly supported a small plate for holding a candle. Rectangular beaded wirework cartouches may have ornamented women's headdresses in the Tang dynasty (618-907) (*see* Gao 2001: Fig. 478; Hong Kong Heritage Museum 2002: Fig. 34). The form seems to have been quite tenacious; it appears again, albeit in a larger scale, in an early-20th-century Chinese bead seller's shop sign (Francis 1986: Fig. 3).

Figure 5. Detail of *ruritou* showing beaded wirework motifs (courtesy of Kyoto National Museum and Nanzenji Temple).

Viewed as a whole, the lantern seems to integrate opposing forces with ease, balancing monumentality and delicacy; opacity and transparency; negative and positive space; stasis and movement; plane and line; complexity and simplicity; and so on. The lantern also orchestrates diversity in its application of beadwork technique, blending netting (or plaiting) with wireworking, wrapping, and tasselling in ways both obvious and ingenious. That a single object could so gracefully unite such diverse modalities advances the notion that mainland Chinese beadwork was highly developed by the Ming dynasty, if not before. The beaded lantern genre was also highly developed. Zhou Mi (1232-1298), a 13th-century Chinese retired government official turned writer, noted that "bead lanterns" on display during the yearly Lantern Festival in his home city of Lin'an, then the capital of China's Southern Song dynasty (1127-1279), were fitted with "nets woven with multi-colored beads and... decorated with fringe pendants. Some of the lanterns depicted stories involving dragon boats, phoenix carriages or pavilions" (Zhou 1956:372).[8] Lin'an is the modern city of Hangzhou in Zhejiang province, not far from Suzhou, a city in Jiangsu province which apparently produced many lanterns in Zhou's era, bedecked with glass beads and pendants (Francis 1986:14).

An Early Example in Europe

A Swedish royal inventory of 1719 mentions a miniature bamboo pagoda measuring 86 x 30 cm that once belonged to Hedvig Eleanora (1636-1715), Queen of Sweden from 1654 to 1660 (later regent) and the founder of Drottningholm Palace, a residence for the Swedish royal family near Stockholm. Octagonal in shape, with nine stories topped by a spire, the pagoda is covered with white, blue, and green glass beads that were either stitched or glued to the pagoda's tiered eaves, doorways, roof, and base (Figure 6). The railing around the second story is beaded with wirework star or floral motifs not unlike those on the beaded lantern discussed above. Costumed human figures stand in most of the pagoda's niches, gesturing or gazing outwards (Setterwall et al. 1974:187). Believed to have been made in China during the reign of Emperor Kangxi

Figure 6. Miniature beaded pagoda, Qing Dynasty (ca. 1650-1700), 86 x 30 cm (courtesy of Chinese Pavilion, Drottningholm Palace, cat. no. FE 199/HK 350; photo by Erik Liljeroth).

from 1661 to 1722 (Setterwall et al. 1974:309), the pagoda constitutes a third possible historical precedent for Chinese export beadwork.

Long before the Swedish East India Company was formed in 1731 to send ships directly from Gothenburg, Sweden, to Canton (modern-day Guangzhou) in China, other European nations had been active in the China trade by the 16th century, notably Portugal, Spain, and Italy, followed by Britain and the Netherlands in the early 17th century. We may speculate that the pagoda was given to Hedvig Eleanora as a gift from another nation, from the Chinese imperial court, or from another source. In any event, the pagoda can be seen as a harbinger of the fascination with things Chinese that swept Europe in the 17th and 18th centuries, culminating in the faux-Chinese decorative style known as "Chinoiserie." In some cases, European aristocrats commissioned European architects to emulate Chinese architectural structures. Fittingly, the beaded pagoda is now displayed in one such structure, the Chinese Pavilion at Drottningholm Palace. Built from 1753 to 1769 at the behest of Adolf Fredrik, King of Sweden from 1751 to 1771, the Chinese Pavilion was furnished with Chinese porcelains, lacquerwares, silks, and other luxury goods transported on Swedish ships (Wikipedia 2017a).

The pagoda is displayed in a glass vitrine. While the beads are difficult to see, they appear to be made of wound glass with irregular contours. The white beads appears to have a pearl-like coating, perhaps in imitation of real pearls (pers. obs.).

CHINESE EXPORT BEADWORK: ca. 1875-ca. 1949

While beadwork produced in China for the indigenous market still turns up in antique or curio shops in cities such as Beijing, beadwork produced in China for export generally does not (pers. obs.). In the following paragraphs we examine seven pieces offered for sale in European or American antique shops or on global e-commerce platforms such as eBay. We will address pieces made for display first, followed by pieces of personal adornment. Most of the pieces feature glass beads; five carry origin marks. Where possible, chemical composition analyses of the beads are included, courtesy of Laure Dussubieux of The Field Museum's Elemental Analysis Facility, Chicago.

Export Beadwork for Interior Display

Two pieces fall into this category: a netted or plaited beaded panel with a paper "CHINA" label and a bead-embroidered panel stamped "Made in China."

Netted or Plaited Panel with "CHINA" Label

A complex beading technique was used to create the first piece, a rectangular panel of glass bead netting or plaiting measuring 56 x 54.3 cm (Figure 7). It was acquired from Sarajo Gallery in New York City. Apparently unknown outside China and published here for the first time, the technique creates a complex grid of squares and diamonds by connecting units of four and five beads with simple pairs of beads (Figure 8). The same technique was used to create the straps of long beaded ornaments made for use within late-Qing-dynasty China. Examples suspended from lanterns at a monastery in Zhejiang province may be seen in a ca. 1906-1909 photo in Boerschmann (1982:144). A related technique appears in the trefoil-shaped niches of a valance attributed to early-20th-century Perak State, Malaysia (Cheah 2014: front cover), home to many peoples including immigrants newly arrived from China, descendants of Chinese immigrants who had arrived long ago, and native Malay.

Figure 7. Panel of wound glass beads united in an unusual netting or plaiting technique, ca. 1890-1910, 56 x 54.3 cm; private collection (this and all subsequent photos by Jezrel White).

Figure 8. Detail of the panel in Figure 7 showing the beading technique.

The panel is suspended from a length of bamboo. Seventeen gourd-shaped, gilt-wood finials sporting red silk tassels edge the bottom of the panel; some of these elements may be missing. A small white paper label measuring 4.5 x 12.5 mm still clings to one of the larger wood finials. It reads CHINA stamped in faint red ink (Figure 9). Origin marks of this nature stemmed from regulations imposed in the late 19th century by Britain and the United States on imports of foreign goods (Cheah 2007:80). In Britain, the Merchandise Marks Act of 1887 "required certain goods made outside of Britain to bear an origin label." In the United States, the McKinley Tariff Act of 1890 "required origin labels on all imported goods to be placed in conspicuous positions in legible English words" (Cheah 2007:79-80).[9] Thus, a credible date range for the panel might be ca. 1890-1920.

Figure 9. Paper label bearing a CHINA stamp on one of the tassels of the beaded panel in Figure 7.

It should be noted that Chinese manufacturers also used origin marks, written not in English but in Chinese characters. Eng-Lee Seok Chee (1989:78) published such a chop stamped on the cotton backing of a pair of beaded pillow end panels attributed to Palembang, Sumatra. The chop might identify a manufacturer or dealer in China or in Southeast Asia. Soon, we will encounter two bilingual Chinese chops that juxtapose English letters and Chinese characters.

In shades of translucent green and red, plus opaque yellow and white, the panel's glass beads exhibit the bubbles, coil marks, and other irregularities typical of the winding process that was common in China for centuries (Francis

2002:76-78). The beads range from 3.5 mm in diameter by 3 mm in length to 5 mm in diameter by 4.5 mm in length. A yellow bead tested by LA-ICP-MS (laser ablation-inductively coupled plasma-mass spectrometry) proved to be a lead-potash glass (PbO=55.99%; K_2O=7.25%) (Laure Dussubieux 2017: pers. comm.), a composition consistent with Chinese origin at certain places and points in time (Francis 2002:72-75; cf. Burgess and Dussubieux 2007:65-70). The coloring agent may have been lead stannate (Laure Dussubieux 2017: pers. comm.).

Beaded Panel Marked "Made in China"

Our second example, also likely intended for interior use, consists of a rectangular panel of bead-and-thread embroidery on silk measuring 59.4 x 24.8 cm. Two stock motifs of Chinese iconography enliven the panel's stark black background, pairing embroidered branches of a flowering prunus tree or shrub (*Prunus mume*) with an embroidered white crane captured in mid-flight (Figure 10). Symbolic associations add meanings beyond the merely referential, linking the flowering prunus with notions of perseverance, purity, longevity, or spring renewal, and the flying crane with elevated social rank or longevity (Bartholomew 2006:107, 212), among other possible connotations. Averaging 2 mm in diameter, the beads of coral and seed pearls are sparingly stitched atop the embroidered motifs, imparting luxury, tactility, delicacy, and depth (Figure 11). Such a panel may have satisfied the tastes of many Western housewives in the opening decades of the 20th century, eager to bring a bit of the fashionable Orient into their homes. The presence of indigenous Chinese bead materials such as coral and pearl may have heightened the panel's perceived authenticity.

Figure 10. Embroidery panel with crane above flowering prunus branches, ca. 1920s, 59.4 x 24.8 cm; private collection.

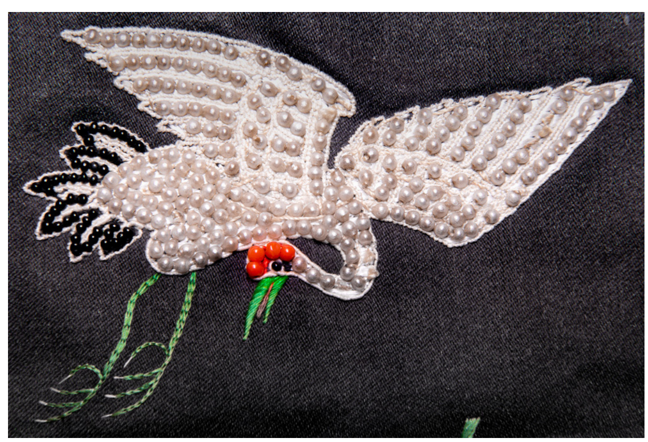

Figure 11. Detail of the panel in Figure 10, showing pearl and coral beads stitched atop motifs worked in silk-thread embroidery.

"Made in China" is stamped in black on the panel's red cotton or linen backing (Figure 12). Enclosed in an oval frame measuring 31 x 18.5 mm, the three words are flanked on the left by the Chinese character for "mouth" (*kou*) and on the right by what may be the Chinese character for "earth, land" (*tu*) or the character for "scholar" or "respected person" (*shi*). The latter interpretation makes more sense in that combining the morphemes *shi* and *kou* produces the character *ji*, meaning "lucky" (Hwei-Fe'n Cheah 2017: pers. comm.), a very good name for a manufacturer. "Made in China" origin marks may have appeared first in the 1920s, thereby postdating "China" origin marks, or "been introduced unevenly" with the two versions in use simultaneously (Cheah 2007:80). Cheah (2007:79; cf. Cheah 2010:167-169) observed both versions on 14 of the Peranakan Chinese beaded belts, slippers, pillow ends, and purses she studied at The Field Museum in Chicago which accessioned them in 1926 and 1936 (Cheah 2007:75, 79;

Figure 12. Detail of reverse of panel, showing a "MADE IN CHINA" origin mark flanked by two Chinese characters.

cf. Cheah 2010:167-169). A plausible date for the panel in Figure 12 would be the 1920s-1930s, although it could be earlier or later.

Export Beadwork as Personal Adornment

We now turn to our second category of Chinese export beadwork: items of personal adornment. Two subcatagories are discussed here: handbags and jewelry.

Beaded Handbags

Beaded handbags are represented by three examples. They have various characteristics in common, such as identical beading on both sides, perimeters edged with sawtooth motifs, paired ring handles, and silk linings. Many are hexagonal, with six straight sides; others are shaped like bottle gourds. The examples shown here date to the late 19th-early 20th centuries or ca. 1890-ca. 1930s, although some may be earlier or later. For the most part, the bags are easily distinguished from those made in Europe and the Americas during this period (*see* Haertig 1990; Schürenberg 1998).

Bag with Dragon or Centipede Motif

The bag in Figure 13 is one of many measuring approximately 26.2 x 17.1 mm that have been listed on eBay in the last decade. On this bag, a creature resembling a dragon winds its way through cloud-like motifs that periodically obscure its torso from view. The Chinese character *ri* (sun, day, or date) floats between the creature's horns or antennae. Along with the *yue* (moon) character, the *ri* character also appears on pieces of ca. 1920s-1930s mainland-Chinese beadwork made for domestic use (pers. obs.) and on other pieces made for export, such as a ca. 1920s-1930s bead-embroidered belt evincing a Peranakan Chinese aesthetic with a leather backing stamped "Made in China" (Cheah 2017:231). In China, the sun evokes *yang* or masculine energy, as does the color red, the bag's assertive background hue. Dragons also embody the *yang* principle while signifying power, high rank, and fertility (Bartholomew 2006:43). A second interpretation is also viable, according to which the motif represents not a dragon but a centipede (or a snake), two of the Five Noxious Creatures that emerge from hibernation on the fifth day of the fifth lunar month, secreting poisons believed to be strong enough to "counteract pernicious influences" (Bartholomew 2006:281). Depictions of the Five Noxious Creatures on clothing or accessories served talismanic ends, "combating poison with poison" (Bartholomew 2006:281). According to the second interpretation, the *ri* character and red background color call to mind the heat of summer or the toxins themselves.

Figure 13. Hexagonal handbag featuring dragon or centipede motif, ca. 1920s, 26.2 x 17.2 mm; private collection.

A tiny "Made in China" stamp measuring approximately 5 x 11 mm can still be discerned on the pink silk lining of the bag near one of the ring handles. The ink that remains is so faded that the words may one day disappear. All of the glass beads are of drawn manufacture averaging 1.0-1.75 mm in diameter; they appear to be European (Figure 14). They lend themselves well to being strung on strands that are couched at frequent intervals to a fabric ground, as on this bag. One red bead analyzed using LA-ICP-MA consists of a soda glass (Na_2O=16.49%) "with significantly high concentrations of potash (K_2O=7.2%)" plus 3.4% lime, 1% lead, 2.8% zinc, and 650 ppm of cadmium. Interestingly, zinc and cadmium are part of a pigment that began to be used around the 1920s to color red glass (Laure Dussubieux 2017: pers. comm.). It is not possible to conclude that this bead originated in Europe on the basis of chemical composition analysis alone, because not enough comparative data exist (Laure Dussubieux 2017: pers. comm.); the bead does not correspond to information provided in Burgess and Dussubieux (2007). Thus, until further research is undertaken, we may tentatively date the dragon/centipede bag to the 1910s-1930s.

Figure 14. Detail of the hexagonal handbag showing (European?) drawn glass beads measuring 1.0-1.75 mm in diameter.

If these are European drawn glass seed beads, how did they come to be used in China? Three 20th-century texts are worth mentioning. The first would carry more weight if credible sources had been cited. Nevertheless, its references to "foreign merchants" with "imported foreign beads and equipment" count as anecdotal evidence, as does its provision of an inception date of 1875.

> As early as 1875, opera costume stores and workshops in the *Zhuangyuan fang* district of Guangzhou made and sold beaded headbands, beaded slippers, beaded flowers, beaded hair ornaments and beaded aprons.... With the introduction of advanced foreign technology, arts and crafts technicians in Guangzhou started making purses and tobacco bags with foreign beads. By 1910, some foreign merchants imported foreign beads and equipment in a larger scale to China to make bead handbags. Local Chinese arts and crafts technicians combined the western and Chinese techniques and made large quantities of Western-style bead hand bags to export to all parts of the world (Lin 1988:196).[10]

A second account describes beadwork being produced in quantity in south China during the late 19th and early 20th centuries without mentioning where the beads originated. The author is Lida Scott Ashmore (1852-1934), an American Baptist missionary who, in the 1880s, began introducing Western needlework techniques to Chinese Christian women in the Chaozhou region of eastern Guangdong province (Ashmore 1920:94; Cai 2012:153-155). Several decades on, as Ashmore's workshops flourished and the items produced were sold abroad to benefit the mission and the Chinese women who made them, the technical repertoire expanded; by ca. 1920, it included "embroidering, beading, making tassels, making bead bags, crocheting" (Ashmore 1920:94; Cai 2012:159). Missionaries of other religious affiliations, also eager to engage the Western export market, set up needlework workshops in the region and, like Ashmore, arranged through personal contacts or professional intermediaries to export the results to the United States and Europe (Cai 2012:159).

Equally sketchy, a third account consists of an entry entitled Bead Embroidery (*zhu xiu*) in a Chinese encyclopedia published in 1991. Without referencing sources, Hong Shouzi (1991:666-667), the author of the entry, states:

> Glass bead embroidery was first seen during the reign of Emperor Guanxu of the Qing dynasty (1875-1908). At that time, many Chinese residents in Luzon (now the Philippines) brought back to Fujian province sandals and slippers made of glass bead embroidery (popularly known as "Luzon slippers"). Later, craftsmen in the Zhanzhou area of Fujian made Luzon slippers with imported glass beads and sold them in the open port city of Xiamen. Around 1920, the "Huoyuan" Trading Firm of Xiamen imported glass beads for production of bead embroidery... some embroidery products are also made into hanging scrolls and other artistic pieces.

Although attempts to locate and correspond with Hong Shouzi failed, with further research it may be possible to substantiate such statements or learn more about the Huoyuan Trading Firm and whether, for instance, it sourced beads from any of the European glass bead suppliers identified by Waltraud Neuwirth (1994:484 ff.) as exporters of beads to China or the "Orient" ca. 1892. That companies in Xiamen, a city in Fujian province formerly known as "Amoy," used "imported glass beads" should not be surprising, since from 1842-1912, Amoy was a British-run treaty port, frequented by many foreign traders. For that matter, European drawn glass beads could have entered China through other British-run treaty ports such as Canton (Guangzhou) in Guangdong province or Ningbo in Zhejiang province, to name but a few.

Bag with Pomegranate, Chime, and Vase Motifs

A second beaded handbag with paired ring handles (Figure 15) reflects the diversity of the genre. No origin mark is present. The rounded oval shape of the bag is rare. Once again, the motif is wholly Chinese: a pair of pomegranates bursting with seeds, signifying abundance and "a wish for numerous progeny" atop a stone chime evoking the Chinese words for "celebration" and "auspicious happiness" poised on a vase tied with string, which may encode wishes for a long peaceful marriage or a life full of blessings (Bartholomew 2006:29, 57, 76, 248). In Chinese art, compositions containing multiple motifs can sometimes be read as rebuses or verbal puns conveying wishes for happiness, prosperity, longevity, or other desirable attributes; if a rebus is intended here, it may be obscure. The glass ring handles are more typical of the genre than the silk-thread-wrapped wood handles of the dragon/centipede bag. In fact, during the late 19th and early 20th centuries, China exported glass rings as a commodity unto themselves (Fenstermaker and Williams 1979: Plates XXVI-XXIX). Dual-language chops were sometimes stamped on the rings' packaging (Figure 16).

Figure 15. Oval handbag featuring pomegranate, jade chime, and vase motifs, ca. 1890-1920; private collection.

Figure 16. Pink glass ring 88 mm in diameter with packaging bearing a dual-language origin mark, late 19th-early 20th centuries; private collection.

Whereas the workmanship of the dragon/centipede bag in Figure 13 is smooth and even, reflecting the relative uniformity of the drawn glass beads, the workmanship of the pomegranate bag looks rough because the beads are irregular in shape and size, an artifact of the winding process by which they were made, probably in China (Figure 17). A turquoise-blue bead from the bag analyzed by LA-ICP-MS manifests the characteristics of lead-soda glass (PbO=33% and Na_2O=10%). It contains 0.8% copper as well as slightly higher than average zinc and lead concentrations (Laure Dussubieux 2017: pers. comm.). Unfortunately, the origin of the bead cannot be determined based on the chemical composition alone because, once again, not enough comparative data exist. The bead's visual characteristics, however, are consistent with a Chinese origin.

Bag with Auspicious Chinese Characters

The export beaded handbag genre of the late 19th and early 20th centuries also includes netted or plaited

Figure 17. Detail of the oval handbag in Figure 15, featuring wound glass beads whose irregular sizes and contours make them difficult to couch evenly.

bags, such as the example in Figure 18. It measures 38.2 x 15.5 cm. Old paper wrappings still encircle the glass ring handles, suggesting that the bag was never used. There is no origin mark. This is one of many such bags bearing large Chinese characters extending auspicious wishes. In this case, the character *ji* (lucky) is enclosed in a speckled white hexagonal frame that echoes the bag's hexagonal outlines. All of the beads are wound and irregular, averaging 2-3.5 mm in diameter and 1-2 mm in length (Figure 19). The beading technique creates the diagonal pattern common to many pieces of mainland-Chinese netted or plaited beadwork produced during the late 19th to early 20th centuries (pers. obs.; *see* Hector 2005:15, 24) depositing 12 beads per cell. Three eight-strand beaded tassels, each topped by a pink wound glass bead measuring 12 mm in diameter by 8 mm in length, join with a series of single-strand tassels to animate an otherwise static composition. Sawtooth motifs accent the upper and lower perimeters of the bag.

Figure 18. Hexagonal handbag featuring large Chinese character in a hexagonal frame, ca. 1890-1925, 38.2 x 15.5 cm; private collection.

Figure 19. Detail of hexagonal handbag showing irregular wound glass beads netted or plaited in a technique that creates an open-diamond pattern.

Mainland Chinese Export Jewelry

Another locus of beadwork lies in Chinese export jewelry. We consider two examples in which beadwork is combined with base metal.

Beaded Dress Clip with Origin Marks

The first item is a dress clip, 51 x 43 mm, made of a yellow metal such as brass and bearing four bezel-set cabochons of stone or glass on a ground of filigree rosettes around a central hexagonal panel of beadwork (Figure 20). The beads are translucent eggshell white glass but have a pale green tint due to green corrosion products on the underlying metal. With smooth edges and regular contours averaging 1.74 mm in diameter by 1.0-1.5 mm in length, the beads appear to be made of carefully wound glass; it seems fair to assume that they were made in China. If so, they demonstrate that certain classes of wound beads

Figure 20. Dress clip set with stone or glass cabochons, wire-filigree rosettes, and a panel of glass beads, ca. 1900-1925, 51 x 43 mm; private collection.

Figure 21. The back of the dress clip showing two origin marks.

were very finely finished indeed, rivaling in perfection the best European glass seed beads. A panel of glass bead embroidery in a private collection also appears to be worked in Chinese coil beads of a similarly fine size and high degree of regularity (pers. obs.). It is believed to date to the early Qing dynasty (ca. 1650-1700) (Sandra Whitman 2005: pers. comm.). Other specimens of fine Chinese glass seed beads may be sought in hair ornaments and other items made in imperial workshops (*see* National Palace Museum 1986: Figures 146, 161; Palace Museum 1992: Figures 77, 149).

The technique used to connect the beads is a net or plait that disposes beads at right angles, building four beads per cell; this bead pattern was noted earlier in the Ming-era calligraphic panel (Figure 1). Oddly, the reverse of the clip carries two different origin marks in two differing type fonts. One, on the armature's back plate reads "madeinchina" (Figure 21, top). The other, near the end of the long clip arm, which appears to be made of a different yellow-metal alloy, reads "CHINA" (Figure 21, bottom). Possibly, the dress clip was made in a workshop that employed a componential method to streamline production, whereby parts were made separately and later assembled in varying configurations. As Lothar Ledderose (2000) has shown, this method is ancient in China. In any case, the finished clip can tentatively be dated to ca. 1910-1930, with the understanding that certain parts may have been assembled before others.

Charm Necklace with Beadwork

Our final example of what could be called Chinese export beadwork is a filigree charm necklace 53 cm in length. It is made of a yellow, brass-like metal embellished with glass and coral beads (Figure 22). Of the seven metal charms, three have "CHINA" stamped on their undersides (Figure 23). The clasp is not marked. Four of the charms may symbolize abundance as baskets overflowing with produce or carts laden with goods. One depicts a bell, which may connote harmony; another a flower, connoting beauty or purity. To the Western eye, the central charm (Figure 24) may look like a heart, but it almost certainly represents the peach of immortality carried by Shoulao, the Chinese God of Longevity. The peach is one of the most popular motifs found in Chinese art (Bartholomew 2006:190, 204). Here it is worked in tiny coral seed beads averaging 2 mm in diameter by 1 mm in length, creating a peach measuring 16.5 mm wide by 20 mm high. The bead netting or plaiting technique conjoins cells of four beads inclined at right angles – a pattern identical to that on the dress clip and calligraphic panel described above.

The coral beads on the other six charms are larger, averaging 3 mm in diameter by 2 mm in length, and set on tiny wires that are connected to the metal armatures. Conceivably, the names of the charms might form a rebus with an auspicious meaning which, while lost on the necklace's Western owner, may have been plain to its Chinese makers. At the very least, the charms embody positive attributes that most humans desire.

Figure 22. Seven-charm necklace accented with beads of glass and coral, ca. 1900-1925, 53 x 30 cm; private collection.

CONCLUSION

Sufficient evidence exists to constitute Chinese export beadwork as a distinct category whose scope and diversity have yet to be determined. Incontrovertible examples dating to the late 19th and early 20th centuries are difficult to find; "their rate of survival" may stand in "inverse proportion

Figure 23. "CHINA" origin mark on one of the charms.

Figure 24. Composed of tiny coral beads, the necklace's central charm likely represents the peach of immortality.

to their ubiquity" (Clunas 2007:93). The paucity of origin marks is regrettable. Many have probably worn off or faded to invisibility; in some cases, pieces may not have been marked before export. Fortunately, the Chinese textual record affords intriguing insights; further research is needed. The English textual record also merits further examination. As Hwei-Fe'n Cheah (2007:83) concludes, traces of Chinese export beadwork are almost impossible to detect in British and American import records of the late 19th and early 20th centuries because Chinese beadwork was likely classified not as a category of its own but as part of the large category of export needlework. Nevertheless, missionaries' accounts of their lives in China have proven fruitful in at least one instance, providing first-hand evidence of Western involvement in the production of beadwork for export.

Many questions remain. Who oversaw the designing of pieces for export during the late 19th and early 20th centuries? What percentage of pieces carry classic Chinese motifs such as the dragon/centipede, pomegranate/chime/vase, or auspicious characters? Was it assumed that such motifs would appeal to Western women, eager for a taste of the Orient? Or have we got it wrong – were the pieces designed for Chinese women living in the West? How did motifs and pieces change over time? Did Chinese manufacturers ever seek to emulate Western motifs or adjust their products to more closely approximate Western tastes? What else can be learned about beadwork workshops in the Zhuangyuan fang neighborhood of Guangzhou during the late 19th and early 20th centuries? Through what avenues were Chinese beaded objects sold in Western – or Eastern – countries? Did images of Chinese export beadwork appear in American mail-order catalogs, and how did Western audiences respond? How many of the bead curtains or valances shown in early retail catalogs originate in China? Can photos be found showing Chinese export beadwork displayed in homes or worn on bodies?

What about the three early pieces discussed at the beginning of this paper, dating to the Ming and early Qing dynasties? If the pieces had been made or exported under imperial auspices, would the beads be made not of glass but more costly materials such as pearls, coral, or gemstones? Would the surfaces of the glass beads be smoother, the shapes more regular? How were glass beads viewed during the Ming and Qing dynasties? Do more examples of beadwork from the imperial era still survive in public or private collections and if so, where are they?

Lastly, the pieces we have discussed here bear witness to China's rich history of producing beadwork for export using diverse materials, techniques, formats, and styles to serve diverse purposes. Origin marks provide reliable evidence of the kinds of pieces exported from the late 19th century on. For the centuries preceding the imposition of origin marks, we must build our narratives on other kinds of evidence by culling from the textual, pictorial, and anecdotal records, and staying alert to possibilities not previously considered. Although the history of Chinese export beadwork can be researched separately from the history of Chinese domestic beadwork, much might be learned by enlisting the one to illuminate the other.

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ENDNOTES

1. Since the word for bead, *zhu*, can mean a pearl or a bead of any other material in Chinese, the "pearl sewn shirt" described in the Ming story was not necessarily embellished with pearls. For an idea of what beaded shirts of the late Qing dynasty may have looked like, there is one embellished with glass beads in Han Han (1998:88) and one with bamboo beads in Hector (2005:24).

2. For the distinction between bead netting and plaiting, *see* Hector (2016:68 ff.).

3. The panel was found at Hōryūji Temple in "a storage box that reads 'Ornament for the Palanquin of the Retired Emperor Shirakawa' who retired in 1086" (Blair 1973:398). Blair further states that the 1086 date is far too early for the panel. Rather, the panel was probably stored in a repurposed box.

4. In netted or plaited beadwork, a "cell" is a two- or three-dimensional unit symmetrical in shape, composed of beads, which shares some of its beads with neighboring cells (Hector 2016:70). On several objects made for imperial use during the Qing dynasty, nets or plaits with cells aligned at right angles are discernable (National Palace Museum 1986: Figures 111, 119, 315; Palace Museum 1992: Figures 80, 143, 149, 157; Palace Museum and Art Gallery 1987: Figure 61). Whether or to what extent glass beads may have been used in China's imperial workshops has not been documented.

5. Dating to ca. 1279, the earliest surviving intact example of netted or plaited beadwork in China appears to be a hair ornament of the late Southern Song dynasty (1127-1279). It is beaded with tiny pearls depicting neither motif nor inscription (Hector 2016:75). The ornament is worked in a technique that juxtaposes hexagonal and diamond-shaped cells (pers. obs.).

6. "To look upon a work of art brings endless longing" posits heart radicals in the *bing bing* characters. "Let us look upon this painting/work of art, eternally luminous" posits fire radicals in these characters. "To look upon this painting/work of art brings endless

happiness" posits heart radicals in *yong yong* (instead of *bing bing*) characters.

7. For information about single-thread plaiting techniques, *see* Hector (2016:68-69).

8. According to translator Han Zhang, the exact wording Zhou uses in this passage is *zhū zi dēng zé yǐ wǔ sè zhū wéi wǎng* – "the bead lanterns used the nets woven with multi-colored beads" (Zhou Mi 1956:372). Zhou seems to be referring to freestanding panels of beadwork, meaning that the beads, in combination with the threads, form a fabric unto themselves (*see* Hector 2016:68). Whether the motifs he mentions (dragon boats, phoenix carriages, and pavilions) were depicted in or on the beaded panels is not clear.

9. Cheah (2007:79) poses an important question: were origin marks attached immediately after pieces were made or later, by dealers engaged in reselling them.

10. In 2006, in the Zhuangyuan fang neighborhood of Guangzhou, women could be observed sitting in small groups on stools outside of shops, doing commercial bead embroidery (pers. obs.). Not far away, shops within and around Liwan Plaza were selling all manner of beads as well as finished jewelry.

REFERENCES CITED

Ashmore, Lida Scott

1920 *The South China Mission of the American Baptist Foreign Mission Society: A Historical Sketch of its First Cycle of Sixty Years*. Methodist Publishing House, Shanghai.

Bartholomew, Terese Tse

2006 *Hidden Meanings in Chinese Art*. Asian Art Museum, San Francisco.

Birch, Cyril

1958 *Stories from a Ming Collection: Translations of Chinese Short Stories Published in the Seventeenth Century*. Compiled by Feng Menglong. Translated by Cyril Birch. Grove Press, New York.

Blair, Dorothy

1973 *A History of Glass in Japan*. Kodansha International, Tokyo, and the Corning Museum of Glass, Corning.

Boerschmann, Ernst

1982 *Old China in Historic Photographs*. With a new introduction by Wan-go Weng. Dover Publications, New York.

Brook, Timothy

1998 *The Confusions of Pleasure: Commerce and Culture in Ming Dynasty China*. University of California Press, Berkeley and Los Angeles.

Burgess, Laurie E. and Laure Dussubieux

2007 Chemical Composition of Late 18th- and 19th-Century Glass Beads from Western North America: Clues to Sourcing Beads. *Beads: Journal of the Society of Bead Researchers* 19:58-73.

Cai Xiang-Yu

2012 Christianity and Gender in Southeast China: The Chaozhou Missions, 1849-1949. Ph.D. thesis. Leiden University.

Cheah, Hwei-Fe'n

2007 'Made in China'? A Case Study of Nonya Beadwork. *Textile History* 38:59-91.

2010 *Phoenix Rising: Narratives in Nyonya Beadwork from the Straits Settlements*. National University of Singapore Press, Singapore.

2014 Historical Descriptions of Malay "Beadwork." *Beads: Journal of the Society of Bead Researchers* 26:3-8.

2017 *Nyonya Needlework: Embroidery and Beadwork in the Peranakan World*. Asian Civilizations Museum, Singapore.

Clunas, Craig

1991 *Superfluous Things: Material Culture and Social Status in Early Modern China*. University of Hawai'i Press, Honolulu.

2007 *Empire of Great Brightness: Visual and Material Cultures of Ming China, 1368-1644*. University of Hawai'i Press, Honolulu.

Eng-Lee Seok Chee

1989 *Festive Expressions: Nonya Beadwork and Embroidery*. The National Museum, Singapore.

Fenstermaker, G.B. and Alice T. Williams

1979 The Chinese Bead and the Romance of the Bead-Jewelry Trail. *Archaeological Research Booklets* XV. Lancaster, PA.

Francis, Peter, Jr.

1986 *Chinese Glass Beads: A Review of the Evidence*. Occasional Papers of the Center for Bead Research 2. Lake Placid, NY.

2002 *Asia's Maritime Bead Trade, 300 BC to the Present*. University of Hawai'i Press, Honolulu.

Fu, Shen C.Y., Marilyn W. Fu, Mary G. Neill, and Mary Jane Clark

1977 *Traces of the Brush: Studies in Chinese Calligraphy*. Yale University Art Gallery, New Haven, CT.

Gao Chumming

2001 *Zhongguo fushi mingwukao* (Study of Chinese Dress and Personal Adornment). Shanghai wenhua chubanshe, Shanghai.

Haertig, Evelyn

1990 *More Beautiful Purses*. Gallery Graphics Press, Carmel, CA.

Han Han (Luo Yuan Yuan)

1998 *Zhongguo gu boli* (Chinese Antique Glass). Yishu jia chubanshe, Taipei.

Hector, Valerie

2005 *The Art of Beadwork: Historic Inspiration, Contemporary Design*. Watson-Guptill Publications, New York.

2016 Bead Netting and Plaiting Techniques in the Peranakan World. *Beads: Journal of the Society of Bead Researchers* 28:66-91.

Hong Kong Heritage Museum

2002 *Zhong guo li dai fu nü xing xiang fu shi* (Images of Women in Chinese History). Leisure and Cultural Services Dept., Hong Kong Heritage Museum.

Hong Shouzi

1991 Zhuxiu (Bead Embroidery). In *Zhongguo da baike quanshu* (Great Chinese Encyclopedia) 71:666-667. Xinhua shudian Shanghai faxing suo faxing, Shanghai. Unpublished English translation by International Language and Communication Centers, Inc., Chicago.

Ledderose, Lothar

2000 *Ten Thousand Things: Module and Mass Production in Chinese Art*. Princeton University Press, Princeton.

Lin Mingti (ed.)

1988 *Guangdong gongyi meishu shiliao* (History of Arts and Crafts in Guangdong Province). Guangdong Arts and Crafts Association, Guangzhou. Unpublished partial English translation by Licheng Gu.

National Institutes for Cultural Heritage

2017 Ornament for Portable Shrine. e-Museum, http://www.emuseum.jp/detail/100706?x=&y=&s=&d_lang=en&s_lang=ja&word=&class=12&title=&c_e=&region=&era=&cptype=&owner=&pos=185&num=8&mode=detail&century=, accessed October 27, 2017.

National Palace Museum

1986 *Catalogue of the Exhibition of Ch'ing Dynasty Costume Accessories*. National Palace Museum, Taipei.

Neuwirth, Waltraud

1994 *Perlen aus Gablonz: Historismus, Jugendstil/Beads from Gablonz: Historicism, Art Nouveau*. Self published, Vienna.

Palace Museum

1992 *Jewelry and Accessories of The Royal Consorts of Ch'ing Dynasty*. Forbidden City Publishing House, Beijing.

Palace Museum and Art Gallery

1987 *Qing dai Guangdong gong pin* (Tributes from Guangdong to the Qing Court). The Palace Museum, Beijing, and The Art Gallery, Chinese University of Hong Kong.

Schürenberg, Sabina B.

1998 *Glasperlarbeiten: Taschen und Beutel: von der Vorlage zum Produkt*. Hirmer Verlag, Munich.

Setterwall, Åke, Stig Folgelmarck, and Bo Gyllensvärd

1974 *The Chinese Pavilion at Drottningholm*. Allhems Förlag, Malmö.

Tokyo National Museum

2004 *Treasures of a Great Zen Temple: The Nanzenji*. Asahi Shinbunsha, Tokyo. Unpublished partial English translation by Patrick Kirby.

Wikipedia

2017a Chinese Pavilion at Drottningholm. https://en.wikipedia.org/wiki/Chinese_Pavilion_at_Drottningholm, accessed 2 October 2017.

2017b Japanese Missions to Ming China. https://en.wikipedia.org/wiki/Japanese_missions_to_Ming_China, accessed 2 November 2017.

Zhou Mi

1956 *Wulin Jiushi* (Ancient Matters from the Wulin Garden). In *Dongjing menghua lu* (*wai si zhong*) 2. Shanghai gudian wenxue chubanshe, Shanghai. Unpublished partial English translation by Han Zhang.

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FLYING WOMAN'S BEADED CHEYENNE CRADLEBOARD AND ASSOCIATED BEAD CARD FROM FORT KEOGH, MONTANA

William T. Billeck

Glass bead sample cards were sent out in the 19th century by bead dealers and producers to illustrate their products and few are known that include small beads of drawn manufacture. One such card marked New York was acquired in 1882 by Captain Eli Lindesmith, a Catholic priest and Army chaplain at Fort Keogh, Montana. Lindesmith used the card to select seed beads for a cradleboard he commissioned that year from a Cheyenne woman named Flying Woman, the wife of Wolf Voice. This previously undescribed sample card is compared to other 19th-century cards displaying drawn beads in an attempt to determine its origin. Insight into the identity and family history of the maker of the cradleboard is also provided.

INTRODUCTION

Father Eli Washington John Lindesmith, a Catholic priest, became an army-post chaplain at the age of 53 at Fort Keogh in Montana Territory, where he served from 12 August 1880 until he retired from the military in July 1891. While at Fort Keogh he interacted with tribes in the area, particularly the Cheyenne Indian Scouts who worked for the military as well as with their families. He obtained a number of native-made objects at Fort Keogh during the ca. 11-year period that he was stationed there. Lindesmith eventually donated his collection to several institutions and museums, with most of the objects going to the Catholic University of America in Washington, D.C. and the Snite Museum of Art at the University of Notre Dame. In 1956, most of the ethnology objects at the Catholic University of America were transferred to the Anthropology Department at the National Museum of Natural History (NMNH), Smithsonian Institution. An exhibit of the Lindesmith collection at the Snite Museum of Art in 2012, with an accompanying catalog (Mack 2012a), revealed the scope of the collection and also Lindesmith's careful documentation which detailed how and when he obtained the objects, including, in some cases, the names of the object's makers.

One of the objects in the NMNH collection – a beaded cradleboard that Lindesmith commissioned a Cheyenne woman to make in 1882 – is interesting for two reasons. First, there is detailed provenance for this object. It is very unusual to be able to link a 19th-century Native American object in museum collections to a specific maker and to precisely date it. Second, the museum also holds a bead sample card that Lindesmith obtained from a New York bead dealer in order to select beads for the cradleboard. Such sample cards are scarce, often poorly dated, and few are known from the 19th-century United States. This card, however, can be precisely placed in time and directly linked to the cradleboard.

THE LINDESMITH CRADLEBOARD

The cradleboard exterior consists of a completely beaded buffalo hide which is attached to a wooden frame (Figure 1). The frame is decorated with brass tacks and ribbon (the ribbon was replaced in 2012, when the cradleboard was on exhibit). The glass beads are of drawn manufacture and about the same size: ca. 2.1 mm in diameter and 1.1 mm in length. They are lane stitched with the dominant color being opaque blue (Munsell 5B 5/8). Other colors include translucent purple-blue (5PB 2/6), opaque green (7.5GY 5/6), translucent red on opaque white (5R 3/10), and opaque yellow (5Y 8/8) that form linear designs, crosses, and stepped triangular patterns. The triangular pattern may refer to the important Cheyenne religious locations of Sweet Medicine's Cave or Bear Butte (Mack 2012a:29).

LINDESMITH'S RECORDS

Lindesmith's handwritten tag describes how he obtained the cradleboard, which he calls a "papoose pouch," and the bead card:

> During my labors in the Rocky Mountains as a chaplain for the U.S. Army, I sent to New York for a sample card from which to select beads for

Figure 1. Cheyenne cradleboard commissioned by Father Lindesmith and made in 1882 by Flying Woman at Fort Keogh, Montana (National Museum of Natural History, Smithsonian Institution, cat. no. E395625A).

> a papoose pouch. The Indians attach something sacrad [sic] to a "Family Pouch." All the children of a family are raised in the same Pouch; unless a child dies; it is buried in the "Family Pouch." They will never part with the pouch, unless enemies open the grave, take out the pouch and sell it. I could have bought one of that kind, but I would not be guilty of aiding such a sacrilige [sic]. I got a squaw to make (Smithsonian NMNH, catalog E395625).

In a letter written to Msgr. Henri Hyvernat in March of 1911, Lindesmith adds: "... I paid an Indian Squaw forty dollars to make for me this new pouch" (Lindesmith Papers/ American Catholic History Research Center and University Archives [LP/ACHRCUA]: box 7, file 8).

The CUA Archives also holds a transcribed copy of the information on a tag prepared by Lindesmith that was once attached to the cradleboard:

> No. 608. Fort Keogh, Montana T. Nov. 24. 1882. A Pachist (a Cheyenne) baby pouch. It was made for me by Amecha or Fly [Flying] Woman, the squaw of Hotnaemisto or Wolf Voice - whose mother was a Gros ventres and father was a Cheyenne (LP/ ACHRCUA: box 7, file 8).

The information on the NMNH catalog card is based on this information and it also identifies the maker as Flying Woman, and indicates that her name in Cheyenne was Amecha.

An entry in Lindesmith's account books made on 24 November 1882 states that he paid Wolf Voice, Flying Woman's husband, eight dollars for the cradleboard, and purchased from the Fort Keogh post trader the following items to make it: 24 bunches of beads for $3.00, 8 pounds of buffalo hide for $2.50; 2 bunches of beads for $0.25, brass tacks for $1.50, and ribbon for $0.25 (LP/ACHRCUA: box 21, 1881-1888 account book: 53; Box 5, diary 1881-1882: 99). Unfortunately, there is no further information in either his account books or diary regarding the source of the bead sample card.

It is unusual for collections made at this time to have such detailed information including where an object was made, who made it, and when it was acquired. The transcribed copies of Lindesmith's tag on the cradleboard indicate that he arranged for Flying Woman to make the cradleboard in 1882 while he was at Fort Keogh, Montana. Lindesmith paid an $8.00 commission to Wolf Voice, $40.00 dollars to Flying Woman for her labor, and $7.50 to the post trader for the materials.

IDENTIFYING A NATIVE AMERICAN WOMAN IN THE ETHNOGRAPHIC AND HISTORIC RECORDS

The identity of the maker of the cradleboard appears to be straightforward until other published sources and archival records are examined. The Lindesmith exhibit catalog (Snite Museum of Art 2012:92, 94) states that the cradleboard was made by Elk Woman, and that she was the wife of Wolf Voice (Burst 1994:10; Mack 2012b:70; Powell 1981:1137, 1256), rather than Flying Woman. Elk Woman is a misidentification that will be corrected here. To do so Wolf Voice – and his wives – need to be identified.

There are two main reasons why it is difficult to identify specific Plains Indian women in the 19th century. First, Native American women, as compared to men, are rarely mentioned by name in 19th-century accounts. While it is known that objects were made, owned, and used by women, their identities are almost always invisible within museum collections. In the few cases where the maker or owner of an object is recorded, the individuals are almost always male. Similarly, many Plains Indian males in historic photographs are named while accompanying women remain anonymous. Photographs taken in 1877-1878 and 1889 that identify Wolf Voice, but none of the women, are a good example.

Second, when a woman's name is present in records, cultural practices can obscure her family history. Cheyenne names can be translated into English in different ways, resulting in variations. Native Americans in the Plains can also change their native name over their lifetime in response to significant life events. Cheyenne names can also be inherited from relatives (Moore 1984), resulting in many individuals in a tribe having similar or the same name. U.S. census records further obscure a woman's family history since only their new, usually non-Native given name appears, along with the translation of their husband's Cheyenne name as the surname. For example, Wolf Voice's wife is listed on most census records as Clara Wolf Voice, with no mention of her native name.

A review of published sources, historical photographs, and census records demonstrates the complexity of trying to identify the wife of Wolf Voice and her descendants. Wolf Voice is generally identified as a Gros Ventre who scouted with the Cheyenne for Lt. Casey at Fort Keogh (Weist 1977). Lindesmith wrote that Wolf Voice's mother was Gros Ventre and his father was Cheyenne (LP/ACHRCUA: box 7, file 8). There are, however, two different tribes that have been called Gros Ventre in the Plains: the Atsina in central Montana and the Hidatsa along the Missouri River in North Dakota. The federal census records of 1900 for (Frank) Wolf Voice list his mother as being Gros Ventre from North Dakota and that he was born in North Dakota, making him Hidatsa on his mother's side. His son, Grover Wolf Voice, said that his father was Hidatsa and raised near Elbowoods, North Dakota, on the Fort Berthhold Reservation (Schwartz 1989:113).

Warren Schwartz's (1989:11, 111) interviews with Grover Wolf Voice and his cousin, Wesley Whiteman, clarify some family relationships. Whiteman identified his and Grover Wolf Voice's grandmother as being Elk Woman with the Cheyenne name of Moeha, and also said that she changed her name to Wolf Traveling Woman following the death of her first husband, Low Brow. She subsequently married a man named Strong Left Hand and they had a son, Yellow Robe, and a daughter whose name is not known (Liberty 2006:98-100; Powell 1969:898; Schwartz 1989:11). The daughter married Wolf Voice and was the mother of Grover Wolf Voice (Schwartz 1989:11). Casey Barthelmess, the son of a photographer at Fort Keogh, knew Yellow Robe for many years, but said that Yellow Robe and Wolf Voice were married to sisters (Frink and Barthelmess 1965: image between pp. 120 and 121) which contradicts Wesley Whiteman's identification of Yellow Robe's sister as the wife of Wolf Voice (Liberty 2006:100; Schwartz 1989:11).

Wolf Voice appears solely under his native name on the 1886, 1888, 1889, and 1890 Indian censuses. Beginning in 1892 and until 1901, he is referred to as Frank Wolf Voice in the yearly Indian Census for the Northern Cheyenne. He was born, based on the ages provide in the censuses, between 1852 and 1857, and on the 1893 and 1896 Indian censuses his Cheyenne name is provided as He-ni-misto or He-ne-e-misto. He is married to Cinnamon Bear on the 1888 and 1890 censuses. She was 20 in 1890, and her Cheyenne name is listed as Mo-eq-tah. Beginning in 1891, Wolf Voice's wife is identified as Clara Wolf Voice on each Indian census and, based on her age, she was born in 1870. Her name appears on the 1892, 1893, and 1896 censuses as Mo-o-tah, which in Cheyenne means "black," which is similar to the name Mo-eq-tah provided in the 1890 census. The 1900 federal census lists only surnames and here she is identified as (Clara) Black Bear and the census indicates that she has been married to Wolf Voice since 1887. On the 1888 and 1890 censuses, Wolf Voice is listed as married to Cinnamon Bear, which is likely a variation of Clara Black Bear. Thus, Clara Wolf Voice is the same person as Cinnamon Bear and Black Bear.

The 1891 census lists Clara Wolf Voice and her two-year-old daughter, Eva Wolf Voice, but does not list Frank Wolf Voice. Significantly, Clara Wolf Voice is listed on the census just after the family of Henry and Mary Strong Left Hand, suggesting that she may have been living with them. This corresponds with accounts stating that Grover Wolf Voice's mother was the daughter of Elk Woman (Mary Strong Left Hand) and (Henry) Strong Left Hand. Clara Wolf Voice is the mother of Grover and the daughter of Elk Woman and Strong Left Hand. Since Cheyenne names can be inherited, it is possible that Clara inherited and used her mother's name (Elk Woman) for a time, a possible explanation why some sources (Powell 1981:1137, 1256) report that Wolf Voice was married to Elk Woman.

While the examination of records revealed that Wolf Voice was married to the daughter of Elk Woman, no additional records have been found dating to the late 1870s or early 1880s that link Flying Woman with Wolf Voice, other than the evidence provided by Lindesmith that they were married in 1882. There is the possibility that Flying Woman is the "squaw" in the 1877-1878 photograph by John H. Fouch that he titled "Wolf Voice and a Cheyenne Squaw" (Burst 1994, 2000) (Figure 2). Mack (2012b:70, Figure 19) and Burst (1994:10) identify the woman in the photograph as Elk Woman and the wife of Wolf Voice. If the woman is Wolf Voice's wife, she could be Flying Woman, who was married to Wolf Voice at least by 1882. The woman in the photograph cannot be Clara (Black Bear) Wolf Voice, who married Wolf Voice in 1887, and was only 12 when

Figure 2. Wolf Voice and an unnamed Cheyenne woman (possibly Flying Woman) in 1877-1878, photographed by John H. Fouch at Fort Keogh, Montana (National Anthropological Archives, Smithsonian Institution, INV 09950700, Photo Lot 90-1, no. 1209).

the cradleboard was made and eight when Fouch took the photograph. It is possible that Flying Woman died or, if she remarried, changed her name. This makes it very difficult to identify her in historic records.

The photograph taken at Fort Keogh in 1889 shows Wolf Voice, Yellow Robe, two unidentified Cheyenne women, two Cheyenne children, and Leo, the son of the photographer Christian Barthelmess (Figure 3). Wolf Voice is on the left, and he and Leo Barthelmess are the only two individuals who can be identified with certainty. The younger woman with the baby in her arms is likely Clara Black Bear with her daughter Eva Wolf Voice. The person on the right could be Clara Wolf Voice's mother, Elk Woman (Wolf Traveling, Mary Strong Left Hand). Yellow Robe may be the person in the background.

While Wolf Voice's mother-in-law was Elk Woman, it is not known if any of his wives inherited that name. The maker of the cradleboard, Flying Woman, was married to Wolf Voice in 1882 and it is possible she appears in the 1877-1878 photograph with him; otherwise little is known about her.

Cheyenne woman are difficult to identify in 19th-century records, with scattered pieces of information that may be impossible to link together regarding their identities and family histories. An object identified as having been made by a named Cheyenne in the 19th century and knowledge as to how it was acquired is noteworthy, but much concerning who Flying Woman was and her history is invisible. While it has been possible to identify that Flying Woman made the cradleboard, it has not been possible to find addition records to trace her and her descendants.

LINDESMITH'S NEW YORK BEAD SAMPLE CARD

The cradleboard is associated with a portion of a bead sample card that Lindesmith obtained from New York to select beads for the cradleboard he commissioned. This would date the card to 1882 or earlier. Unfortunately, Lindesmith's records do not indicate the name of the company from which it was obtained. The card was associated with the cradleboard until about 25 years ago, when it went missing from the NMNH collections, but a high-quality color image was made in 1979 (Figure 4).

The top and left side of the card have been trimmed. Remnants of gauze along the left edge indicate that it was once part of a two- or three-page folding card (the gauze would have reinforced the seam). The card displays seven bead sizes (1 to 6/0) in 28 colors. While the latter are numbered 1 to 39, including 26½, quite a few numbers are absent from the list (e.g., 5-6, 8-9, 14-15), possibly because they were no longer available. Blue, red, yellow, green, black, white, milk white, and colorless seed beads that range from opaque to transparent are represented. The only geographic identification on the card is "New York." Notably, the red-on-white beads on the cradleboard are not represented on the card. On other cards from around the end of the 19th century, red-on-white beads are typically displayed separately on the cards and are labeled with the name cornaline, cornelian, or corniola (Billeck 2008:50).

Figure 3. Wolf Voice and family with Yellow Robe and Leo Barthelmess in 1889, photographed by Christian Barthelmess at Fort Keogh, Montana (National Anthropological Archives, Smithsonian Institution, OPPS NEG 56083).

Since the Lindesmith card originally had multiple pages, these beads may have been on the missing portion (*see* Billeck 2008: Plate XA).

COMPARISONS WITH CONTEMPORARY BEAD SAMPLE CARDS

Bead sample cards were produced by both manufacturers and dealers, and were kept at shops or sent to trading establishments or individuals. The cards produced by five manufacturers and dealers were examined to determine if there are similarities with Lindesmith's New York card.

Giorgio Benedetto Barbaria (closed 1835)

One of the earliest bead sample cards with small seed beads is in the Murano Glass Museum and attributed to Giorgio Benedetto Barbaria, a firm that ceased trading in Venice in 1835 (Panini 2017:203, 206, 338). This card foreshadows the organization of drawn beads on later sample cards. The sizes available are represented by black beads. The ink labels are very faded and it is not possible to tell if the sizes are designated by codes. Red beads, possibly red-on-white, are shown separately by size. The beads are grouped by shape (circular and tubular), with striped beads listed separately. This presentation pattern continues on many of the later sample cards.

Francis Greil (ca. 1870-1898)

Francis Greil produced a number of sample cards in English and all labeled "Francis Greil, Venice." One example is present in the Museum of Applied Arts & Sciences collection in Sydney, Australia (Webber 1998) and several cards are at the Peabody Museum of Archaeology and Ethnology. They are assigned to 1880-1910 at the Museum of Applied Arts & Sciences and Francis (1999:8) dates the Peabody Museum cards to ca. 1870-1898, though specific evidence for these dates is not provided.

The Museum of Applied Arts & Sciences card (Figure 5) has small drawn beads labeled "Seedbeads" that were

Figure 4. The New York sample card obtained by Father Lindesmith in 1882 (National Museum of Natural History, Smithsonian Institution, cat. no. E395625B).

available "in bunches of 120 strings" in 40 numbered colors. Seed beads occur in 10 sizes that are labeled 6/0 (smallest) to 4 (largest). There are larger beads that, based on other cards and records, were often sold by weight and referred to as pound beads. On the card they are not described as pound beads but as "Common Colours" numbered 11 to 22 and "Fine Colours" numbered 22-34. Common and fine colors are available in 12 sizes ranging from 00 (smallest) to 10 (largest). There are beads (nos. 35-40) labeled "Cornelian" (red on white) that occur in several sizes. Also on the card are short tubular beads (nos. 41-47) labeled "Bugles" that are represented by black beads. It is interesting to note that sizes 2/0 to 4 in the seed bead group appear to be equivalent to sizes 00 to 4 in the common and fine-colored beads (or pound bead) group. Seed bead sizes then overlap with the sizes of beads sold as pound beads.

Bead no. 13 is of note in that it is opaque red on transparent green (Figure 6), a type that has been available since at least the early 17th century in the Americas and is believed to have been gradually replaced by the transparent red-on-opaque white "cornelian" type during the 1830s-1840s (Billeck 2008). The presence of the cored variety on this bead card reveals that it was still being offered for sale in the late 19th century.

The Peabody Museum holds two different sets of seed bead cards. The first card (cat. 2004.24.24328) lists Frances Greil as a "Commission Merchant" or distributor rather than a manufacturer. On this card "seed beads" are listed as sold in bunches of 120 strings occurring in colors numbered 1-18. Beads described as "Pound beads" occur in colors numbered 19-84. The sizes available are not shown on the card. The second card (cat. 2004.24.24329) is identical to the card at the Museum of Applied Arts & Sciences described above.

Nissin Namer (late 19th century)

A three-page bead card with text in French that is labelled "Nissin Namer" was acquired by the Royal Ontario Museum in 1907 and has a handwritten label stating that these were the bead types used in the Sudan ca. 1870 (Billeck 2008: Plate XA). Page one displays 14 sizes (*Grosseurs*) of seed beads. Nos. 15-34 are "fine" colors and nos. 35-84 are labeled "Charlottes la Masse del 120 fil." The beads do not display faceting and appear to be equivalent to the unfaceted seed beads sold in bunches of 120 strings on the Greil cards. Beads referred to as Charlottes today are a specific size of seed bead with a single cut that produces a reflective surface. It seems likely that the designation had a different meaning when this card was made.

On card two, nos. 85-103 are labelled "Orientale" and appear to be drawn beads in translucent colors with a high luster. Nos. 104-122 are called "Madre-Perla" and are short tubes that appear to have multiple sides. Nos. 123-130 are "Corniola Perla" or red-on-white drawn beads. Nos. 131-138 are "Raje" or striped drawn beads. Nos. 139-146 are "Noir facite" or black faceted beads. Nos. 147-154 are "Fais" and appear to be larger black faceted beads. Page 3 is labeled "Manifatture alla Lume" and shows wound beads, numbered 155-199.

Societa Veneziana Conterie (1898-1992)

The Societa Veneziana Conterie was created by 16 beadmaking concerns in 1898 on Murano (Venice), Italy. Bead cards that were once part of a larger set that dates to 1899 are on the Picard Trade Bead Museum (2017) website. Three of the cards have beads numbered in sequence. The first is titled "Carte F" and displays drawn beads numbered 341-423, as well as examples of eight bead sizes labeled I (smallest) to VIII (largest). The second card, titled "Societa Veneziana," has small drawn beads labeled 424 to 519. The

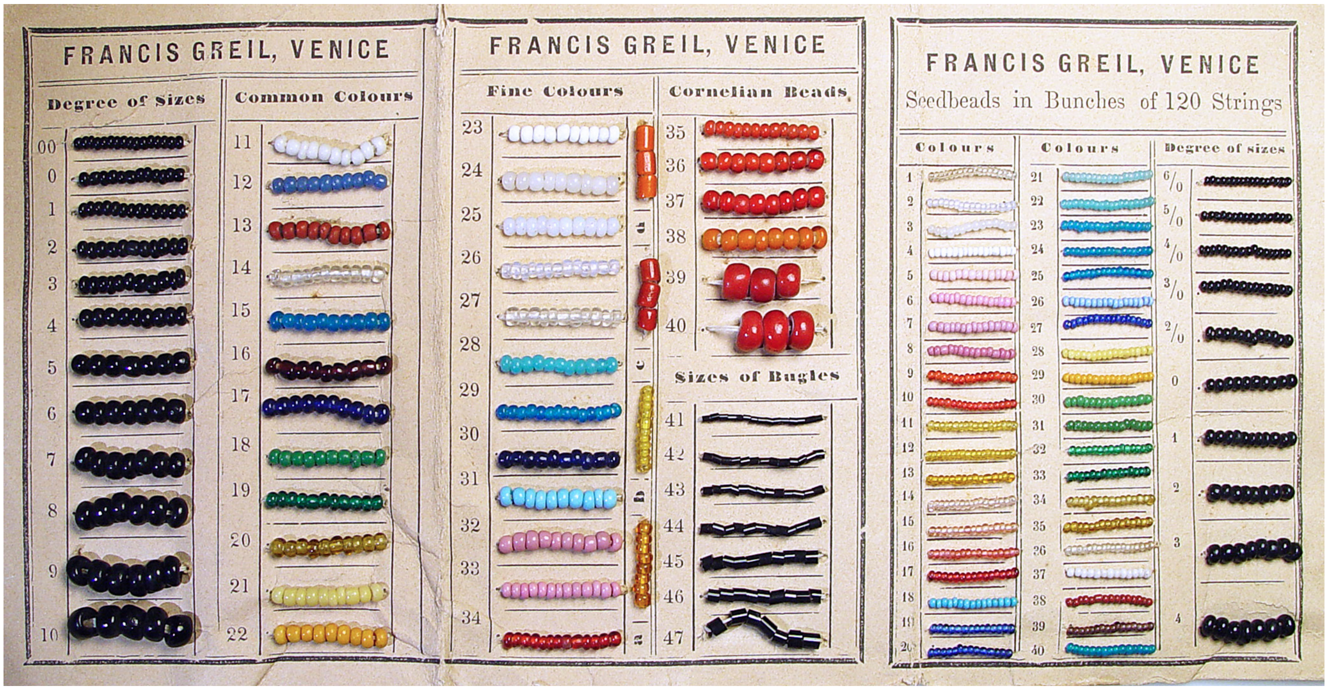

Figure 5. A multi-part sample card from Francis Greil, Venice, ca. 1880-1910 (courtesy of Thomas Stricker).

third card is labeled "Edition 1899" and has drawn beads numbered 520 to 615. Another card is also labeled "Edition 1899" and displays lustrous drawn beads labeled "Ceylon" beads in nine colors numbered 752-760 with examples of ten sizes numbered 0/1 (smallest) to 0/10 (largest). Nos. 761-768 are tubular beads of different sizes that are red on white and named "Pipiotis." Nos. 769-778 are drawn beads of different sizes that are red on white and named "Cornaline." The "Ceylon" beads on this card appear to be identical to the "Orientale" beads on the Nissan Namer card.

Stephen A. Frost & Son (1848-1937)

Stephen A. Frost & Son began trading in Leavenworth, Kansas, in 1848, and had moved to New York by the 1870s. The company closed when the son, Dan Frost, retired in 1937 (Illinois State Museum 2006; Ridgely 1958). According to New York City directories, Stephen A. Frost had an occupation/business of "beads" in 1882 and "Indian goods" in 1891 (Ancestry.Com Operations 2011). The 1880 census lists Frost's profession as "Fancy Goods" and shows that he lived in Jersey City, just across the Hudson River from New York City. He had the same residence in the 1860, 1870, and the 1880 censuses when his profession was listed as salesman, dry goods merchant, and merchandise, respectively.

The Illinois State Museum obtained 71 sample cards from the Frost company in 1941 (Illinois State Museum 2006; Ridgely 1958). Among these are 24 cards with the Frost logo (SAF&S) and the legend "Venice" which display examples of wound and chevron beads (*see* Liu 1983: Figures 24-25). The beads on these cards are numbered from 1 to 1,100 and are reported to have been those exhibited at the 1904 St. Louis World's Fair (Illinois State Museum 2006; Ridgely 1958).

In addition, there are 28 cards, each with 20 groups of beads (Figure 7), that display 560 color hues of seed beads. These cards bear the logo of the Frost company as well as that of the Societa Veneziana Conterie. Twelve more cards with the same logos show 240 wound beads (*see* Liu 1983: Figure 18). None of the beads on these 40 cards are numbered as would be expected on a commercial sample

Figure 6. Bead 13 on the Greil card (courtesy of Thomas Stricker).

Figure 7. Sample card of the Stephen A. Frost & Son of New York City (collection of the Illinois State Museum, Springfield).

card and it is likely that they constituted part of the exhibit at the St. Louis World's Fair. Since they bear the logo of the Societa Veneziana Conteries, they must postdate 1898. There are also five cards that exhibit the logo of the Frost Company and "Gablonz" (*see* Liu 1983: Figure 3), as well as two cards without logos that hold beads likely made in Gablonz (*see* Liu 1983: Figure 23). All of the beads are numbered and include small drawn seed beads, faceted beads, Prosser beads, stone beads, and some wound and drawn beads that likely originated in Venice (cf. Liu 1983).

DISCUSSION

The bead sample card that Lindesmith obtained from New York may have come from Stephen A. Frost & Son. No examples of Frost sample cards from the 1880s have been found to date; all the known examples post-date 1898. If there were additional bead dealers in New York City in the 1880s, they have yet to be identified. None of the Frost cards are in the format of the Lindesmith card but this may well be because the Frost cards were made exclusively for the 1904 St. Louis World's Fair.

Lindesmith's sample card shares attributes with the Barbaria, Francis Greil, Nissin Namer, and Societa Veneziana Conterie cards. These bead cards display examples of small drawn bead sizes and colors and each is assigned a number. The Lindesmith card has sizes ranging from 6/0 (smallest) to 1 (largest) and similar sizes on the Greil and Namer cards are identified as seed beads. Yet the color numbering system of the Lindesmith card does not match that of any of the other cards.

CONCLUSION

In 1882, Father Lindesmith commissioned Flying Woman to make a beaded cradleboard at Fort Keogh, Montana, and used a bead sample card that he obtained from New York to select the beads. While the card was used to select the bead colors and sizes, the beads themselves were obtained from a post trader at Fort Keogh or nearby Miles City. The card is well-dated to 1882, and represents the earliest documented occurrence of small seed beads on a sample card in the United States. The Lindesmith card was obtained from a New York dealer, most likely Stephen A. Frost & Son. It is possible that there were other companies in New York City that distributed beads and made bead cards in the 19th century, but none have yet been identified.

The Lindesmith cradleboard has provided an exceptional opportunity for study because it is still associated with the bead card used to select the beads for its creation and because the identity of its maker is known. Nineteenth-century Native American objects in museum collections that can be definitively linked to named makers are extraordinarily rare, especially when the maker is a woman. The cradleboard has exceptional provenience for the late 19th century, with Flying Woman identified as its maker, the Cheyenne as the tribe of origin, 1882 as the date of manufacture, and Fort Keogh as the location.

Native American women are very difficult to identify in the Plains region in the 19th century, as shown in the attempt here to identify Flying Woman in census records and photographs. She is known only because Father Lindesmith recorded her as being the maker and that she was married at the time to Wolf Voice, a Cheyenne scout at Fort Keogh. Apart from her name appearing in the Lindesmith records, Flying Woman, like many women who were not part of the dominant culture of the period, is otherwise invisible in the historical record.

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REFERENCES CITED

Ancestry.Com Operations
2011 U.S. City Directories, 1822-1995. Provo, UT.

Billeck, William T.
2008 Red-on-White Drawn or Cornelian Beads: A 19th-Century Temporal Marker for the Plains. *Beads: Journal of the Society of Bead Researchers* 20:49-61.

Burst. James S.
1994 John H. Fouch: First Post Photographer at Fort Keogh. *Montana: The Magazine of Western History* 44(2):2-17.
2000 Photojournalism, 1877: John H. Fouch, Fort Keogh's First Post Photographer. *Montana: The Magazine of Western History* 50(4):32-39.

Frink, Maurice and Casey E. Barthelmess
1965 *Photographer on an Army Mule*. University of Oklahoma Press, Norman.

Francis, Peter, Jr.
1999 The Venetian Bead Story 2. *The Margaretologist* 12(1): 3-12.

Illinois State Museum
2006 Stephen A. Frost & Son, Bead Merchants. http://www.museum.state.il.us/ismdepts/anthro/beads/StephenFrost_merchant.html, accessed 27 November 2017.

Liberty, Margot (ed.)
2006 *A Northern Cheyenne Album*. University of Oklahoma, Norman.

Liu, Robert K.
1983 Dan Frost Bead Collection. *Ornament* 6:25-29, 44-45.

Mack, Joanne M.
2012a The Father Lindesmith Collection: History, Anthropology, and Art. In *Father Lindesmith's Collection: History into Art and Anthropology*, pp. 28-33. Snite Museum of Art, Notre Dame, IN.
2012b Father Lindesmith, Fort Keogh, and the Native Americans of Montana. In *Father Lindesmith's Collection: History into Art and Anthropology*, pp. 68-83. Snite Museum of Art, Notre Dame, IN.

Moore, John H.
1984 Cheyenne Names and Cosmology. *American Ethnologist* 2:291-312.

Panini, Augusto
2017 *The World in a Bead: The Murano Glass Museum's Collection*. Antiga Edizioni, Crocetta del Montello (Treviso), Italy.

Picard Trade Bead Museum
2017 Trade Beads on Pre-1900 Sample Cards. http://www.picardbeads.com/exhibit8.html, accessed 30 October 2017.

Powell, Peter J.
1969 *Sweet Medicine: The Continuing Role of the Sacred Arrows, the Sun Dance, and the Sacred Buffalo Hat in Northern Cheyenne History*. 2 vols. University of Oklahoma Press, Norman.
1981 *People of the Sacred Mountain: A History of the Northern Cheyenne Chiefs and Warrior Societies, 1830-1879 with an epilogue 1969-1974*. 2 vols. Harper & Row, San Francisco.

Ridgely, Frances S.
1958 The Dan Frost Collection of Trade Beads at the Illinois State Museum. *Midwest Museums Quarterly* 18:74-75.

Schwartz, Warren E.
1989 *The Last Contrary: The Story of Wesley Whiteman (Black Bear)*. Center for Western Studies, Augustana College, Sioux Falls, SD.

Snite Museum of Art
2012 Native American Objects of the Exhibition. In *Father Lindesmith's Collection: History into Art and Anthropology*, pp. 84-127. Snite Museum of Art, Notre Dame, IN.

Webber, Kimberley
1998 Bead sample book. Made by Francis Greil in Venice, Italy, 1880-1910. Museum of Applied Arts & Sciences, Sydney, Australia. https://collection.maas.museum/object/160661, accessed 24 November 2017.

Weist, Katherine M.
1977 Ned Casey and his Cheyenne Scouts: A Noble Experiment in an Atmosphere of Tension. *Montana: The Magazine of Western History* 27:26-39.

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FULL INSTRUCTIONS IN NEEDLE-WORK OF ALL KINDS: BEADS

The material that follows appeared in Godey's Magazine and Lady's Book *for 1858 (vol. 50, pp. 169-170) as part of a series of articles presenting "Full Instructions in Needle-Work of All Kinds." It is reprinted here in that it offers contemporary insight into the major categories of beads used in needle work during the mid-19th century in the United States.*

"O. P." We cannot at all discover the origin of this extraordinary name for the large beads. They were at first used principally for mats and table covers; for which, indeed, on account of their rough sharp edges, they were singularly unfit. They make beautiful pendent vases for flowers, decorations for chandeliers, and similar articles. They are sold in bunches of twelve strings. They are either clear or opaque. If the latter, it would appear that they are painted on the inside, with a color different from that of the glass itself. They are technically termed clear, and filled. The latter are always dearest. They are manufactured in Bohemia.

Pound Beads. – These are like seed beads, except in size. Those in most general use are distinguished as Nos. 1, 2, and 3. No. 1 is rarely used, except for grounding mats worked in wools and silks. No. 2 is used for tables, ottomans, table borders, and such things. No. 3 is fit for footstools, handscreens, and fine articles. The greatest variety of colors and shades is to be had in this size. It is next to seed beads in its dimensions. All these are sold by the ounce.

Seed Beads. – Very small beads, for crests, cigar-cases, and very delicate work generally. Can only be used with proper beading or jeweller's needles, and fine white silk. Sold in small hanks of ten strings each.

Cut Beads. – These, instead of having a round smooth surface, are cut in angles. They are more brilliant as well as more expensive than the ordinary kinds. Black, ruby, and garnet are the colors usually obtainable.

Fancy Beads are almost infinite in their variety of form, size, and color. Many are used in ornamenting mats and fancy baskets. Some, which are round, are of plain glass, silvered or gilt, to look like gold, silver, or steel beads. The flat-round ones, termed sequins, both gilt and of colored glass, are used much in trimming headdresses. All are sold by the string or bunch.

Metal Beads are gold, silver, steel, and blue steel. The two former may be had either cut or round, the last-named kind being considered the best. They are sold in small bunches, marked from 2 to 12. The sizes from 9 to 12, being very large, are not generally to be obtained.

Bugles are tubes of glass, varying both in length and thickness. The black and white are used for trimming articles of mourning. Colored bugles have lately been introduced. Green, purple, bronze, and blue. They are sold by the ounce or pound.

Editor's Note: The O. P. beads mentioned above are hexagonal tubes with thin walls and large perforations that are often coated with paint or silvering (Figures 1-2). In *Victorian Embroidery: An Authoritative Guide*, Barbara Morris (2003:28) states that they were first imported in 1853 or 1854.

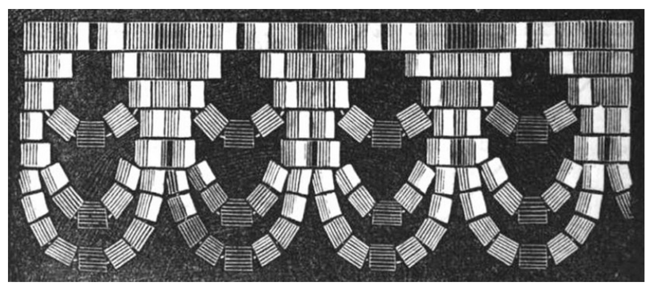


Figure 1. Loop and vandyke border, in O. P. beads (*Godey's Lady's Book* 1859, vol. 59, p. 70).

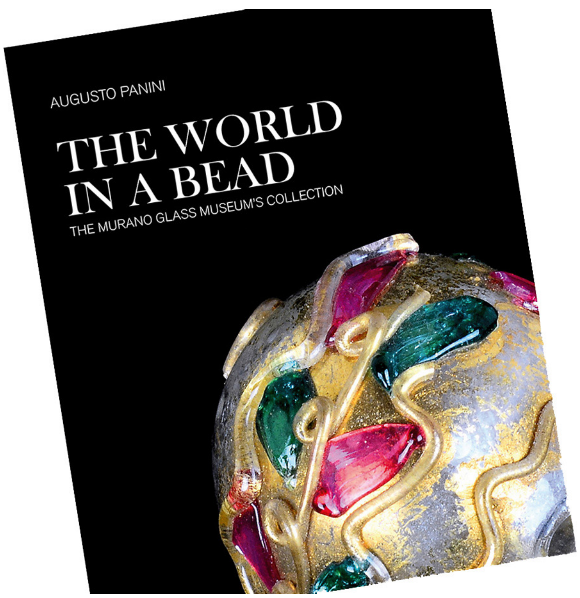
Figure 2. O. P. bead tassels on a Mohawk souvenir cushion ca. 1890 (private collection).

BOOK REVIEWS

The World in a Bead: The Murano Glass Museum's Collection.

Augusto Panini. Antiga Edizioni, Crocetta del Montello (Treviso), Italy. 2017. 376 pp., 677 color figs., glossary. ISBN 978-88-99657-90-1. €39.00 (paper cover).

This handsome, large-format book is – above all – a visual tribute to the innovativeness, artistry, and craftsmanship of Venetian beadmakers. The book is richly illustrated with excellent color images, many in full-page size, which reveal the wide range of bead manufacturing types, decorative styles, and forms that poured out of Venice by the ton during the 19th century.



The Introduction provides a very brief history of the Murano Glass Museum which was founded in 1861, and summarizes its holdings of beads which include individual specimens, bunches, and sample cards. Since an early inventory of the collection was lost in 1912, the author had to do an extensive literature search to provide information concerning the attribution and dating of the specimens illustrated in this book. The section concludes with a discussion of rosetta (star or chevron) beads and why they are all but absent in the sample cards.

The second section (Venetian Beads) lightly touches on the different techniques used to produce glass beads. This is followed by Sample Cards and Bunches of Beads which comprises over half the book and provides an extensive pictorial catalog of the beads – mostly in bunches as offered for sale and on sample cards – made by the following companies: Giovanni Battista Franchini and Giacomo Franchini, Società Fabbriche Unite, Arbib, De Prà Bortolo, Dal Negro & Comp., and Girgio Benedetto Barbaria.

The pictorial catalog continues in the next two substantial sections which illustrate beads that were primarily intended for the European (pp. 223-251) and the African (pp. 252-303) trade, respectively. The beads are arranged principally on the basis of their decorative style. While the different categories are in English in the table of contents, they are in Italian in the image section causing a bit of confusion, at least initially. One also wonders about the translation of some of the terms; e.g., *vetro filato* (pp. 224-226) is translated as mother-of-pearl but satin glass is what is shown, and *a pettine* (pp. 236-237) should be "combed," not "feathered" which is the translation for *piumate* (p. 244).

There follow three "Files" which present data on the beads and cards depicted in the three catalog sections discussed above. This includes brief descriptions, type of manufacture, dating, museum inventory numbers, measurements, and notes. One minor error that was noted concerns bead no. 231 in the Europe Beads section which is described as lampworked but is clearly a faceted drawn cane bead. Furthermore, it is doubtful that this bead is a Venetian product as such faceted beads were a staple of the Bohemian bead industry.

A Glossary and Bibliography conclude the volume. The former is well intentioned but is of relatively little use as the definitions often duplicate the term; e.g., "Bead with alphabet letters or figures" is defined as "lamp bead decorated with alphabetic letters and figures" while "Bead with figures" is defined as "lamp bead decorated with figures." There are several such instances. The terms "Feather bead" and "Fenicia bead" are referred to each other but *fenecia* is not used in the pictorial catalog; *piumate* is, as mentioned above, but does not appear in the glossary. The definition of "Mother of Pearl bead" clearly indicates that "Satin bead" would be the correct term.

Despite these minor problems, *The World in a Bead* provides a beautiful and useful inventory of the glass beads produced by a number of 19th-century Venetian companies and will be of interest not only to collectors and archaeologists, but basically anyone interested in beads.

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Wild Beads of Africa.

Billy Steinberg (editor) and Jamey Allen (text). Privately published, Los Angeles. 2017. 216 pp., 180 color plates, glossary. ISBN: 978-0-692-90710-8. $65 (hardcover). Order from: https://www.wildbeadsofafrica.com

Wild Beads of Africa, by renowned songwriter and bead collector Billy Steinberg, is the first book on the subject of old African powder-glass beads. With comments and editing by Mr. Steinberg, text and glossary by noted bead historian Jamey Allen, and stunning photography by Fredrik Nilsen, we learn much of the history of these beads, yet with an astute awareness of their art and mystery.

Why "Wild" beads, you might ask? The phrase "Wild Beads" resembles "Wild Beasts," or "*les Fauves*" in French, referring to the early-20th-century Fauvist art movement. Those artists, including Henri Matisse and Andre Derain, emphasized painterly qualities and strong colors. Steinberg sees some of the same vitality in that genre of artwork as on the African beads discussed in *Wild Beads of Africa*.

After the forward by John and Ruth Picard, Allen gives an informative history. He explains numerous points, first defining bead names. Among the Krobo people in Ghana, any large, desirable bead is called *kpo*, which translates in old English as "locket" from a time when the British referred to pendants as "lockets." Allen then explains how names like *Bodom* and *Akoso* have been popularized in recent decades and used primarily by collectors and not the African people themselves.

Next, the high regard for these beads in Africa is explained – they have a mythical sort of esteem. Some believe that these beads have spirits and will reproduce in the ground if buried! There is also an informative history of glass and glass beadmaking with a specific section on the production of powder-glass beads. Allen explains that it was not invented in Africa, but that the technique was practiced in antiquity in western Asia and the eastern Mediterranean. It is believed that the West African powder-glass beadmaking industry is only about two centuries old. We learn about the various glass materials used for powder-glass beadmaking in Mauritania, Ghana, and Nigeria. It is noted that a similar industry existed in South Africa that may pre-date production in West Africa.

Probable inspirations for the West African powder-glass industry are observed: both ancient glass beads from the post-Roman and Islamic periods, as well as modern glass trade beads from 19th-century Venice. We can see these influences in both antique powder-glass beads as well as the recent versions still being made. There is a thorough discussion of the construction of the old beads vs. the newly made ones.

The specific glass used in production is discussed, as well as the construction techniques. It is evident that a thorough study has been made of the specimens in the Steinberg collection, showing much innovative re-use of Venetian glass beads and bead parts. Since the "raw material" glass used in making most of the beads is Italian beads from the mid-19th century onward, it is believed that this is the same general time frame for the earliest powder-glass beads.

A helpful chart of twelve typical bead shapes appears after the opening history and before the three segments presenting bead photographs and captions. It shows four varieties of bicones, three oblates, two spheroids, and three barrels.

Each photo segment is a generous multi-page gallery of large, stunning bead images followed by thorough discussion of each and every bead by Allen, with intermittent comments and observations from Steinberg. The presentation is perfect. The visuals are absolutely commanding and the accompanying text is satisfying from both an academic standpoint from Allen and an artistic perspective from Steinberg.

The 29-page illustrated glossary of names, terms, and beadmaking techniques is invaluable, especially for the novice bead enthusiast. The knowledge found here can be used in many areas of bead collecting and research, even though the glossary is at the same time custom-built for this book. It makes the book approachable and provocative for any collector level.

In his acknowledgments, Steinberg graciously thanks the individuals by name who have offered him the beads in his collection. These are mostly African dealers from The Gambia who have made a living traveling between Africa and the United States for many years. My only regret is that no attempt seems to have been made to interview some of these people in order to learn the place of these beads in the family histories of which they were a part.

Allen explains that the primary objective of the book is to present old powder-glass beads in a manner that reveals their innate beauty and provides some context for their manufacture and importance to West African people. *Wild Beads of Africa* certainly accomplishes this goal. Thanks to this contribution, I feel that more collectors of African art as well as bead collectors will discover a greater appreciation for the beauty of old powder-glass beads.

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A Bag Worth a Pony: The Art of the Ojibwe Bandolier Bag.

Marcia G. Anderson. Minnesota Historical Society Press, Saint Paul. 2017. 266 pp., 300 color and b&w figs., appendices, index. ISBN 978-1-68134-029-6. $34.95 (soft cover).

Richly decorated bandolier bags were made and used by the Native nations of the Great Lakes region, notably the widely scattered Ojibwe (Anishnabe) peoples of Minnesota, Wisconsin, Michigan, and Ontario, but also by neighboring tribes such as the Potawatomi, Ho-Chunk (Winnebago), and Menominee.

Usually worn by men for ceremonial dances, the *gashkibidaagan* (plural *gashkibidaaganag*), as this style of beaded bag is called in the Ojibwe language, consists of a large rectangular cloth bag or panel with a broad shoulder strap. They were often worn in pairs, the straps crossing each other. Early examples, generally smaller in scale, were constructed on a heddle loom with a woven front panel and strap decorated with complex geometric designs. Later bags were made using the couched overlay (spot stitch or appliqué) technique, employing floral motifs in varying levels of complexity.

These most-impressive of impressive bags were produced in very large numbers, and the sheer volume of surviving examples represents a huge artistic achievement of the Native peoples of the region. So popular were they amongst the Great Lakes nations that they were traded with Plains tribes for horses and other trade items, hence the book's main title.

Just like the beaded bags that form the focus of this magnificent new study, Marcia G. Anderson's book has clearly been a labour of love, presenting research carried out over several decades.

An introductory chapter discusses the history of the Great-Lakes-style bandolier bag with its origins in a variety of earlier styles of hide pouches, some with applied quillwork decoration, their form perhaps inspired by European military bags and pouches with straps.

The second chapter analyzes the different forms of construction and styles of decoration of the *gashkibidaagan*, including details of the main front panel, usually incorporating the bag compartment, the opening of which may sometimes be reduced to a small pocket at the top, though on some later examples being just a decorated panel serving no actual function other than as a decorative accessory.

Also described is the treatment of the strap which may sometimes consist of two separate halves, though it is frequently sewn together as a single, continuous band. The various styles of woven tabs or bead-strung fringe decoration used along the lower edge of the main panel are also discussed.

The choices of materials available to the Ojibwe makers of *gashkibidaaganag* are also studied here, including a range of textile fabrics: woolen cloth, velvet, plain or printed cotton, bias binding for edgings, wool yarn for tassels, as well as the choice of glass seed beads, faceted *Sprengperlen*, and other beads obtained through trading outlets.

Chapter 3 discusses the rich repertoire of beadwork designs used, some traditional and age-old in origin, others influenced by designs from other tribes or the non-Native world. Geometric compositions and repeated linear border designs such as zigzags and so-called “otter tracks” were important traditional motifs to the Ojibwe, with origins in twined fiber bags, and these forms of decoration persisted well into the 20th century, while even early-style woven bandolier bags sometimes borrowed from European textile design sources such as patchwork quilts. Bold floral motifs as used on the later, larger *gashkibidaaganag* were routinely observed by Native beadwork artists from the local flora, including vines, tendrils, American white water lily, bunchberry, and broad-leaf arrowhead.

Further chapters deal with the subject of bandolier bags in historic photographs, a great many examples of which are illustrated. Also dealt with is the marketing of Ojibwe beadwork by local businesses of the day, including trading posts, curio stores, county fairs, and expositions.

The author goes on to present a series of reminiscences about *gashkibidaaganag* and their role in indigenous Native communities, and the efforts of specific collectors, entrepreneurs, and trading post owners to collect, preserve, and even document these magnificent beaded artworks from a range of Minnesota Ojibwe reservations: Grand Portage, Leech Lakes, Mille Lacs, Red Lake, and White Earth. Included in this section are examples of bandoliers by contemporary makers including Maude Kegg and Batiste Sam (Mille Lacs), Melvin Losh (Leech Lake), and Ellen Olson and Marcie McIntire (Grand Portage). In this respect, the art of making *gashkibidaaganag* is very much an ongoing Ojibwe tradition and looks set to continue well into the future.

This extraordinary 266-page publication is impeccably well researched and lavishly illustrated throughout with a wealth of color images of some of the finest extant beaded bandolier bags in museum and private collections, as well as a mass of historic photos of bags in use, both indigenous and non-Native.

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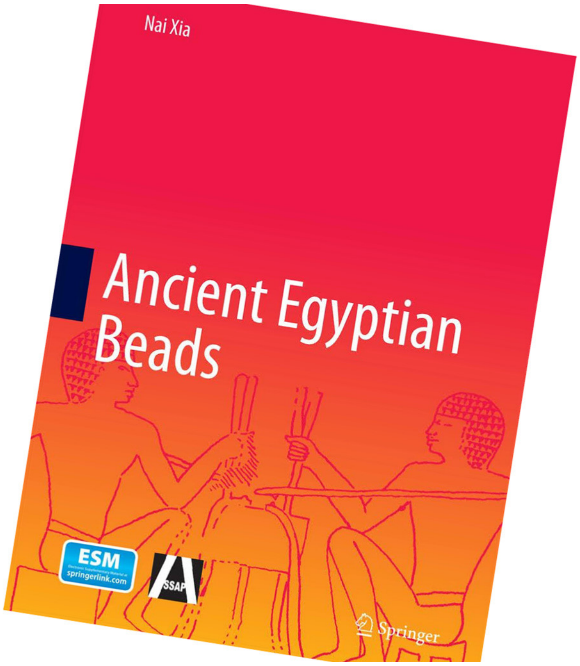
Ancient Egyptian Beads.

Nai Xia. Springer-Verlag, Berlin and Heidelberg. 2014. xiii + 174 pp., 20 B&W plates. ISBN 978-3-642-54867-3. $129.00 (hard cover).

Although this work was published in 2014, its inception dates back to 1938 when Nai Xia, a Ph.D. student from China, saw the research potential in the ancient Egyptian beads housed at the University College London and chose this as his dissertation project. When UCL was closed at the onset of World War II, Nai Xia returned to China and completed his dissertation there in 1943. He received his degree in 1946. The dissertation then sat on a library shelf until two UCL directors – seeing its research potential – began the task of editing and retyping it for publication. That finally happened 70 years after its completion. Thus, the material is dated in varying degrees but still remains the principal work on ancient Egyptian beads and pendants.

Following a Foreword and Preface which provide a background to this work, the book is divided into four parts:



1) Introduction, 2) Technical Methods of Bead-Making, 3) Classification and Corpus, and 4) Chronological Survey. The Introduction extols the Archaeological Value of Beads, explains the Scope of the Study, describes the Method of Registration and the Mode of Treatment, and concludes with Nomenclature and Identification of Materials.

Part II provides details about the techniques used to produce beads of glass, stone, pasty materials (faience as well as blue frit, "frit," pottery, clay, and vegetable paste), metal, and miscellaneous materials. The latter include bone, coral, ivory, resin (including amber), reeds, mollusc shell, ostrich egg shell, mother-of-pearl, and wood.

In Part III, the author points out the shortcomings in existing bead classification systems, including that of Horace Beck and several others, and proposes a new one coupled with a new corpus scheme, the basic unit of which is the "type." In this system, classification provides a basic framework for ordering beads while the corpus records the extent of variation within each type or subtype.

The Chronological Survey is extensive and takes up the second half of the book. It begins with the Prehistoric Period and ends with The Greco-Roman Period. The author concedes that since the chronology is based primarily on the Petrie Collection, some bead types are likely not represented or not represented in all their principal periods. He also points out the problems with the dating of the beads, noting that often a tomb is dated by all the funerary objects and then the beads are dated by the tomb. This results in the temporal range of a specific bead type being "unnecessarily extended a great deal." In addition to a detailed discussion of the beads that typify each of the nine chronological periods, Nai Xia provides information about bead use, the arrangement of beads in necklaces, and the stringing material.

Illustrations are restricted to 20 B&W full-page plates of line drawings which comprise the Bead Corpus and illustrate all the recorded bead and pendant forms for each material group. These were clearly derived from photocopies of the original drawings in the dissertation so aren't the best quality but are adequate for their intended purpose.

While this book is dated, it still contains a wealth of information about the perforated ornaments utilized in Ancient Egypt from their introduction during the Neolithic Period through to the end of the Greco-Roman Period. Unfortunately, the high price of the volume will keep it out of the hands of many researchers who would find it useful.

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BEADS: Journal of the Society of Bead Researchers

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