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Alice Scherer
Society of Bead Researchers
P.O. Box 13719
Portland, OR 97213
U.S.A.
alice@europa.com

Books for review and manuscripts intended for the journal should be addressed to:

Karlis Karklins, SBR Editor
1596 Devon Street
Ottawa, ON KIG 0S7
Canada
karlis4444@gmail.com

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INFORMATION FOR AUTHORS

Manuscripts intended for *Beads: Journal of the Society of Bead Researchers* should be sent to Karlis Karklins, SBR Editor, 1596 Devon Street, Ottawa, ON K1G 0S7, Canada, or e-mailed to karlis4444@gmail.com.

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IMITATION AMBER BEADS OF PHENOLIC RESIN FROM THE AFRICAN TRADE

Rosanna Falabella

Examination of contemporary beads with African provenance reveals large quantities of imitation amber beads made of phenol-formaldehyde thermosetting resins (PFs). This article delves into the early industrial history of PFs and their use in the production of imitation amber and bead materials. Attempts to discover actual sources that manufactured imitation amber beads for export to Africa and the time frame have not been very fruitful. While evidence exists that PFs were widely used as amber substitutes within Europe, only a few post-WWII references explicitly report the export of imitation amber PF beads to Africa. However they arrived in Africa, the durability of PF beads gave African beadworkers aesthetic freedom not only to rework the original beads into a variety of shapes and sizes, and impart decorative elements, but also to apply heat treatment to modify colors. Some relatively simple tests to distinguish PFs from other bead materials are presented.

Figure 1. Beads of phenol-formaldehyde thermosetting resins (PFs) from the African trade. The large bead at bottom center is 52.9 mm in diameter (metric scale) (all images by the author unless otherwise noted).

INTRODUCTION

Strands of machined and polished amber-yellow beads, from small to very large (Figure 1), are found today in the stalls of many African bead sellers as well as in on-line stores and auction sites. They are usually called "African amber" or "copal amber" despite the fact that many are made from phenol-formaldehyde thermosetting resins (hereafter phenolic resins or PFs). When questioned about the origin of the PF beads, both sellers and collectors indicate a probable European source, possibly German, and likely made during the interwar period. There seems to be no more specific information about them, in comparison to the relatively large amount of detail known about Venetian and other European glass beads that were made for the African trade.

The introduction of PF beads into the U.S. market is documented by Allen (1976:22) who notes that the trend began around 1971, with the "importation of large, attractive, amber-like, oblate-shaped beads from Africa." He reports that other shapes, such as barrel and spherical (Figure 2), were imported as well, but the short oblates are the most common. Contemporary bead sellers report that these beads are found in West Africa and the Maghreb countries, especially Mauritania and Mali, and in Ethiopia. Allen mentions Nigeria as an additional source, and he also notes "small-sized beads, often found in prayer strand format," coming from Egypt, the Middle East, and Afghanistan. Allen further comments that "some reputable jewelers and dealers... decided [the imitation amber beads] were Bakelite." Phenolic resins are often known only as Bakelite®, the original and most recognized trade name for this class of materials. In his pioneering work on identifying materials that imitate amber, Allen (1976) found that over half of the amber-colored beads he tested were a synthetic thermosetting resin. Most likely they were all made from PF.

Figure 2. Typical as-manufactured phenolic bead shapes found in the African trade.

The arrival of PF beads in the U.S. coincided with the flood of glass beads from Africa that began in the late 1960s and peaked in the early 1970s (Picard and Picard 1987:4). These beads primarily relate to the heyday of the Venetian and Czech bead industry: the mid-1800s to the mid-1900s. It therefore seems logical to assume, as many did, that the "African amber" beads were roughly the same age.

In fact, the author found one seller of PF beads who attributed them to the late 1800s. Phenolic resins were not produced until 1910 (Crespy et al. 2008), so this claim is incorrect. Two modified natural products – Celluloid (based on cellulose, registered in 1870) and Galalith (based on milk casein, invented ca. 1890) – were used for beads from the late 1800s and into the interwar period. These two early plastics were also used for imitation amber, and since their period of use overlaps with PF up through at least WWII, there is the possibility of confusion among the three materials. The author, however, has not yet found any examples of Celluloid or Galalith beads in the African trade, so the present study is focused on PF beads.

To gain accurate information about "African amber" beads, the author initiated a search for the makers of PF beads, and when and how the beads arrived in Africa. The investigation began with a review of the development of PFs. Industrial chemistry texts, including two by Carleton Ellis (1923, 1935), were very helpful in placing PFs in their historical context as amber imitations and bead material.

HISTORICAL INFORMATION ON PHENOLIC RESINS

Belgian-born chemist Leo Baekeland succeeded in overcoming the technical difficulties of making solid masses from phenol-formaldehyde combinations and began submitting his inventions, which covered the compositions and technology for molding PFs, to the U.S. Patent Office in 1907. He was awarded numerous patents, starting in 1909 (Baekeland 1909a, 1909b). Phenolic resin became the world's first industrial-scale, fully man-made material, following the development of modified natural products such as Celluloid and Galalith.

Phenolic resins are of two basic types: powders with added filler meant for compression molding and casting resins that are poured into open molds and cured without pressure. Unlike thermoplastics, which can be melted and reshaped, phenol-formaldehyde formulations are thermosetting resins that must be machined to final dimensions after curing unless the final shape is produced in the mold. Compression molding compounds are generally designed for industrial uses such as electrical connectors, or items like radio housings. Casting resins were developed alongside molding resins, and are assumed to be the materials used to make beads due to their use as "turnery" materials; i.e., materials designed for machining on a lathe. Castings in the form of rods, sheets, and tubes were the raw stock used to make items like beads and bangles; special shapes like curved umbrella handles were also made by pouring PF resin into lead and glass molds. The castings were hammered out of the lead molds or the glass was broken to remove the article after the cure was complete.

During the period 1905-1910, as Baekeland was conducting research, scaling up his home laboratory production, and opening factories to make his patented Bakelite® resins in the U.S., Germany, and elsewhere, the rest of the industrial chemistry world was not idle. Patent activity in England, Belgium, Germany, and France during the same period shows many inventions for PF formulations (Ellis 1935: Chapter 13) and some are described as "hard translucent resins useable as substitutes for copal, amber, and shellac" (Ellis 1935:287).

Patent applications related to amber and ivory imitations were filed between1910 and 1912 by Fritz Pollak of Berlin, who disclosed ivory-colored PFs, those with a range of colors from transparent bright red to yellow, and formulations designed to eliminate the rapid color change of PFs once they were exposed to air (Pollak 1911, 1917). In the U.S., Redman (1914) devised ways to improve the toughness of PFs, described their use as artificial amber, and disclosed a method for imparting a ruby-red color to PFs.

An interesting side note to the development of the PF industry is that the worldwide supply of phenol, one of the starting materials required for PF production, was mainly provided by Germany and England prior to WWI (Ellis 1935:359). German chemists were providing expertise to the factories set up by Baekeland in both England and Germany; being a source of phenol made these countries an obvious choice for new plants. When WWI began in July of 1914, the German chemists in England were evidently sent home, and production of PF resins in the U.S., England, and Germany turned toward providing materials for military use (Holdsworth 2015; Mumford 1924:68-80).

The story of PF resin development picks up after the war ended in November of 1918. In England, the 1919 production of PFs for castings reached one-half ton per week at the Damard plant (Holdsworth 2015) which had entered into collaboration with the U.S.-based Bakelite Co. in 1910 (Crespy et al. 2008). More patents were filed that mention amber substitutes; e.g., one that discloses a method for making multi-colored blocks of PF with amber, ruby red, emerald green, and opaque white layers (Redman et al. 1922). Note that PF patent activity was occurring before the original Baekeland patents of 1909 ran through their 17-year protection period. In Europe, the Bakelite GmbH patent of 1908 filed by Baekeland was invalidated by the 1921 challenge of Pollak (Ullman 1931:4). Ullman also relates that a change of catalysts from those described in Baekeland's first patents allowed an independent German PF resin industry to develop.

The breadth of the PF industry by the mid-1930s is demonstrated by the list of trade names documented by Ellis (1935:1380-1419), one that totals over 300, with over 70 PFs specifically noted as turnery materials, or provided as sheets, rods or tubes, both required by the bead and jewelry industry (Tables 1-4). Product names from Ullman (1931), Baekeland and Bender (1925), and translated *Die Perle* articles (Gumpert and Karklins 2005) were cross-referenced and added if relevant. These lists are provided in the hopes that they will aid further investigation into the history of PF beads.

With such a large number of commercial PFs, the point can be made that it would essentially be impossible to determine the pedigree of any individual PF bead after the fact without significant additional information. The chemical formulas disclosed in patents may provide some basis for distinguishing one PF from another – for example, if a unique element was used – but trade names are not indicated in patents and further historical information about individual products would be needed. It is notoriously difficult to reverse-engineer thermosetting resins in anything but a general way once they are cured and, to make the effort more difficult, it is also likely that many formulations were held as trade secrets. Given this situation, it is easy to see how Bakelite®, the trade name of the first patented PF material, passed into general usage for all PFs.

Another indication of the widespread use of PFs for imitation amber during the interwar period is the law for the protection of natural amber passed by the German Reich in 1934. The law restricted the use of the term "amber" or a word complex that included "amber" to natural amber products with no additives. The cheaper imitation materials were apparently having severe negative consequences for the German amber industry (Ganzelewski 2004:475).

To summarize, phenolic resin production began in 1910 with the founding of the General Bakelite Company in the U.S. After WWI, a large PF industry developed in England and Germany in particular. Building on the pioneering work of Baekeland and others, numerous modifications to the manufacturing process and the chemistry of PFs were disclosed in the patent literature. Some of these materials were optimized for certain properties or applications such as improved machinability or clarity of the final product. The chemical reactions, intermediate chemical species, side-reactions, etc., of these PF formulations are discussed in a very large outpouring of technical literature (Ellis 1923, 1935; Ullman 1931). Amber imitations are mentioned numerous times from the very earliest work on PFs, as there was evidently keen commercial interest in replacing expensive natural amber.

THE BIRTH OF PHENOLIC RESIN BEADS

Even though PF materials that could have been machined or turned into beads were being manufactured as early as 1910, specific mention of PFs for beads is not found in references until the early 1920s. In Ellis' (1923) text on synthetic resins, beads are specifically mentioned as end products for PFs that were formulated for turnery applications (Ellis 1923:93, 114, 163, 165). Ellis (1923:164-165) has a page on "Infusible Transparent Cast Products from Phenol and Formaldehyde" with sub-headings "Artificial Amber" and "Methods of Making Transparent Products," both of which mention beads. The products described include "[added] substances such as fish scales and powdered mica to produce a shimmering effect... waxes for the purpose of producing a cloudy amber effect, and dyes of many different colors for producing material suitable for beads and various novelties."

In the mid-1920s, jewelry made from PFs appears in some publications relating to Bakelite®. Mumford (1924:24) describes "gleaming, cut Bakelite beads of blue or vermillion, or green or purple or amber yellow." A 1924 color chart showing beads of Bakelite® Pearl Colors and squares of Bakelite® Jewel Quality Colors is reproduced in Davidov and Dawes (1988:17). A Bakelite® Corporation brochure of 1926 shows a triple string of beads (Elfrink 2014).

Table 1. German PF Trade Names, ca. 1924-1935.

Utilit (Utilith), Albolit (Albolith)	Augsburger Kunstharz-Fabrik, Augsburg
Pantolit	Augsburger Kunstharz-Fabrik, Augsburg
Resinit (Resinite)	Bakelite GmbH, Berlin
Alberit	Chem. Fabr. Dr. Kurt Albert, Weisbaden
Lor-Wal-Lith	Chemie & Technik J.M.S. GmbH, Hamburg
Dekorit, Leukorith, Vigorith	Dr. F. Rashig, Ludwigshafen
Faturan	Dr. Heinrich Traun & Son, Hamburg (later acquired by Herold AG)
Trolon	Dynamit AG, Troisdorf
Ivorax, Marbolith, Elastolith	Herold AG, Hamburg
Herolith, Ornalith	Herold AG, Hamburg
Taumalit	Isopresswerk, Berlin
Wenjazit	Kunst-Rohstoff AG, Hamburg
Resan, Resanit	Kunstharzfabrik Resan, Mosbierbaum
Koraton	Wedig & Reuss, Eilenburg
Neoresit	Nowak, Bautzen

Table 2. U.S. PF Trade Names, ca. 1924-1935.

Gemstone	A. Knoedler Co., Lancaster, PA
Catalin, Prystal	American Catalin Company; later, Catalin Corp., New York
Panplastic	American Plastics Corp., New York
Bakelite, Resan	Bakelite Corp., New York; Bakelite GmbH, Berlin; Bakelite Ltd. Co., Britain; also France, Canada, Sweden, Italy, and Japan
Condensite, Redmanol	Acquired by the Bakelite Corp., New York
Catalazuli	Catalazuli Manufacturing Co., College Point, NY
Ivaleur	Celluloid Corp., Newark, NJ
Dilecto	Continental-Diamond Fibre Co.
Crystillin	Crystillin Products Corp., Brooklyn, NY
Phenolin	DuPont Viscoloid Co., Newark, DE
Marbalin	Federal Cutlery Co., NY
Fiberlon	Fiberloid Corp., Indian Orchard, MA
Textolite	General Electric Co., Schenectady, NY
Durez	General Plastics, Inc., N. Tonowanda, NY
Jewelin	Jewelin Corp., Woodside, NY
Joanite	Joanite Corp., Long Island City, NY
Marblette	Marblette Corp., Long Island City, NY

Table 3. United Kingdom PF Trade Names, ca. 1924-1935.

Formite	Bakelite Ltd., formerly Damard Lacqueur Co. Ltd, London
Bexite	British Xylonite Co., Ltd., London
Idonite	Damard Lacquer Co. Ltd., Birmingham
Tufnol	Ellison Insulations, Ltd., Birmingham
Trolone	F.A. Hughes & Co. Ltd., London
Lacrinite	Lacrinoid Products, Ltd., London
Lorival	Lorival Mfg. Co. Ltd., Southall
Metduro	Metduro, Ltd., London

Table 4. Other European PF Trade Names, ca. 1924-1935.

Formit, Ambrasit, Ultrasit	Chemische Fabrik Ambrasit, Vienna, Austria
Eolit, Ivoit, Juvelith, Schellit	Kunstharzfabrik Dr. Fritz Pollack, Vienna, Austria
Durolit	Soc. Du Duroid, Enghien, Belgium
Solith	Tschechoslovakische Kunstharzfabrik, Olomouc, Czechoslovakia
Ivrit	Établissement Kuhlmann, Paris, France
Amberglow, Écaille 97%, Similex, Similit	Laboratoires Industriels d'Asnieres, Paris, France
Lucienit	Lucien Eilertsen, Paris, France
Agatine, Nobeline	Soc. Nobel Française, Paris, France
Cristaloid	Unknown, France
Ivrite	Soc. Anon. Ivra, Torino, Italy
Xilite	Unknown, Italy
Haefelyte	Emil Haefely et Cie., Basel, Switzerland

Note: Ambra, Dekufit, Fibroc, Ivorloid, Ronyx, and Tenalan are additional trade names listed in Ellis (1935) and Gumpert and Karklins (2005) with no identifying business name or country of origin.

An obscure German jewelry trade journal from the 1920s, *Die Perle*, was fortunately discovered, reviewed, and select articles translated by Gumpert and Karklins (2005). There are specific mentions of PFs developed for beadmaking. A 1924 article describes a new German PF material, Utilit, with "a rich scale of colors, from transparent to vivid red," for "use in manufacture of beads," and another the same year mentions additional materials – Dekorit and Leukorit – for the manufacture of beads. Dekorit is listed as an "amber substitute" in Ellis (1935:1391). Juvelith, the "synthetic material that most resembles amber," was also reported in 1924. In 1926, *Die Perle* introduces Vigorit, which has "greater solidity and stability of colors when exposed to light," and Dekufit (manufacturer unknown, possibly related to Dekorit) "which is available in all imaginable colors and is well-suited for beads and other products." Tables 1 and 4 provide more details about these products.

The firms that manufactured PF as raw stock and turnery material likely did not manufacture beads. In the excerpts from *Die Perle*, there is an advertisement for a company called Sächsisch. Kunsthorn-Industrie, based in Neukirch (Lausitz), with the notation, "*Perlen, Colliers, Knoepfe aus Galalith und imit. Bernstein fabriziet als Spezialität*," or "beads, necklaces, buttons of Galalith and imitation amber fabricated as a specialty" (Gumpert and Karklins 2005:20). It should be noted that Galalith was also used as an amber substitute, so mentioning Galalith *and* imitation amber strongly suggests that materials other than Galalith, such as PF, are indicated.

The conclusion drawn from the foregoing information is that PF imitation amber suitable for beads, and possibly developed specifically for beads, was in use by the mid-1920s. Phenolic resins were being produced in the U.S. and all over Europe, especially in Germany and England. Additionally, imitation amber beads were certainly being made from PF for the costume jewelry trade in the interwar period, but no references were found regarding the production of PF beads specifically for trade to Africa during that period.

PHENOLIC RESIN BEADS FOR THE AFRICAN TRADE

When starting this investigation, the author hoped to find dated bead sample cards – one of the gold standards of trade bead research – showing the various PF beads found in today's collector's marketplace. Unfortunately, most of the cards encountered only exhibit beads made of glass or ceramic (e.g., Neuwirth 2011: Plate 25B). Two notable exceptions are cards labeled "Imitation Amber Beads" that bear the logo of the Sachse Company, a well-known jewelry and bead export firm that operated in Jablonec nad Nisou, Czech Republic, from the late 1800s until 1920, when the business was sold. Albert Sachse developed a significant export trade to West Africa (Kaspers 2014:45), so the beads on the sample cards have a very high probability of entering the Africa market during the first two decades of the 20th century.

Held by the Museum of Glass and Jewelry in Jablonec nad Nisou, the cards show mostly medium-brown beads, with a few ivory-colored specimens (Figure 3). The brown beads look similar to short barrel-shaped PF beads found in today's African trade, but they are brown rather than amber yellow. It is possible that they are PF beads that have discolored over the years, but Celluloid and Galalith are also distinct possibilities (Jiroušková et al. 2011:11). Unfortunately, since the author has not been able to personally examine the cards and requests to the museum regarding them have gone unanswered, the composition of the beads remains uncertain.

It is not known to what degree PF beads were manufactured during the war years. Though small-scale glass beadmakers did operate in rural Germany until 1942 (Vierke 2006:417), it is likely that the plastics industry was soon set to producing materials primarily for the war effort, especially since the National Socialists considered the bead industry a "nonsense industry" that produced "racially intolerable Negro jewelry" (*"Mumpitz-Industrie... rassisch nicht tragbaren Negerschmuck"*) (Karlis Karklins 2014: pers. obs., Historisches Museum Bayreuth "bead room" exhibit text). While the German glass bead industry

Figure 3. Sample cards of "Imitation Amber Beads" from the Sachse Co., Czech Republic, ca. 1920s (photo: John Picard).

recovered quickly after 1945 (Vierke 2006:136), it is not known if the PF bead industry did as well.

An article by Günther Kuhn (2002) provides support for the post-war German production of PF beads for the African trade. It contains a photo from 1951 that shows strands of very large, presumed PF beads, on their way to Sudan via Tangier by air, for use as *Bernsteingeld* or amber money. The beads are mostly short cylinders, up to about 50 mm in diameter, with some much smaller beads that could be short oblates. Kuhn's father bought two strands of similar beads from Bernstein-Manufaktur Hamburg in 1952. The author believes the beads are made of PF, based on Kuhn's description of how the color of the beads has changed over the last 60+ years from yellow-brown to dark coffee brown. Age-related browning is a well-known trait of PF resins (*see* below).

A memo sent to Kuhn's father by Bernstein-Manufaktur Hamburg on 22 February 1952 reveals that PF beads were more affordable than natural amber:

> We cannot deliver a bunch of *Negerkorallen* [Negro coral] from natural amber or pressed amber for a price of DM 10 even if we deviate from the standard weight of 320 grams. We recommend, however, a bunch of *Edelkunstharz* [a German term for cast PF; literally, precious art resin] in amber color, which certainly serves the same function as a showpiece for your collection (Kuhn 2002:24) (translated from German by the author).

Based on Kuhn's report, PF beads were traded into Africa as imitation amber after WWII and were a viable product due to the high price of natural amber. The Hamburg connection was a dead end for further details in that the firm that bears the name Bernstein-Manufaktur today is a completely different company than the one that sold beads in 1952 (Bernsteinmanufaktur Hamburg 2015: pers. comm.). But a link to Königsberg was discovered when information was received naming Gerhard Rasch, a former manager of the Bernstein Manufaktur-Königsberg operations that were relocated to other parts of Germany due to the war, as the founder of the original Bernstein-Manufaktur Hamburg in 1945 (Günter Kuhn 2015: pers. comm.). Kuhn followed many leads but could not find anything else about the manufacture of the (presumed) PF beads his father purchased.

Saechtling and Küch (1951) discuss a rising post-WWII demand for *Edelkunstharz*. This "precious art resin" has the same triboelectric properties as amber (i.e., it takes on a static charge when rubbed) and so passes the electrostatic test used by the customer for amber. The implication is that the buyers believed the material was natural amber. The intended trade was to Africa, as indicated by its use as *Negergeld* (Negro money) and *Negerschmuck* (Negro jewelry). They also reveal that real amber from East Prussia was no longer available for this purpose.

PF stock and beads continue to be made. For instance, the website of the Raschig company based in Jaipur, India, offers "original German Catalin and Faturan" made at factories in Germany, India, and Thailand (www.raschig.net). Their site is linked to CatalinRods.com, a subsidiary based in Thailand, which produces beads and rosaries using "genuine cast phenolic resin [that] has the same chemical, physical, and optical properties as vintage made phenolic resins" (CatalinRods.com 2009: About Us). It is highly likely that their products are among the new PF prayer strands that are currently readily available from online auction sites. Whether such contemporary PF beads have found their way into Africa is unknown.

The above sources provide evidence that the PF beads we see today in the African trade could have been produced and introduced after WWII, especially since some of the capacity of the German PF industry was restored by the new Bakelite GmbH plant in Iserlohn-Letmathe in the early 1950s (Wikipedia 2016). There is, of course, the possibility that some of the beads traded after WWII were either pre-war products or made from pre-war stock (Karklins 2016: pers. comm.). The Sachse sample cards are likely evidence of PF beads for the African trade prior to 1920. More research is needed in order to establish links between PF bead manufacture and the African trade during the interwar period.

PHENOLIC RESIN BEADS IN TODAY'S AFRICAN TRADE

PF beads are easy to find at a variety of venues, although in the past seven years the author has noticed that the availability has dropped and the prices have increased correspondingly. These beads are rarely marketed as phenolic resin. Instead the terms "African amber" and "copal amber" are in wide use as generic terms not only for PF beads but also for other imitation amber beads such as those made from thermoplastics, dyed horn, etc. The term "copal amber" is especially unfortunate since it is a meaningless term – a substance is either copal or amber. Allen (1976) relates how "copal amber" or "so-called copal" was represented as "amber from Africa" and that "many people forgot their fears that African amber was plastic" in continuing the misidentification.

The term "copal amber" also appears in the section on Natural Beads in a booklet by Gordon and Kahan (1976). Their sketch of a "copal amber" bead looks very much like a short, oblate PF bead, complete with a typical pattern of long, sparse cracks, such as seen on the largest bead in Figure 2. It is the author's opinion that their "copal amber" beads are actually made of PF, based on the range of colors noted (golden yellow to deep red or warm brown), the opacity (opaque or partially transparent), and the surface cracks (Figure 4). Regardless, it seems that a new term, "copal amber," arose around the time that PF beads from

Figure 4. Color variation and marbling in PF beads from Africa.

the African trade were appearing in U.S. markets. One can speculate that whether or not people realized the beads were of man-made thermosetting plastic, instead of calling them "imitation amber," "synthetic resin," or another more accurate term, the term "copal amber" was invented, perhaps as a marketing tool.

A few distinct shapes and sizes of PF beads are seen repeatedly in African trade strands: short oblate, cylindrical, and round (Figure 2), with short oblates 30-40 mm in diameter especially numerous. The shapes and quantities suggest machining and polishing on a mass-production scale, presumably using rod stock of standard sizes. Based on the number of beads the author has seen for sale in various venues, it would appear that tens of thousands of these beads were made.

Phenolic resin is much harder, more rigid, and more durable than the natural amber it imitates. Artisans in Africa have taken advantage of these traits to rework the original beads into beautiful and sometimes intricate works of art (Figure 5). The simplest modification is cross-drilling (drilling a hole perpendicular to the original one) which allows the beads to be worn flat. A second common modification is reshaping cross-drilled beads into soft diamond shapes, a traditional shape found in Africa among real amber beads.

Diamond and other bead shapes are found with scribed lines and circles, as well as pigmented dots. Finally, flat pieces that were likely sawn or broken from thick beads, or taken directly from rod stock, are perforated and fashioned into openwork designs (Figure 6). Many of these altered PF beads come from Mauritania where they are used as ornaments woven into women's hair (Christine Smoot 2015: pers. comm.) and in traditional necklace designs.

PF beads are also found with patterns of small dots as well as larger irregular areas that were made by burning the surface, presumably with a hot point in the case of the former and a small flame (cigarette lighter perhaps) for the latter (Figure 7). This figure also shows PF beads with smooth concave pits, also presumably applied for decorative purposes, and several beads that exhibit characteristic cracks that serve as "natural" decoration.

IDENTIFYING PHENOLIC RESIN BEADS

As previously discussed, Galalith, Celluloid, and a number of completely synthetic polymers have been used as amber substitutes (Gierlowska 2003). A few African trade beads are made of high impact polystyrene, polyester, and dyed horn. Aside from the analytical laboratory, there are ways to confirm that a bead is made from a PF, using easily obtained equipment and chemicals. One consideration that needs to be kept in mind when examining PF beads is that many formulations of phenol and formaldehyde were made into commercial products and a range of properties can be expected. Exactly how the specific formulations affect the final properties of PF beads would require analytical instrumentation and samples of known composition.

Color Instability

The early PF literature reveals that formulations had unstable color, a distinguishing feature of this material that can help with identification. PF products made in a mold in light colors darkened to red and brown with exposure to ambient conditions. The color change in some cases occurred within a few weeks to a month (Ellis 1935:335; Ganzelewski 2004:477). Some patents disclose ways to eliminate the problem, including the obvious but highly impractical fix of excluding oxygen (Redman et. al. 1920). Reducing excess phenol or using purified phenol are methods also disclosed in patents (Hessen 1931; Pollak 1917). There are mentions of special formulations to enhance color stability via more expensive starting materials when cost was less of a problem as, for example, for jewelry applications (Ellis 1935:326). The color stability problem of PFs was still being tackled in the 1960s as shown by an invention that used glyoxal to prevent or delay the color change in PFs (Feigley 1961).

The color change is attributed to unreacted excess phenol or impure raw materials or catalysts, all of which lead to the development of chemical compounds that gradually oxidize to dark colors (Ellis 1935:335). The red color, often called cherry red, is due to the presence of aurin, a chemical that is bright red at a pH over 6.8. Aurin is one of the possible condensation products of phenol and formaldehyde (Ellis 1935:294, 312). Translucent beads for costume jewelry that have this distinctive color are normally called "cherry amber," another notable conflation of natural and synthetic material terminology.

The PF material with the trade name Faturan (Table 1) deserves special mention with regard to color instability. Holdsworth and Faraj (2015) state that Faturan has the unique characteristic of "always oxidizing to a dark red" regardless of the original color. They dissected a dark red shift knob and revealed that the material beneath a thin outer layer of cherry red was comprised of amber yellow and green PF. Faraj (2016: pers. comm.) has further experimented with making new beads from old pieces of Faturan (from a contact who has mined a defunct factory site for pipe mouthpieces and umbrella handles) and observed the red color developing on the surface in a matter of weeks.

Figure 5. Modified oblate beads and smaller pieces of PF beads from Africa. Remnants of the original and cross-drilled holes are visible on some beads.

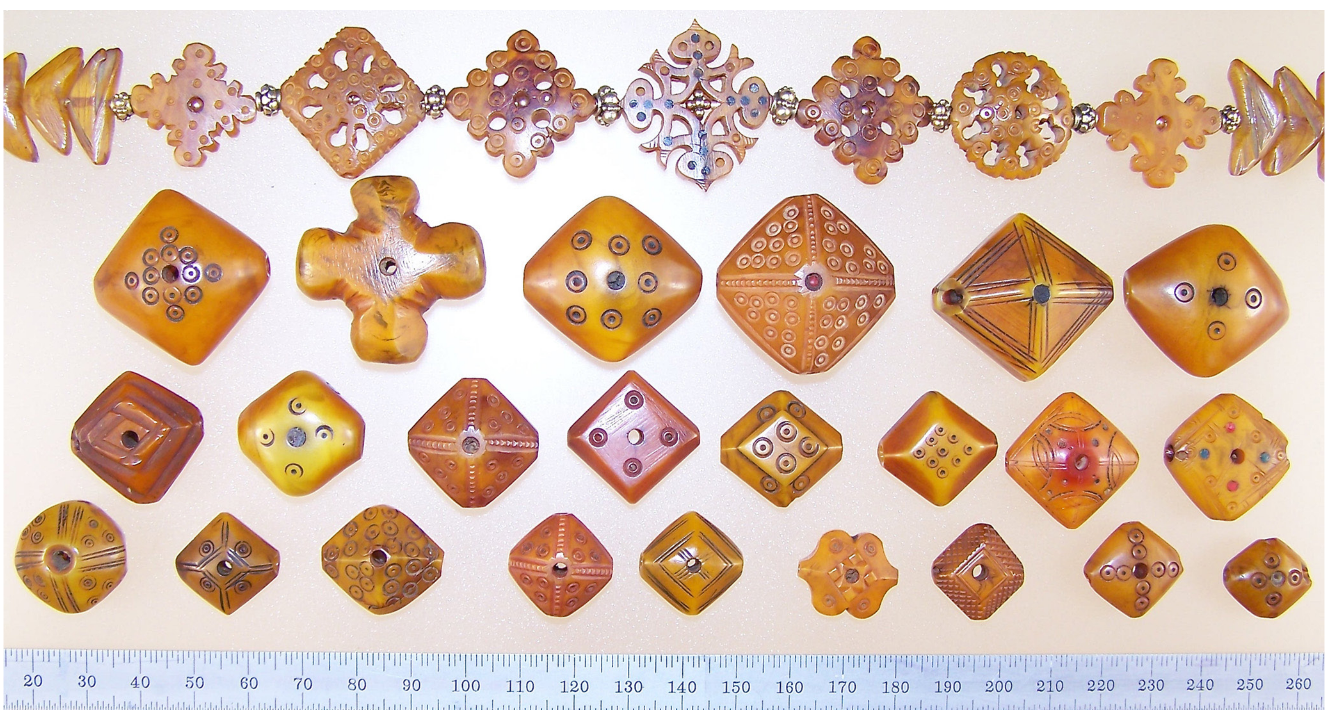

Figure 6. Carved, drilled, and decorated PF beads from Mauritania, Mali, and Morocco. The center bead, top row, and the two right-most beads, third row, show added red and blue pigment.

Figure 7. PF beads from Ethiopia showing a variety of surface modifications.

Figure 8. PF bead subjected to elevated temperatures in air (right) compared to an unheated one (left). Thermal cycle was 1 hour at 121 C, followed by 1 hour at 149 C, followed by 1 hour at 177 C.

Figure 9. Heat-treated PF beads from Africa. Note that some beads have been reshaped as well as heat treated.

Since a large number of formulations of PFs were developed in the same time frame as Faturan (the earliest reference found by Holdsworth and Faraj is 1917), and many patents sought to overcome the problem of relatively rapid color changes in PFs, it is possible that Faturan is not the only product that manifested this behavior. Additional research on early commercial PF formulations is needed for clarification.

The reaction that spontaneously turns some PF resins dark red at room temperature may be accelerated in other, more color-stable PF resins by heating them to temperatures of 121-177 C for short periods of time. The surface color will progressively change from the original amber yellow to red to dark reddish brown to almost black. This accelerated color change confirms the composition as PF; the color is irreversibly changed, however. The heat treatment of amber-colored PF beads to effect color changes was reported by Allen (1976:26) and has been repeated by the author (Falabella 2015a, 2015b). A typical result of heating a PF bead to temperatures of 121-177 C is shown in Figure 8.

Red and red-brown PF beads are found among the amber-colored beads in the African trade (Figure 9). The color could be due to the use of the type of PF that changes color under ambient conditions, but in all probability it is the result of a heat treatment applied by the African owners. One color-altering technique reportedly employed in Africa is heating in palm oil (John Picard 2015: pers. comm.), presumably to help avoid thermal gradients and the resulting stresses that can break the bead (a bead heated by the author to about 232 C in air broke in half).

Identification Tests

Relatively simple tests that do less permanent damage than heat treatment can be employed to identify PFs. Unfortunately, none are completely non-destructive and some require a keen sense of smell. In general, the author uses visual inspection of PF beads to identify them, and confirms the composition with other tests if necessary.

PF beads often have surface cracks that are indicative of the very slow shrinkage of the material over time or of heat treatment. The cracks appear as dark lines on several beads in Figures 1, 2, 6, and 8. Such cracks do not appear in all PF beads, however. As with some of the other properties of PFs, the presence or lack of cracks may be due to differences in chemical formulation rather than age or exposure conditions.

The surfaces of many amber-colored PF beads turn shades of yellow-brown to brown with age (Kuhn 2002). This change is distinct from the red color that results from heat-treatment or from a PF composition that is intrinsically unstable. That the brown color exists in a thin surface layer can be seen on beads where the layer has been worn away by rubbing on adjacent beads (Figure 10). This layer cannot be washed off, showing that it is not a patina resulting from contact with skin oil and dirt. It can, however, be rubbed off and the original color restored. The gradual browning of the surface of PF jewelry items is well known by vintage Bakelite® jewelry collectors. After studying the chemistry of the degradation of PFs, the author believes the brown color is either due to: 1) the oxidation of small amounts of free phenol on the surface (the oxidation products of phenol are varied and include highly colored compounds such as benzoquinones), or 2) the breakdown of cured PF into colored aromatic compounds.

The brown surface of old PF beads will often, but not always, give a positive reaction to being touched with a cotton swab wet with a tiny amount of a 10% ammonia solution. The swab will turn dark mustard yellow. A reaction with free phenol or one of the oxidation products

Figure 10. PF beads showing age-related surface browning with the original color visible at wear spots around the perforations.

of phenol is presumed but not proven and would be an interesting investigation. Ammonia-containing products such as Simichrome® (a metal polish made in Germany) are commonly recommended in the vintage plastic jewelry trade to confirm old PF articles. Since Simichrome® contains a mild abrasive, using it for spot testing may remove some of the surface layer. Products such as Purple Power® that contain sodium hydroxide will also give a positive test. The author has found that red heat-treated PF beads do not give a positive result, presumably because the reactive compounds on the surface have evaporated or degraded.

Determination of the density of a bead by weighing, then determining the volume by water displacement, can be useful to distinguish PF (specific gravity 1.35-1.38 g/cc) from amber (1.05-1.10), polystyrene (0.96-1.05), and acrylic (1.17-1.20). But the density of PF is too close to polyester (1.38), Celluloid (1.4), Galalith (1.35), and possibly some epoxy resins for this physical property to be definitive.

A favorite test of the author is the use of a diamond-grit bead reamer to remove some material from the surface of the perforation (this assumes the perforation is not coated with dirt which must be removed). If the resulting dust is sniffed immediately, the musty, medicinal odor of phenol (also known as carbolic acid, an old disinfectant) can be detected if the bead is made from PF. The dust will typically be a mustard yellow color, regardless of the outer surface color. Other plastics, like acrylic and polystyrene, have a distinct plastic odor. Galalith, which is based on the milk protein casein, yields dust that smells like burnt milk and Celluloid dust smells like camphor. Dust from horn beads may smell faintly like burned hair. Natural amber dust has a pleasant pine odor.

The smell test may be also be done by touching a red-hot needle point to the bead. A spot just inside the hole is the least intrusive. The hot needle will readily sink into all thermoplastic materials and amber, but not into PF, Galalith, or horn. This test must be approached with caution as it involves the risk of inhaling potentially toxic fumes, and Celluloid is very flammable. Some amber-colored PF beads collected by the author have small, dark burn marks that were probably hot-point tests used to prove that the material is PF and not natural amber or thermoplastic. Running very hot water over a bead until it is heated up can also give a positive result in the smell test, but this treatment can remove patina.

CONCLUSION

The year 1910 has been established as the start of industrial production of phenol-formaldehyde resins and therefore, the earliest possible date for beads made of this material. By the early to mid-1920s, many PF products for imitation amber articles and beads are discussed in the literature, and by the mid-1930s, over 70 commercial product names exist for PF materials suitable for beads. Despite strong circumstantial evidence that imitation amber beads were probably made for the African trade in the first few decades of PF production, no firm documentation has been found to support this. Importation of PF beads into Africa during the early years of WWII is a possibility and seems to have revived in the post-war period. Circumstantial evidence points to Germany as the probable place of manufacture.

When PF beads came on the U.S. market around 1970, the widespread use of the terms "African amber" and "copal amber" for them appeared to be the result of the original marketing of the beads as a substitute for natural amber, or possibly as a form of genuine natural amber or copal. The same terms persist in today's market, not only for PF beads, but for beads made of other synthetic materials.

More work is needed to establish the earliest dates and manufacturing sites of PF beads found in the African trade. It is hoped that bead historians and researchers in Europe in particular will find this report helpful in the event they find relevant information about PF beads in their respective locales.

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REFERENCES CITED

Allen, Jamey D.

1976 Amber and Its Substitutes. Part. III. Is it Real? Testing Amber. *The Bead Journal* 3(1):20-31.

Baekeland, Leo H.

1909a Method of Making Insoluble Products of Phenol and Formaldehyde. U.S. Patent 942,699.

1909b Condensation Product of Phenol and Formaldehyde and Method of Making the Same. U.S. Patent 942,700.

Baekeland, L.H. and H. L. Bender

1925 Phenol Resins and Resinoids. *Industrial and Engineering Chemistry* 17(3):225-237.

Crespy, Daniel, Marianne Bozonnet, and Martin Meier

2008 100 Years of Bakelite, the Material of 1000 Uses. *Angewandte Chemie International Edition* 47:3322-3328.

Davidov, Corinne and Ginny Redington Dawes

1988 *The Bakelite Jewelry Book*. Abbeville Press, New York.

Elfrink, Brad

2014 *Bakelite: Mystery, History & Facts*. http://www.elvenkrafte.com/bakelite%20presentation.htm, accessed 3 Sept. 2016.

Ellis, Carleton

1923 *Synthetic Resins and Their Plastics*. The Chemical Catalog Company, New York.

1935 *The Chemistry of Synthetic Resins, Vols. I. & II*. Reinhold Publishing, New York.

Falabella, Rosanna

2015a Experiments with Heating Phenolic Beads. http://beadcollector.net/cgi-bin/anyboard.cgi?fvp=/openforum/&cmd=get&cG=336363836333&zu=333636383539&v=2&gV=0&p=, 21 July 2015.

2015b Cherry Amber Fresh out of the Oven. http://beadcollector.net/cgi-bin/anyboard.cgi?fvp=/openforum/&cmd=get&cG=338313837333&zu=333831383733&v=2&gV=0&p=, 3 August 2015.

Feigley, David A., Jr.

1961 Color Improvements in Phenol-Formaldehyde Resins. U.S. Patent 3,005,798.

Ganzelewski, Michael

2004 Bernstein-Ersatzstoffe und Imitationen (Amber Replacement Materials and Imitations). In *Das Bernstein-Buch. Die Tränen der Götter: Kunst, Schmuck, Medizin und Magie* (The Amber Book: Tears of the Gods: Art, Jewelry, Medicine, and Magic), edited by Sylvia Botheroyd and Paul F. Botheroyd, pp. 475-481. Atmosphären, München.

Gierlowska, Gabriela

2003 *Guide to Amber Imitations*. Bursztynowa Hossa Publishing House, Gdansk. Translation by Anna Moroz-Darska.

Gordon, Albert F. and Leonard Kahan
1976 *The Tribal Bead: A Handbook of African Trade Beads*. Tribal Arts Gallery, New York.

Gumpert, Anita von Kahler and Karlis Karklins
2005 Die Perle: A 1920s German Trade Journal. *Beads: Journal of the Society of Bead Researchers* 17:19-34.

Hessen, Richard
1931 Manufacture of Condensation Products from Phenol and Formaldehyde. U.S. Patent 1,816,255.

Holdsworth, Ian
2015 Cast Phenolic Resin. Plastic Historical Society, London. http://plastiquarian.com/?page_id=14339, accessed 3 Sept. 2016.

Holdsworth, Ian and Ibrahim Faraj
2015 Faturan. Plastics Historical Society, London. http://plastiquarian.com/?p=15242 (members-only access).

Jiroušková, Jana, Monika Baďurová et al.
2011 *Albert Sachse's Collection in the National Museum*. National Museum, Prague.

Kaspers, Floor
2014 *Beads from Jablonec: A History in Beads*. Marblings Publishing, Amsterdam. https://beadmuseum.wordpress.com/2014/10/09/now-available-beads-from-jablonec/, accessed 3 Sept. 2016.

Kuhn, Günther
2002 Bernsteingeld aus dem Sudan (Amber Money from the Sudan). *Der Primitivgeldsammler* (The Primitive Money Collector) 23(1/2):22-25.

Mumford, John Kimberly
1924 *The Story of Bakelite*. Robert L. Stillson, New York.

Neuwirth, Waltraud
2011 Beads from Gablonz. *Beads: Journal of the Society of Bead Researchers* 23.

Picard, John and Ruth Picard
1987 Fancy Beads from the West African Trade. *Beads from the West African Trade Series* III. Picard African Imports, Carmel, CA.

Pollak, Fritz
1911 Improved Process for the Manufacture of Insoluble Condensation Products from Phenols and Formaldehyde. G.B. Patent 21,401.
1917 Process for the Manufacture of Insoluble Condensation Products. U.S. Patent 1,211,227.

Redman, Lawrence Vincent
1914 Composition of Matter and Process of Producing the Same. U.S. Patent 1,107,703.

Redman, Lawrence V., Archie J. Weith, and Frank P. Brock
1920 Method of Preserving Infusible Phenolic Condensation Products from Discoloration After Preserving. U.S. Patent 1,345,695.
1922 Phenolic Condensation Product Article and Method of Manufacture. U.S. Patent 1,424,738.

Saechtling, Hansjürgen and W. Küch
1951 Kunststoffe im Wettbewerb (Raw Materials Competition). *Chemische Industrie* 3(10):603.

Ullman, Fritz
1931 *Enzyklopädie der Technischen Chemie, Zweite Auflage, Siebenter Band* (Encyclopedia of Industrial Chemistry, 2nd ed., vol. 7). Urban und Schwarzenberg, Berlin.

Vierke, Ulf
2006 Die Spur der Glasperlen (The Trail of Glass Beads). *Bayreuth African Studies Online* 4.

Wikipedia
2016 Bakelite. https://de.wikipedia.org/wiki/Bakelite, accessed 12 Sept. 2016.

Rosanna Falabella
Independent Researcher
Hayward, CA
imustbead@gmail.com

THE FICHTELGEBIRGE BEAD AND BUTTON INDUSTRY OF BAVARIA

Karlis Karklins, Sibylle Jargstorf, Gerhard Zeh, and Laure Dussubieux

Venice and Bohemia are generally considered to be the principal bead manufacturers of Europe. Yet Germany, especially the Fichtelgebirge region of northeastern Bavaria, produced large quantities of glass beads for the world market beginning in the 15th century, if not even earlier, and continued to do so well into the 20th century. The Fichtelgebirge industry is especially notable for two things: 1) the utilization of furnace-winding technology which, based on our current knowledge, was not employed to a significant degree elsewhere in Europe during the post-medieval period, and 2) the localized use of Proterobas, a greenish igneous rock, to produce opaque black beads and buttons without any additives until the early 19th century. This article presents a history of the industry and describes the products and the technology involved. It also provides a preliminary assessment of the chemical composition of the various products.

INTRODUCTION

The Fichtelgebirge is a small forested mountain range in the northeastern corner of Bavaria, itself in the southeast portion of Germany. Located between Bayreuth and the Czech border, it encompasses the former beadmaking villages and towns of Bischofsgrün, Steinachthal, Birnstengel, Fröbershammer, Hütten, Fichtelberg, Mehlmeisel, Mittellind, Unterlind, Warmensteinach, and Oberwarmensteinach, all of which are situated in the western end of the region (Figure 1).

This region was ideal for glassmaking due to the presence of vast forests that not only provided wood for the furnaces but the ashes were a source of potash necessary for the manufacture of *Waldglas* (forest glass). Another major asset was the presence of large amounts of such materials as Proterobas and quartz for glassmaking. The former material is an igneous rock, a greenish lamprophyre (Figure 2), that occurred in a dike some 8 km long and 5-30 m wide that ran through the Oschenkopf, a granite mountain that rises to a height of 1,024 m between the towns of Bischofsgrün and Fichtelberg. It melts readily and produces an opaque black glass without the need of any additives. The glass is truly black unlike traditional black glass which appears either deep purple, green, or blue when a sliver of it is held up to a strong light.

Another advantage of the remote Fichtelgebirge region was that during the Middle Ages the craftsmen there were not as closely regulated as those in the cities who were organized into guilds where every action was supervised and recorded. Furthermore, the guilds fixed selling prices and also limited the number of workshops. The Fichtelgebirge glassmakers could thus carry on business relatively unhindered by guilds and price restrictions.

HISTORICAL BACKGROUND

When exactly the production of beads and buttons began in the Fichtelgebirge is not known as very few documents have survived from the period preceding the 15th century. It might have been as early as the 12th or 13th century when rosary beads came into great demand. Rosaries were not only mnemonic religious devices promoted by the church but were also the only "ornaments" common folk could own. The demand caused a change in terminology. Whereas in former times the designations *Krallen* and *Perlen*, deriving from coral beads and oriental pearls, were equally applied to glass beads, there now appeared the designation *Paternosteri* (rosary beads) throughout Europe. The pilgrims and crusaders who started in or passed through Nuremberg and other cities on their way to the Holy Land would have been a ready market for beads and rosaries, making the Fichtelgebirge an ideal spot for a thriving beadmaking industry.

While a glassworks was already operating in the area of Bischofsgrün in 1340 (Weiss 1971:337), the earliest documented bead- and button-making hut is not recorded there until around 1450 (Goldfuss and Bischof 1817) (Table 1). Hans Röthel owned a glassworks for the production of buttons in the vicinity of Warmensteinach in 1584 (Kühnert 1924) and, in 1615, Christoph Hock is listed in the Bischofsgrün parish register as a beadmaker and glass enameler (Bucher 1893). In 1692, Johann Willen

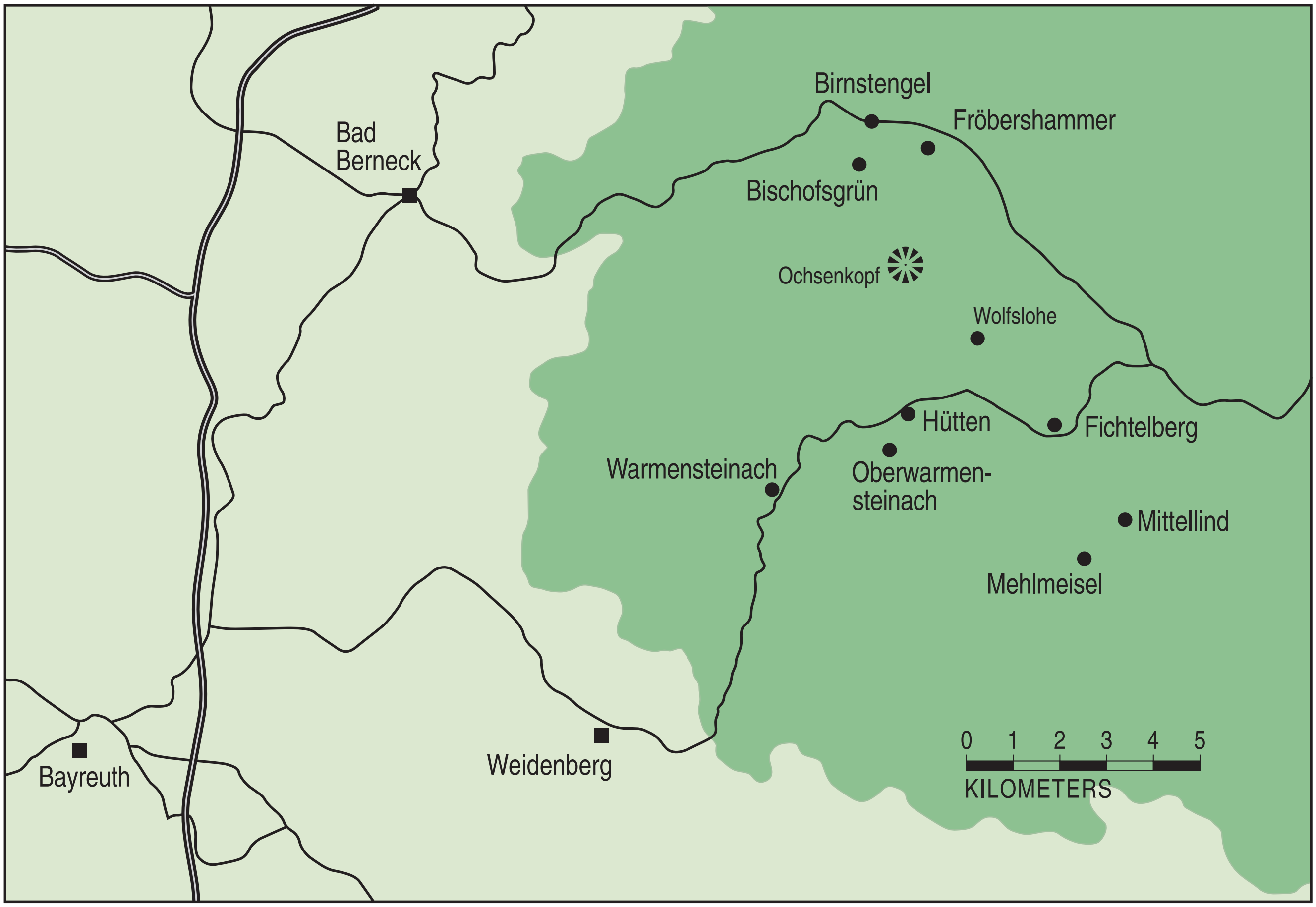

Figure 1. The western portion of the Fichtelgebirge region of northeastern Bavaria showing the locations of former bead-producing centers (●) and nearby towns (■) (drawing: David Weisel).

Figure 2. Proterobas specimen from the Oschenkopf mines (all photos by K. Karklins unless otherwise noted).

(1881) admired the beautiful buttons and beads in many different colors as well as all the beaded ornaments in the two glassworks at Warmensteinach. He also noted the perfect crystal and the beautiful enameling of the local glass products, making reference to the glass dynasties of the Greiner, Glaser, and Wanderer families. Apparently, glassmaking in the Fichtelgebirge at this period was of such outstanding economic importance that members of these famous families – whose names are traditionally linked to Thuringian glassmaking – emigrated to the Fichtelgebirge.

The two Warmensteinach glassworks are again mentioned in 1716 as producers of buttons and entire neck ornaments in many colors of which many hundred quintals were exported each year through Leipzig, Hamburg, and Amsterdam to Moscow, Turkey, and the West Indies (Pachelbel-Gehag 1932). In 1792, Matthias von Flurl (1792:469f) mentions two *Paterlhütten* (bead huts) operated by wire-drawing master Ludwig Haider and armourer Pirzner in Warmensteinach, revealing the close ties between beadmaking and the iron-working industry at this time. That same year, noted geographer and explorer Alexander von Humboldt (1792) named Kommerzienrat Loewel as the owner of a beadmaking hut in Bischofsgrün.

Table 1. Chronology of Registered *Paterlhütten* in the Fichtelgebirge, 1450-1800.

Date	Owner	Location	Source
1450/1493	?	Bischofsgrün	Local archives; Goldfuss and Bischof (1817)
1572-1640	?	Bischofsgrün	Church registers
1584	Hans Röthel	Warmensteinach	Local archives
1611	?	Bischofsgrün	Local archives
1615	Christoph Hock	Bischofsgrün	Church registers
1616-1630	?	Wolfslohe, Fichtelberg	Local archives
1622	?	Bischofsgrün; 2 glassworks	Local archives
1692	?	Warmensteinach	Willen (1881)
1716	?	Warmensteinach; 2 glassworks	Pachelbel-Gehag (1932)
1792-1860s	Loewel, later Scharrer	Bischofsgrün	von Humboldt (1792); Vierke (2006:354)
1792	Ludwig Haider	Warmensteinach	Flurl (1792)
1792	Pirzner	Warmensteinach	Flurl (1792)
1793	?	Bischofsgrün	Tieck and Wackenroder (1970:58)

The bead industry thrived throughout the 19th century (Vierke 2006:351) (Table 2). In 1817, there were four *Paterlhütten* in Steinachthal southwest of the Ochsenkopf and one in Fröbershammer adjacent to Bischofsgrün (Goldfuss and Bischof 1817:319). Each hut could produce at least 1,440,000 buttons or 5,400,000 beads per month. The colored beads were sold by the pound for 20 Kronen, although if the *Masche* (1,000 beads) weighed less than a pound, it cost 12-18 Kronen. Black beads were a bit cheaper. A *Schnur* (a string of 20 dozen) of colored buttons cost 18-20 Kronen; the black ones, 10-12 Kronen. These products went to Poland, Silesia, Switzerland, and Austria, and to Leipzig, Frankfurt, and Hamburg from whence they were shipped to Africa and America (Goldfuss and Bischof 1817:323-324).

At mid century, the four huts in Steinachthal are still in operation with another four in the eastern Fichtelgebirge (Vierke 2006:356). Sackur (1861) mentions 12 glass houses in the Fichtelgebirge region that produce 6,000,000 beads a week! Amthor (1881:11) notes six *Paterlhütten* in Bischofsgrün and Fichtelberg alone whose beads were sent to all parts of the world, especially India and into the interior of Africa, by way of the Bayreuth companies Scharrer and Koch, and Bettmann and Kupfer. A French directory of beadmakers and dealers from that same year shows one *Paterlhütte* in Bischofsgrün, but six in Warmensteinach, two in Oberwarmensteinach, and one in Unterlind (Jargstorf 1995:88).

The Fichtelgebirge bead industry experienced a very strong economy during the late 19th and early 20th centuries. Although trade agreements between the Austro-Hungarian Empire and Russia cut off trade to the latter and much of Asia and profitable sales to Persia dropped off, trade increased elsewhere. This included the Middle and Near East, East Asia, India, but above all, the German colonies in Africa. The Fichtelgebirge exported 30,000 Zentner (1,500,00 kg) of glass beads in 1899. At that time there were 10 *Paterlhütten* in the region: five in Warmensteinach, one in Oberwarmensteinach, one in Hütten near Oberwarmensteinach, one in Bischofsgrün, and one in Mittellind near Fichtelberg (Vierke 2006:352).

Despite the relative prosperity, there was ever-increasing competition from Bohemia during the second half of the 19th century. Compared to the 10 beadmaking establishments in the Fichtelgebirge in 1881, there were 98 beadmakers and dealers in Austria (which incorporated Bohemia at the time), 60 of which were in Gablonz, now Jablonec nad Nisou, Czech Republic (Jargstorf 1995:94). To better deal with this, the beadmakers in Warmensteinach formed a cooperative in 1899. In the early 20th century, Japan also became a stiff competitor (Vierke 2006:352). Then came World War I.

The Fichtelgebirge bead industry attempted to recover following the war but was initially plagued by hyperinflation and then suffered during the Great Depression. By 1925, there were only seven functioning

Table 2. Chronology of *Paterlhütten* in the Fichtelgebirge, 1800-1960 (after Vierke 2006:354).

Date	Name	Location
1800s-1920s	August Pscherer	Unterlind
1800-1860s	Loewel, later Scharrer	Bischofsgrün
1850s-1860s	Adam Greiner	Bischofsgrün
1850s-1870s	C. Bunte	Schönbrunn
1850s-1890s	Johann Schinner	Grünberg (Brand)
1860s	Ludwig Haider	Warmensteinach
1860s	Pirzner	Warmensteinach
1860s-1960s	Josef Trassl	Oberwarmensteinach
1870s-1940s	Christian Herrmann	Birnstengel
1880s	Heinrich Herrmann	Warmensteinach
1880s	S. Lindner	Warmensteinach
1880s	Rabenstein Perlenfabrik	Oberwarmensteinach
1880s	Schott & Herrmann	Warmensteinach
1890s-1960s	Genossenschaft	Warmensteinach
1900s-1920s	Hans Herrmann	Warmensteinach
1920s	Alfons Trassl	Warmensteinach
1920s-1969	Michael Trassl (Trasslhütte)	Oberwarmensteinach

Paterlhütten in the Fichtelgebirge: four in Warmensteinach, one in Oberwarmensteinach, one in Bischofsgrün, and one in Unterlind (Vierke 2006:359-360). The industry deteriorated over the next few years with a number of bead huts closing and the work force being seriously reduced. The remaining huts had to cut production for weeks and months on end. Although the huts continued to produce beads until 1942, World War II essentially brought an end to the *Paterlhütten* (Vierke 2006:417). The *Paterlmachers* were unable to compete with the technology of the Sudeten German beadmakers who were expelled from Bohemia after the war and came to the Fichtelgebirge and other regions of Bavaria to start new businesses. The last *Paterlhütte* in Bischofsgrün ceased production in 1957, followed in 1969 by the Trasslhütte in Oberwarmensteinach, thus ending a beadmaking tradition that spanned a remarkable 500 years and sent countless millions of beads and buttons to practically every part of the world.

FICHTELGEBIRGE *PATERLHÜTTEN*

The production of *Paterln* (from Pater Noster), as the beads were called locally, was performed in so-called *Paterlhütten* (bead huts). These were modest wooden buildings with one or more furnaces in a large working space adjacent to which was a restroom where workers could sleep and take meals. Next to this was a shed where clean white sand was stored for working into glass (Vierke 2006:363).

In smaller huts, a single furnace was located in the center of the work area. Round or oval in outline with a domed top, it was, on average, about 2 m in diameter and 1.6 m high (Vierke 2006:363). A fire channel extended down the center of the furnace with the working crucibles on either side. The melting crucibles were at the front and rear of the furnace. The working crucibles were long, rectangular, earthenware vessels of low height, which were divided approximately in the middle by partitions into two units connected by an opening at the bottom of the partition. The melting crucibles were also earthenware vessels with a rectangular cross-section but had approximately four times the capacity of the working crucibles. The furnaces were fueled with wood for the most part, 1/4 to 1-1/2 fathoms (cords) being consumed daily (Sackur 1861). Coal was also used beginning in the 20th century (Vierke 2006:32).

There was a work hole at every working crucible and each hole was enclosed by short side walls which delineated each work space (Figure 3). On the floor of every work station was a small, thin-walled, earthenware vessel which was kept warm by the furnace. Newly formed beads were placed in these to allow them to cool gradually (Sackur 1861). In some furnaces, there was a heated recess in the furnace wall which contained an earthenware pot for the same purpose. Furnaces could have up to 14 work stations (Vierke 2006:364).

Figure 3. Beadmakers at the furnace in the Marquardhütte, Warmensteinach, 1930s (Herrmann 2008:22).

FURNACE-WOUND TECHNOLOGY

The production of furnace-wound glass ball buttons with iron loop shanks is a fairly simple process. A small piece of bent iron wire held in a pair of pliers (*Zange*)[1] is dipped into a crucible of molten glass in a furnace and rotated back and forth until the required size is achieved. The button is removed from the furnace, smoothed with a knife, and then dropped into a covered earthen annealing pot which is situated in the oven in front of the worker (Flurl 1792:471). While the glass is still viscid, the buttons could be pressed in open-face molds to impart a design. The buttons could also have enamel designs painted on them or ground facets applied when they had hardened.

The furnace-winding of beads differs from winding beads at the lamp in that in the former process, beads are wound directly from a crucible of molten glass in a furnace rather than melting the end of a glass rod over a flame and winding a strand around a mandrel. While Sackur (1861) attributes the invention of furnace winding to the Fichtelgebirge beadmakers, it was a process already described by Theophilus to make rings in Europe during the 12th century and likely used well before that. He prescribed the use of a mandrel composed of a wooden handle about a finger thick and a span (23 cm) long which is fitted into a socketed, tapered iron spit about a foot long with a sharp tip. A wooden disk a palm (7.5-10 cm) in diameter is situated about a third of the way down the handle. The tip of the tool is dipped into a pot of molten glass in the furnace and a glob of glass is taken up on it. The tip is then driven into a wooden post next to the worker to produce the hole. The perforated glob is then immediately reheated in the furnace and the mandrel struck against the post two times to loosen and stretch the glass. The mandrel is then rotated rapidly and by this action the ring is worked down to the disk and rendered uniform and smooth in the process. The ring is then dropped into a little trough (Hawthorne and Smith 1979:73-74).

The Fichtelgebirge beadmaker's principal tools were two iron mandrels (*Perleneisen* or *Paterleisen*) and a blade-like iron tool or hammer to aid in removing beads from the mandrel. The mandrels may originally have been simple iron wires with pointed tips but by the 19th century they were iron rods 0.8-1.6 m in length and up to 1.0 cm in diameter at the handle end. The working end narrowed to whatever diameter was required for a specific bead size and was tapered slightly to aid in removing beads from the mandrel (Sackur 1861; Vierke 2006:370-372).

In the production process, the beadmaker sat on a stool in front of the work hole (Figure 4). To protect his eyes he wore a pair of metal-rimmed goggles. A two-pronged iron fork was driven into the ground on his left side and served to hold his mandrels. These had to be handled carefully because if the working end became bent or misaligned, it would throw the tool out of balance and hamper bead formation. Two mandrels were generally used so that as the beads on one mandrel cooled in the fork, new beads could be formed on the other one, thereby increasing production (Vierke 2006:370-371).

To begin, the working end of the mandrel is generally dipped in a kaolin bath to serve as a separator to facilitate bead removal. To make a single large bead, the worker dips

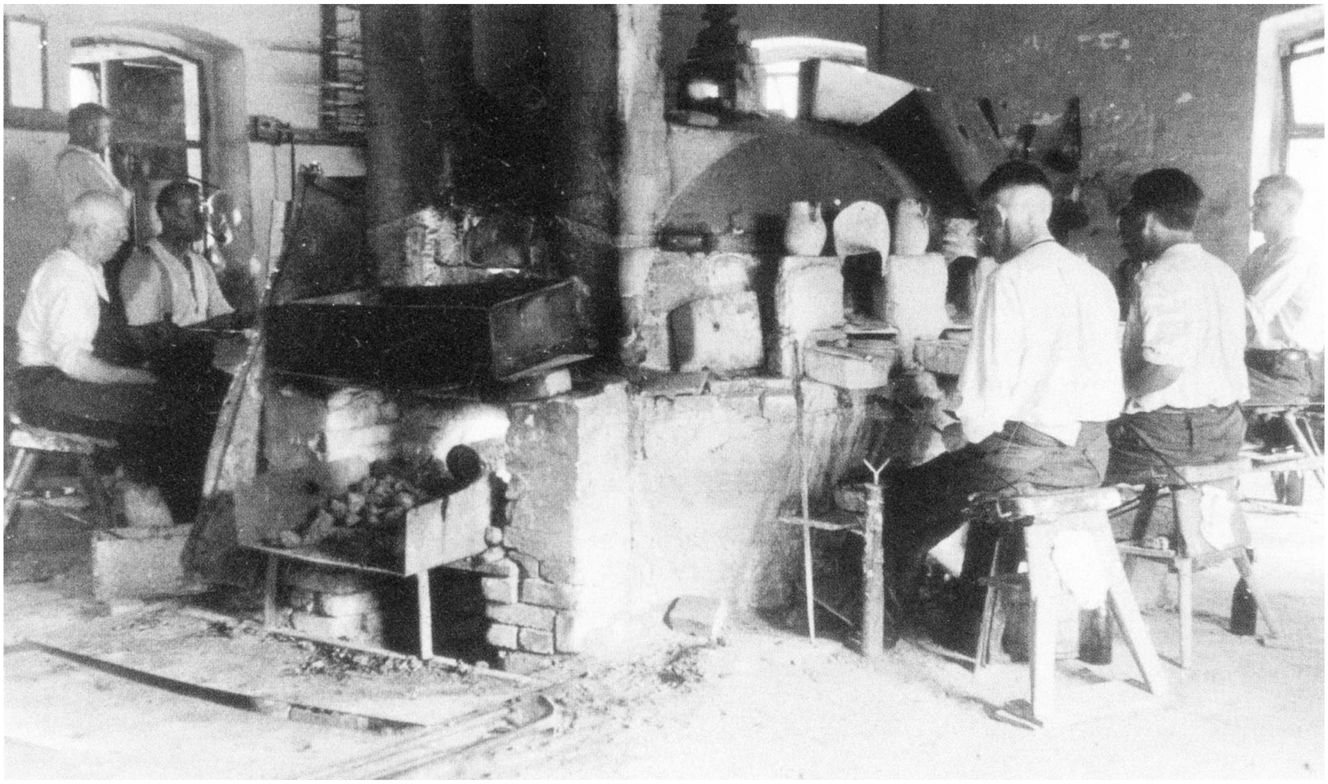

Figure 4. Beadmakers at work in a Warmensteinach *Paterlhütte*, 1930s (Herrmann 2008:21).

the tip of the mandrel into the molten glass in the crucible and removes a small gather which is quickly wound around the mandrel. It is then removed from the furnace and rotated in a wooden mold to impart the final desired shape. Shaping could also be performed by striking the viscid bead with a hammer which imparted flat facet-like features (Vierke 2006:372).

To produce a series of smaller beads, a strand of glass is raised from the crucible and wrapped around the mandrel to form a bead. Without breaking the strand, the mandrel is rapidly moved slightly upward, anchoring the thread next to the first bead and wrapping it around the mandrel to form another bead. The process is continued until the end of the mandrel is reached (Figure 5), each bead in the series being connected to the next one by a thin strand of glass. When the beads are sufficiently cool, the mandrel is struck smartly with a hammer or the blade-like tool to separate the beads from the mandrel and they fall into the annealing box. This process must be done carefully so as not to crack or shatter the newly formed beads. This beadmaking process obviously requires a great deal of skill and an experienced worker takes pride in seeing how close to each other he can place the beads (Vierke 2006:371-372).

In an alternative method for producing multiple beads, the mandrel is not coated with clay. A bead is formed at the tip of the mandrel which is then struck and raised so that the bead is loosened and slips down to the base of the working end. Successive beads are formed in a like manner. In this case the beads are not connected to each other by a thread of glass as in the previous method, thereby producing beads without small broken projections at the ends (Vierke 2006:371).

Once the beads have been properly cooled, those made in a connected series must be separated. This is sometimes done by placing the beads in a sieve and shaking them. The projections break off and fall through the sieve. Another method involves placing the beads in a sack or cloth and agitating it to break them apart followed by sieving. In either case, the beads are then washed and polished by shaking them in bags of bran for 20 minutes or so (Vierke 2006:376-377). The beads are subsequently strung and packed in bundles for shipment worldwide.

BEAD PRODUCTION

The beadmakers worked in 12-hour shifts, one from noon to midnight and the next from midnight to noon, seven days a week. This did not change until the late 19th century when some huts initiated a 6- or 8-hour shift. In the

Figure 5. Beadmaker at the Lindner Trasslhütte in Warmensteinach, ca. 1960, with a series of beads on his mandrel (Herrmann 2008:28).

1920s, the standard shift became six hours with Sundays off (Vierke 2006:381).

According to Flurl (1792:473) the *Paterlhütten* operated from August to Easter. This gave the workers, many of whom were small-scale farmers, part of the spring and summer to undertake agricultural activities. It also allowed woodcutters to cut the large amounts of wood required to fuel the furnaces for the following season.

Sackur (1861) noted that a good beadmaker in the Fichtelgebirge produced about 5,000 of the smaller beads in a workday (12 hours). In a week, a glass house could produce about 500,000 beads of all sizes, which is about 8 to 12 centner (400-600 kg) of glass. Since these products were manufactured in 12 glass houses in that neighborhood, this amounted to a weekly production of 6 million beads.

Veh (1965:100) reports that in the 1930s, a worker could produce 20-36 beads per minute, depending on their size, which reflects a substantial increase in productivity over that mentioned by Sackur 70 years earlier. Unfortunately, increased productivity generally resulted in decreased quality. Beads fashioned in the 19th century were well formed while those made in the 20th century are generally less uniform in shape.

All the beadmakers were men although children were also allowed to make beads during the latter part of the 19th century. They readily learned the production process and their nimble fingers deftly worked the mandrels. Women, on the other hand, were never involved in the manufacturing process but did string the beads (Vierke 2006:369).

BUTTONS AND BEADS OF THE FICHTELGEBIRGE

Although a number of glassmaking sites exist in the Fichtelgebirge, only one has thus far been investigated archaeologically. Attributed to ca. 1616-1630, the "Proterobas Glasshütte" is located on the southern slope of the Ochsenkopf in an area known as the "Wolfslohe" near the small town of Neubau. Excavations conducted there during 2004-2006 under the direction of Dr. Peter Steppuhn (2005, 2008) and Dr. Anja Heidenreich (2007) revealed the foundation of a square 3x3 m stone glassworking furnace (Figure 6) with crucible fragments and a great amount of production waste in association. The furnace likely had an arched superstructure with 4-5 crucibles and an equal number of workstations (Steppuhn 2008:107).

The recovered materials reveal that the principal products were black Proterobas buttons, medium- to low-domed ball types with iron loop shanks (Figure 7). Some were quite fancy, having been decorated with various colored enamels. A number of ball buttons composed of blue and green glass were also recovered (Steppuhn 2008:107), as were fragments of like colored *Waldglas* (forest glass) vessels, some decorated with elaborate enameled decoration, and circular window panes with folded edges (Heidenreich 2007).

Spindle whorls were also in evidence. Up to 4 cm in diameter, these were primarily made of Proterobas and ranged from oblates or somewhat dome shaped to doughnut forms, depending on the size of the perforation (Figure 8). A few globular and ovoid Proterobas beads were also present, as were a number of black tube segments which suggest that the drawing of tubes, possibly for beads, was also practiced here. The tubes were 22-28 mm in length and 3.3-3.9 mm in diameter.

Based on the material recovered from the Wolfslohe site and surface collected in the general vicinity, the most distinctive products of the early Fichtelgebirge furnace-

Figure 6. The foundation of the "Proterobas Glashütte" furnace on the Oschenkopf looking southwest (courtesy of Dr. Anja Heidenreich).

wound cottage industry are those made of Proterobas which was utilized nowhere else. The buttons are generally in the form of low domes around 8-18 mm in diameter. The early ones had iron loop shanks but these were eventually replaced by those of brass. Most are plain but there are many examples with molded designs or ground surfaces and facets. Some buttons exhibit colorful flower-like enamel decoration (Figure 9). When exactly Proterobas buttons began to be made and when production ceased has yet to be determined but in North America they seem to be restricted to the 16th and 17th centuries (Cofield 2014; Pratt 1961:10; Beverly A. Straube 2014: pers. comm.), though Heinrich Scherber mentions the production of Proterobas buttons and beads in the Fichtelgebirge in 1811 (Schaller 1989).

Proterobas beads are less common. Those examined range from oblate to globular forms measuring 8-10 mm in diameter to oblong forms 14-16 mm in length and 7-8 mm in diameter. The globular group includes plain specimens as well as those with a lattice pattern in white or yellow enamel around the equator or white squiggles scattered over the surface (Warmensteinach 2013) (Figure 10). Another form consists of a lobed oblate (Figure 11).

A unique fragmentary tabular Proterobas bead about 20 mm long has a star and the likeness of Christ on the cross on one side and the letters [I]HS on the other (Figure 12) which is the monogram of Christ. It was found in the vicinity of Bischofsgrün. Near identical specimens in black (Proterobas?) and transparent ultramarine glass have been found in Amsterdam (Jamey D. Allen 2014: pers. comm.). They are doubtless related to the tabular beads that depict Mary holding the baby Jesus also found in Amsterdam (Jamey D. Allen 2014: pers. comm.) and are morphologically identical to the man-in-the-moon beads found in eastern North America. Assigned to the period 1670-1760, the latter were believed to have been made in Venice and traded through Holland (Lorenzini and Karklins 2000-2001)

Figure 7. Black Proterobas buttons from the Oschenkopf furnace site (photo: W. Ullmann).

Figure 9. Decorated Proterobas buttons as well as a glass face button from the Oschenkopf site (photo: Manfred Sieber).

Figure 8. Proterobas spindle whorls and possible beads from the Oschenkopf (photo: W. Ullmann).

Figure 10. Globular beads decorated with enamel patterns found at the Hüttenhaus, likely 18th century (Warmensteinach 2013).

Figure 11. Lobed Proterobas bead, 17th century, Oschenkopf.

but it now seems that they may all have originated in the Fichtelgebirge.

As for non-Proterobas beads, a form that likely originated in the Fichtelgebirge is the pentagonal-faceted bead which has eight pentagonal facets pressed into it while the glass was still viscid. A dark amber colored specimen 17.5 mm in diameter was surface collected in the vicinity of Bischofsgrün (Figure 13). While a single surface find cannot be taken as proof for local production, the likelihood is there. Beads of this form have been found at North American sites occupied from about 1650 to 1833 but are most common from about 1700 to 1760 (Karklins and Barka 1989:74).

Possibly as early as the latter part of the 17th century and well into the 20th century, the Fichtelgebirge beadmakers also turned out very large globular (Figure 14) and oval (pigeon egg) forms. Another Fichtelgebirge form is the annular or ring bead (Figure 15, upper center). These are "the ringel perle of Germany" that the American explorer

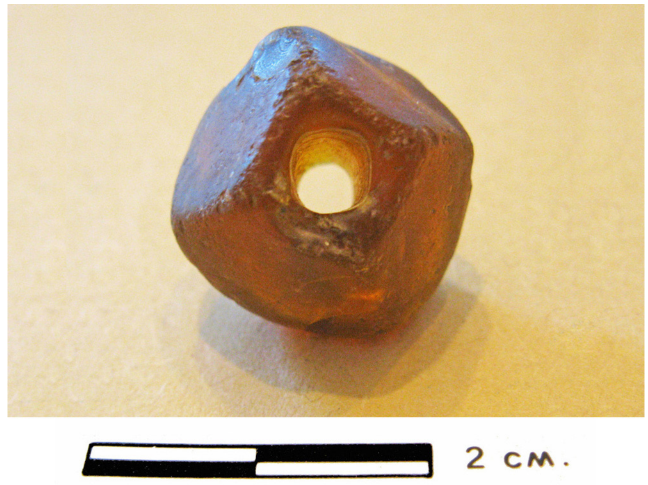

Figure 13. Pentagonal-faceted bead, vicinity of Bischofsgrün.

Richard Burton (1860:393) mentions in the narrative of his travels in Central Africa. They continued to be made in various colors well into the 20th century.

Beadwork made in the Fichtelgebirge during the 19th century incorporates locally made beads. A beaded valence on exhibit at the Fichtelgebirgsmuseum in Wunsiedel is composed primarily of well-formed and uniformly sized doughnut-shaped beads (Figure 16). This piece also incorporates polyhedral bugle beads which were likely obtained from Bohemia so not just local beads were utilized.

Based on surface finds at the Glasperlenhütte Herrmann in Birnstengel (1882-1957) and in Mehlmeisel (1867-1938), the most common beads produced during the late 19th and 20th centuries consist primarily of oblate, round, oval, and ring forms. These came in at least 36 colors and up to 16 sizes (Figure 17). They are generally irregular in form.

Figure 12. Proterobas bead with a star and the likeness of Christ on the cross on one side and the letters [I]HS on the other.

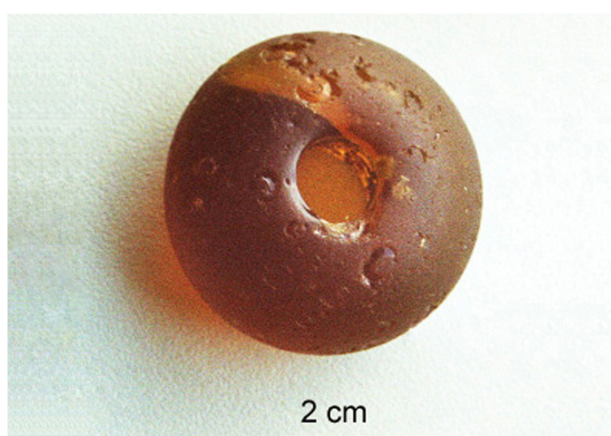

Figure 14. Globular, furnace-wound bead of amber-colored glass surface collected in the Fichtelgebirge (photo: S. Jargstorf).

Figure 15. Group of furnace-wound beads from the Paterlhütte Hermann, Birnstengel, late 19th-20th centuries. The Prosser-molded beads in the upper left are likely imports (photo: Manfred Sieber).

Another distinctive form is the "waffle" bead which appears to have been made during the 20th century. It generally consists of a slightly drop-shaped bead that has been pressed flat parallel to the perforation with a tool that had either a crosshatched pattern cut into it or just a series of parallel lines (Figure 18). Pendants with similar crosshatched decoration but made using molds have purportedly been produced in the Czech Republic.

In addition to the furnace-wound beads mentioned above, blown beads were also produced by some individuals in their cottages. Goldfuss and Bischof (1817:324) relate that some farming families in Bischofsgrün manufactured round and elongated beads from white and colored glass with the aid of a blowpipe. They dipped the end of the hot bead in molten tin and sucked it into the bead and then immediately blew it out again. This imparted a thin film of tin on the interior surface which displayed a beautiful play of colors. Being more fragile and expensive than furnace-wound beads, they did not sell well and were only made in small quantities during free time. Assigned to the 17th century, a strand of very large globular blown beads (Figure 19) that is attributed to the Fichtelgebirge is on display at the Historisches Museum Bayreuth.

When the Sudeten Germans were expelled from Czechoslovakia following World War II, many moved to the Fichtelgebirge area and began to produce both mold-pressed and lamp-wound beads in various forms.

COMPOSITIONAL ANALYSIS

In order to obtain a chemical profile for the beads and buttons produced in the Fichtelgebirge that may aid in the identification of these products in archaeological or ethnographic collections, samples were obtained of some of the material excavated at the Wolfslohe furnace site and surface collected at former beadmaking sites in and around Bischofsgrün, Mehlmeisel, and Warmensteinach. For comparative purposes, beads and buttons likely of Bavarian origin were obtained from generally well-dated archaeological contexts in North America, Europe, and Africa.

While the Wolfslohe material comes from sealed contexts attributed to ca. 1616-1630, the surface material can only be roughly dated to the 18th-19th centuries and the 20th century. While this is not an ideal situation, the

Figure 16. Detail of a 19th-century beaded valence made in the Fichtelgebirge region incorporating small, locally made furnace-wound beads with pink bugle beads likely imported from Bohemia (Fichtelgebirgsmuseum, Wunsiedel).

material nevertheless provides much useful information regarding the chemical composition of Fichtelgebirge beads and buttons over time.

The 41 samples were analyzed by Laure Dussubieux (2016) of the Elemental Analysis Facility, The Field Museum, Chicago, using laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS). The lab numbers are designated KAR in the tables below. The specimens fall into five groups: low-soda/low-potash glass (Proterobas) (9 specimens), high-potash glass (13 specimens), high-soda glass (14 specimens), mixed-alkali glass (3 specimens), and lead glass (2 specimens).

Low-Soda/Low-Potash Glass (Proterobas)

A piece of melted Proterobas (KAR 1) and four Proterobas ball button rejects (KAR 2-5) from the Wolfslohe and nearby find sites were found to contain low soda (2.1-3.2%) and potash (1.2-4.1%) but high concentrations of alumina (13.6-16.9%), lime (9.5-13.1%), magnesia (7.0-9.2%), and iron (6.6-11%). The latter is certainly responsible for the color of the glass.

To determine if 17th-century black ball buttons found in eastern North America derived from the Fichtelgebirge, specimens (KAR 23-26) excavated at several sites in Maryland, Virginia, and South Carolina were analyzed as well (Table 3). Their form, dimensions, and composition mesh nicely with those of the Wolfslohe specimens.

High-Potash Glass

Five Fichtelgebirge samples (Table 4) have high concentrations of potash and lime that are characteristic of glass manufactured using forest plant ash in parts of Europe beginning in the medieval period. Two of these are clear *Waldglas* vessel fragments with a slight greenish tint (KAR 6, 7) from the Wolfslohe site which contain 11.6-12.5% potash with 1.5-1.8% soda, 2.4-2.7% alumina, 14.0-15.0% lime, 2.7-3.5% magnesia, 0.87-1.04% iron, 708-1019 ppm titanium, and 1770-2388 ppm barium.

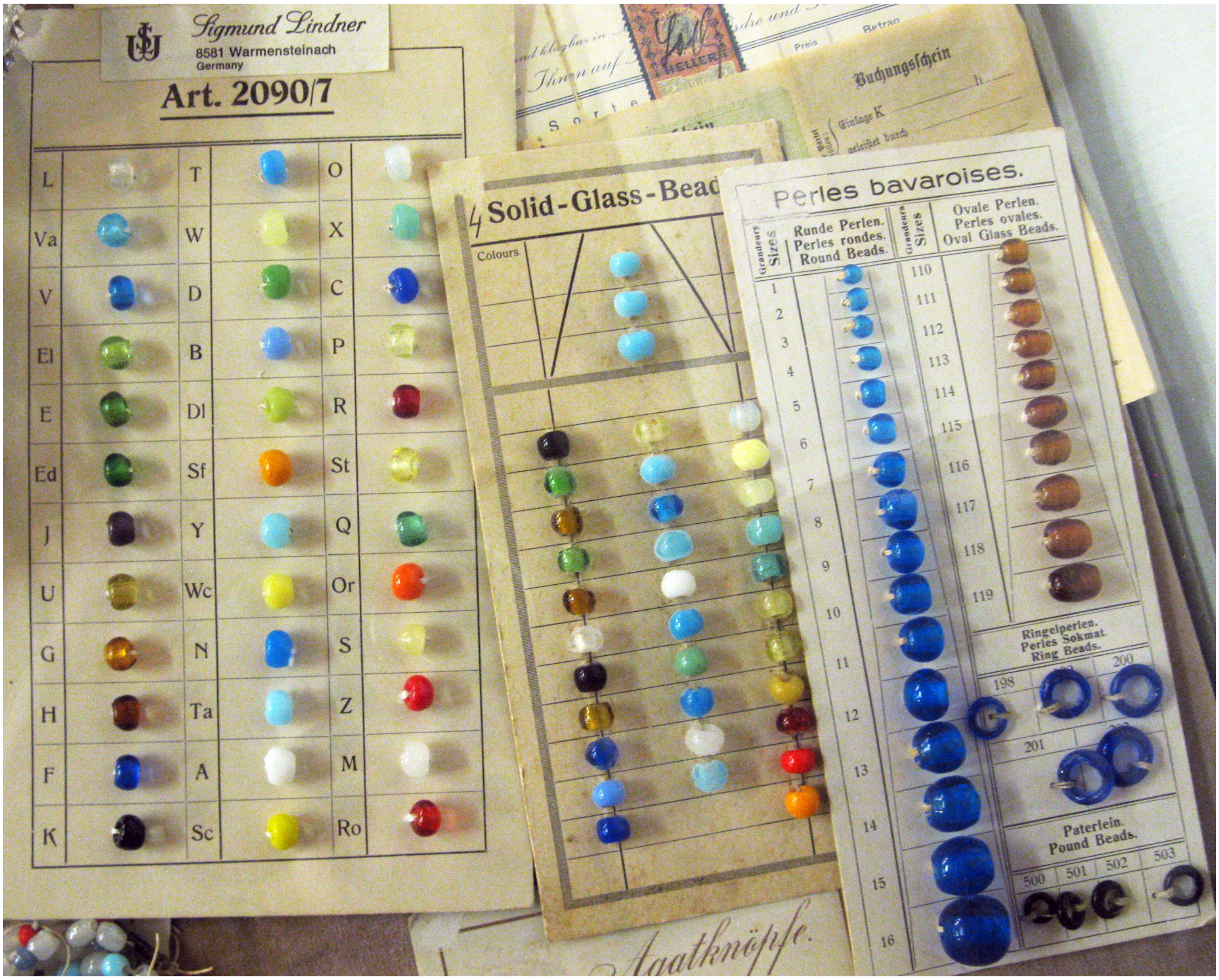

Figure 17. Sample cards of furnace-wound beads produced in the Fichtelgebirge, 20th century (Glasmuseum Warmensteinach). The card on the right is attributed to Paterlhütte Hermann, 1942 (Vierke 2006:131).

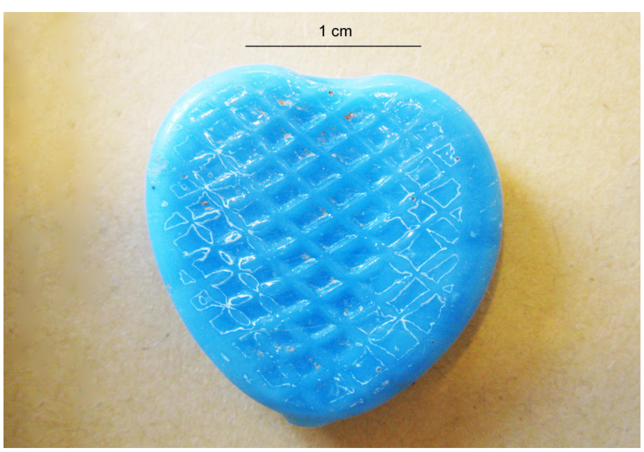

Figure 18. "Waffle" bead from Paterlhütte Herrmann, Birnstengel, 20th century.

Figure 19. Strand of very large globular blown beads in whitish glass attributed to the Fichtelgebirge; 17th century (Historisches Museum Bayreuth).

Table 3. Low-Soda/Low-Potash (Proterobas) Glass Samples.

Lab No.	Description	Source	Date
1	Proterobas waster; op. black	Fichtelgebirge: Wolfslohe	1616-1630
2	Ball button; op. black. D: 14.0, H: 9.9.	Fichtelgebirge: Wolfslohe	1616-1630
3	Ball button; op. black. D: 13.3, H: 8.2.	Fichtelgebirge: Wolfslohe	1616-1630
4	Ball button; op. black. D: 17.0+, H: 7.7.	Fichtelgebirge: Bischofsgrün/Birnstengel	1st half 17th C ?
5	Ball button; op. black. D: 14.5, H: 7.5.	Fichtelgebirge: Bischofsgrün	1st half 17th C ?
23	Ball button; op. black. D: 12.4, H: 8.7.	Jamestown, VA	ca. 1610-1640
24	Ball button; op. black. D: 12.8, H: 7.6.	St. Giles Kusso, SC	1674-1682
25	Ball button; op. black. D: 16.0+, H: 8.3.	Mattapany-Sewall, MD	ca. 1666-1740
26	Ball button; op. black. D: 11.3+, H: 7.4.	Posey Site, MD	ca. 1650-1680
Measurements are in mm. D = Diameter, H = Height.			

Three furnace-wound beads (KAR 9, 11, 13) surface collected at an unspecified site in the Fichtelgebirge and attributed to the 18th-19th centuries also have high potash concentrations (14.6-20.7%) with 1.4-2.5% soda, 0.6-0.9% alumina, 8.9-9.6% lime, 0.3-0.4% magnesia, 0.18-0.2% iron, and 270.4-743.0 ppm of arsenic. KAR 9 and 11 have relatively high phosphorus concentrations (5.5-6.6%) while KAR 13 contains only 0.2%. The low phosphorus could be explained by the use of different types of forest plant ash as a flux.

Attributed to the 18th-19th centuries and unearthed in North Holland (KAR 21, 22), the central United States (KAR 29, 31, 32), The Gambia (KAR 39), and general West Africa (KAR 35, 36), eight likely furnace-wound beads in the comparative group have similar compositions. The potash concentration is at 12.9-18.9% with 0.6-1.5% alumina, 8.2-10.9% lime, 0.3-1.3% magnesia, and 0.11-0.56% iron. Soda content is generally 0.5-2.3% but elevated to 5.3% in one of the West African beads (KAR 36). Arsenic content is very variable ranging from a low of 45.4-165.0 ppm in the African specimens to 919.5-2962.5 ppm in the American specimens and one of the Dutch beads (KAR 21). The beads from Holland and the United States – all of which are blue – have cobalt as the colorant and arsenic is often associated with cobalt. Thus, there is the possibility that the variability in the concentration of arsenic is related to the purity of the cobalt used to color the glass or the amount used. Arsenic was, however, also used to clarify glass or as a refining agent so that may be another explanation.

Figure 20. High-potash glass, Fichtelgebirge (KAR 9). This variety was the most expensive, made with the addition of calcined bone ash (Vierke 2006:364 fn.).

As for phosphorus, three beads – one from The Gambia (KAR 39) and two from the United States (KAR 29, 32) – contain only 0.2-0.5%, a match with KAR 13. The phosphorus content of the other beads is 4.0-7.7% which is in keeping with the other two Fichtelgebirge potash-glass beads.

Generally speaking, aside from the variable arsenic concentrations, the beads in the comparative group are very similar in their compositions to the Fichtelgebirge specimens and may well have originated there.

High-Soda Glass

Seven furnace-wound beads surface collected at several beadmaking sites in the Fichtelgebirge are composed of

Table 4. High-Potash Glass Samples.

Lab No.	Description	Source	Date	Figure No.
6	Waldglas; vessel fragment; light green	Fichtelgebirge: Wolfslohe	1616-1630	
7	Waldglas; vessel fragment; light green	Fichtelgebirge: Wolfslohe	1616-1630	
9	WIb*. Globular; tsl. pale blue. D: 21.2, L: 18.0.	Fichtelgebirge: surface	18th or 19th C	20
11	WIb*. Globular; tsp. ultramarine (opaline). D: 10.6, L: 9.0.	Fichtelgebirge: surface	18th or 19th C	21 (LEFT, Lt)
13	WId*. Doughnut; tsp. redwood. D: 10.8, L: 6.5.	Fichtelgebirge: surface	18th or 19th C	21 (LEFT, Rt)
21	WIb*. Globular; tsl. dusk blue (opaline). D: 10.5, L: 8.6.	North Holland	18th or 19th C	21 (CENTER, Lt)
22	WIc*. Oval; tsl. dusk blue (opaline). D: 17.4, L: 22.5.	North Holland	18th or 19th C	21 (CENTER, Rt)
29	WIb16. Oblate; tsp. bright navy. D: 9.4, L: 7.7.	Deapolis Mandan Village, North Dakota	1806-1838	21 (RIGHT, Ct)
31	WIc*. Oval; tsl./op. bright navy. D: 19.0, L: 25.4.	Deapolis Mandan Village, North Dakota	1806-1838	22 (LEFT)
32	WIIf*. Ridged tube; tsp. ultramarine. D: 7.5, L: 7.5.	Deapolis Mandan Village, North Dakota	1806-1838	21 (RIGHT, Rt)
35	WIb*. Barrel-shaped; tsl. pale blue (alabaster). D: 18.5, L: 15.2.	Africa	19th C	22 (CENTER, Lt)
36	WIb*. Barrel-shaped; tsp./tsl. dusk blue (opaline). D: 19.3, L: 17.1.	Africa	19th C	22 (CENTER, Rt)
39	WIb*. Oblate; tsl. wedgewood blue with golden cast. D: 12.7, L: 9.9.	65 Lemain St., Banjul, The Gambia	19th C	22 (RIGHT)

Measurements are in mm: D = Diameter, L = Length. Figures: LEFT, CENTER, and RIGHT designate the frames in the figures. Within each frame: Lt = Left, Ct = Center, Rt = Right.

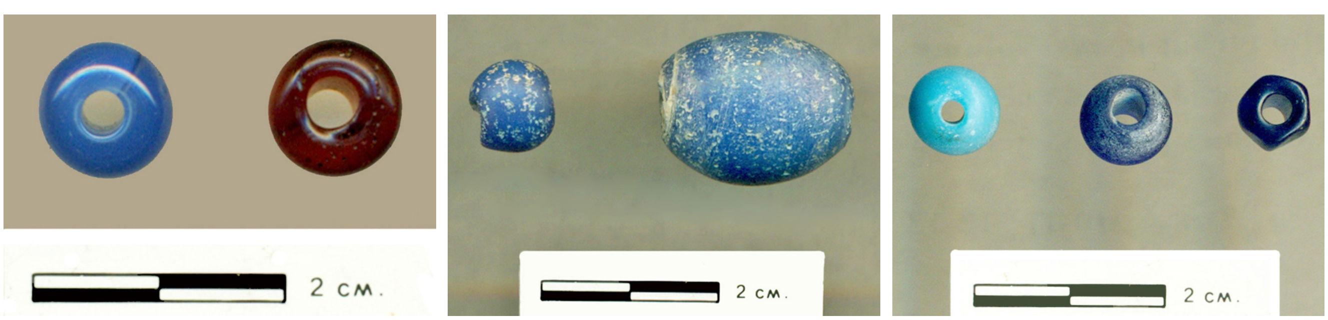

Figure 21. High-potash and mixed-alkali beads. Left: Fichtelgebirge (KAR 11 and 13). Center: North Holland (KAR 21 and 22). Right: Deapolis Village, North Dakota (KAR 28, 29, and 32).

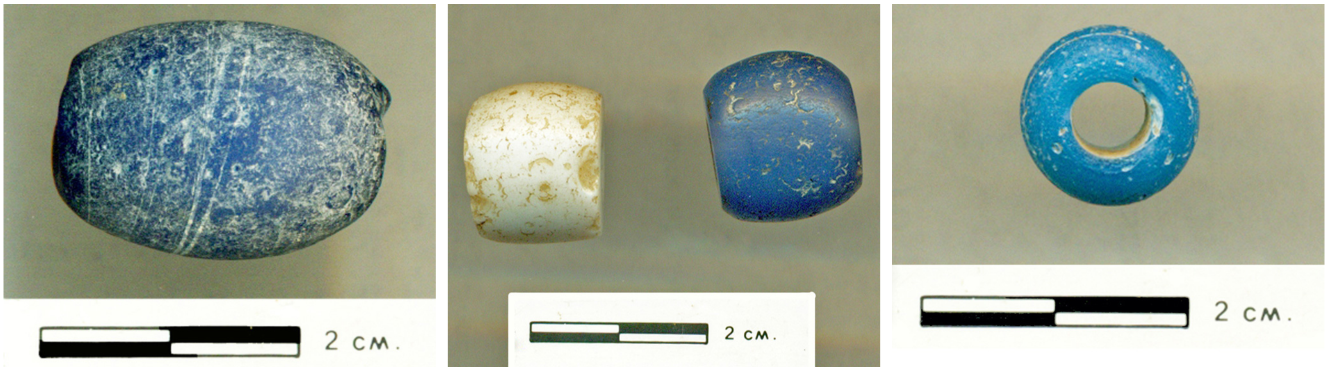

Figure 22. High-potash beads. Left: Deapolis Village (KAR 31). Center: Africa (KAR 35 and 36). Right: The Gambia (KAR 39).

high-soda glass (Table 5). They were likely made during the first half of the 20th century although some may be slightly earlier. The concentration of soda in the glass is 13.4-20.3% with 4.6-15.5% lime and 0.1-0.3% magnesia. Despite the relatively high concentration of potash in all the beads except KAR 20, the low magnesia concentrations (< 1.5%) suggest the use of soda derived from a mineral source. The potash concentration ranging from 2.2 to 5.7 % might be due to the presence of feldspar in the sand. As with the high-potash group, arsenic concentrations are extremely variable, ranging from 5.3 ppm in KAR 18 to 1256.1 ppm in KAR 20. Phosphorus (0.0-0.2%) and chlorine (0.1-0.4%) – which can be impurities in soda – are present in extremely low concentrations, suggesting that the soda used was fairly pure. Antimony is practically non-existent in KAR 15 and 20, but 1116-3557 ppm in the rest. All the beads – with the exception of KAR 17 which is white – are some shade of blue. Half (KAR 15, 19, 20) are colored with cobalt (149.7-374.6 ppm); the others with copper (2228-3378 ppm).

In the comparative group, two high-soda furnace-wound beads (KAR 33-34) from a home-made Native-American-style necklace have compositions that are compatible with those of the Fichtegebirge beads: 18.4-20.3% soda, 3.9-4.0% potash, 6.7-6.9% lime, 0.1% magnesia, with 270.4-743.0 ppm of arsenic and 2955-4818 ppm antimony. Unfortunately, it is presently impossible to determine if they were made before or after World War II.

Three beads (KAR 38, 40, 41) composed of high-soda glass from 18th-19th-centuries contexts in The Gambia also have a high soda content but in this time frame this is not compatible with the composition of contemporary Fichtelgebirge glass. The first two beads are likely lamp wound and quite possibly the products of Venice. From a 19th-century context, KAR 41 is troublesome as it is an annular bead – a staple of the Fichtelgebirge bead industry – with the appearance of being furnace wound. While it is possible that it was lamp wound at another beadmaking center, the likelihood is that it represents the use of soda glass by some of the Fichtelgebirge beadmakers in the 19th century. It is known that soda glass was in use in the Fichtelgebirge by the 1920s but when exactly it was introduced remains to be determined.

Two drawn black beads from 17th-18th-centuries contexts in the United States (KAR 27) and West Africa (KAR 37) were analyzed to see if they were made of Proterobas. Both turned out to be composed of high-soda glass and likely of Venetian origin.

Mixed-Alkali Glass

Two specimens from Bischofsgrün (KAR 8) and Mehlmeisel (KAR 12) and one from a Native American site in North Dakota (KAR 28) are composed of mixed-alkali glass (Table 6) where the concentrations of soda (8.5-11.4%), potash (7.3-10.0%), and lime (9.3-13.8%) are about equal. Phosphorus (an element that is widely present in the high-potash glass) is low (0.0-0.3%), as is antimony (3-57 ppm), and magnesia and iron concentrations are below 1%.

KAR 8 is a black glass "whistle" button attributed to the 1860-1900 period (Janelle Giles 2014: pers. comm.). It was made using ingredients from sources different than for the other two specimens as revealed by trace element concentrations; e.g., U = 19 ppm vs. ~2.7-2.8 ppm in the other two. KAR 12 and 28 are both opaque robin's egg blue and contain ~1% of copper (measured as CuO). They have fairly similar compositions and while not identical, it is likely that KAR 28 originated in the Fichtelgebirge.

It is difficult to explain the composition of these specimens. There are several possibilities, including the use of mixed alkali plant ash or the mixing of high-soda and high-potash glass in equal proportions. Unfortunately, the small sample size precludes an exact determination.

Table 5. High-Soda Glass Samples.

Lab No.	Description	Source	Date	Figure No.
14	WId*. Annular; op. robin's egg blue. D: 12.6, L: 3.0.	Fichtelgebirge: Mehlmeisel	1867-1938	23 (LEFT, 1st)
15	WId*. Annular; tsp. ultramarine. D: 14.0, L: 5.4.	Fichtelgebirge: Mehlmeisel	1867-1938	23 (LEFT, 2nd)
16	WIIdd*. Flattened oblate; tsl./op. light aqua blue. L: 6.3, W: 9.9, T: 5.6.	Fichtelgebirge: Bischofsgrün/Birnstengel	1882-1957	23 (LEFT, 3rd)
17	WIb*. Globular; tsl. white. D: 11.9, L: 9.7.	Fichtelgebirge: Mehlmeisel	1867-1938	23 (LEFT, 4th)
18	WIb*. Oblate; op. light aqua blue. D: 9.3, L: 6.8.	Fichtelgebirge: Warmensteinach	1920s-30s ?	23 (LEFT, 5th)
19	WIb*. Oblate; op. twilight blue. D: 9.2, L: 6.9.	Fichtelgebirge: Bischofsgrün	1920s-30s ?	23 (LEFT, 6th)
20	WII*. Flat "waffle" bead; tsp. ultramarine. L: 19.6, W: ca. 21.0, T: 5.1.	Fichtelgebirge: Mehlmeisel	1867-1938	23 (LEFT, 7th)
27	IIa6/7. Circular/round; op. black. D: 6.1-6.5, L: 4.5-6.3.	Mattapany-Sewall, Maryland	ca. 1666-1740	
33	WIb*. Round; tsl. white. D: 8.8, L: 7.5.	American Indian style hairpipe necklace	20th C	23 (CENTER, Lt)
34	WId*. Donut; op. robin's egg blue. D: 9.8, L: 5.6.	American Indian style hairpipe necklace	20th C	23 (CENTER, Rt)
37	IIa6. Round; op. black. D: 9.8, L: 7.8.	Juffure Factory, The Gambia	18th C	23 (RIGHT, Lt)
38	WIb*. Round; op. black. D: 10.3, L: 8.0.	Juffure Factory, The Gambia	18th C	23 (RIGHT, Rt)
40	WIb16. Round; tsl. bright navy. D: 12.7, L: 12.6.	Juffure Factory, The Gambia	19th C	
41	WId*. Annular; tsp. bright navy. D: 12.7, L: 8.9	Juffure Factory, The Gambia	19th C	

Measurements are in mm: D = Diameter, L = Length, T = Thickness. Figures: LEFT, CENTER, and RIGHT designate the frames in the figures. Within each frame: Lt = Left, Ct = Center, Rt = Right.

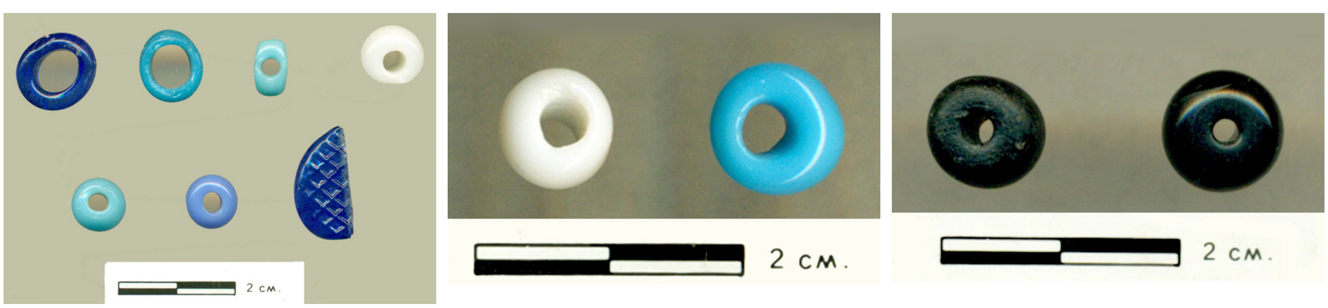

Figure 23. High-soda beads. Left: Fichtelgebirge (KAR 14-20). Center: American Indian style hairpipe necklace components (KAR 33 and 34). Right: The Gambia (KAR 37 and 38).

Table 6. Mixed-Alkali Glass Samples.

Lab No.	Description	Source	Date	Figure No.
8	Button (“whistle” type); op. black. D: 19.0, H: 5.3	Fichtelgebirge: Bischofsgrün	1850-1900	
12	WIb*. Oblate; op. robin’s egg blue. D: 13.0, L: 10.6.	Fichtelgebirge: Mehlmeisel	1867-1938	24 (LEFT)
28	WIb11. Oblate; op. robin’s egg blue. D: 9.7, L: 7.1.	Deapolis Mandan Village, North Dakota	1806-1838	21 (RIGHT, Lt)
Measurements are in mm: D = Diameter, L = Length. Figures: LEFT, CENTER, and RIGHT designate the frames in the figures. Within each frame: Lt = Left, Ct = Center, Rt = Right.				

Figure 24. Mixed-alkali and lead glass. Left: Fichtelgebirge (KAR 12). Center: Fichtelgebirge (KAR 10). Right: Deapolis Village (KAR 30).

Lead Glass

Two beads (Table 7), one (KAR 10) from the Glasperlenhütte Herrmann in Birnstengel and one (KAR 30) from the Deapolis Mandan village in North Dakota, are characterized by high lead concentrations (57% and 48%, respectively) but differ in the rest of their compositions. KAR 10 contains significant concentrations of soda (~5%) and potash (~2.5%) with hardly any lime (0.3%), while KAR 30 contains 3.5% soda, ~5% potash, and 3% lime. The latter is opaque white and contains more than 3% arsenic. It is of a size that intimates furnace winding but the composition is problematic.

KAR 10 is translucent yellow and its color is certainly due to the presence of uranium (4000 ppm). This element was used to impart a range of colors to glass, glaze, and enamel principally between 1840 and 1945 (Vierke 2006:). The composition of the bead, including major, minor, and trace elements as well as coloring agents, is fairly similar to the composition of 19th-century beads possibly manufactured in Venice (Burgess and Dussubieux 2008). On the other hand, Vierke (2006:26) feels that beads containing uranium were likely produced in Bohemia. As the Birnstengel uranium bead is not the only one in the surface collection from that site, it is also possible that uranium beads were produced there as well.

Table 7. Lead Glass Samples.

Lab No.	Description	Source	Date	Figure No.
10	WIb*. Globular; tsl. sunlight yellow. D: 13.6, L: 12.6.	Fichtelgebirge: Bischofsgrün/Birnstengel	1882-1957	24 (CENTER)
30	WIc1. Oval; op. white. D: 14.3, L: 25.5.	Deapolis Mandan Village, North Dakota	1806-1838	24 (RIGHT)
Measurements are in mm: D = Diameter, L = Length. Figures: LEFT, CENTER, and RIGHT designate the frames in the figures.				

DISCUSSION

Over a span of 500 years, the Fichtelgebirge region of Bavaria produced countless tons of furnace-wound buttons and beads which were transported all over the world.[2] Yet very little is known about the exact products of this rather remote region. Archaeological research has so far been restricted to the Wolfslohe furnace site on the Oschenkopf. The finds at this site, which operated ca. 1640, reveal that black ball buttons, several forms of beads, and spindle whorls were the principal products made from Proterobas. Some of these were decorated with various designs which were painted on rather than applied as viscid glass. The distinctive chemical composition of this material makes the identification of Proterobas products relatively simple. Additionally, unlike most black glasses that are translucent on thin edges when held up to a strong light, Proterobas glass is totally opaque. The use of Proterobas to make buttons (and possibly beads) continued until at least 1811 (Schaller 1989).

Glass beads surface collected in the Fichtelgebirge that may be attributed to the 18th-19th centuries based on their similarity to specimens recovered from archaeological sites in the United States include very large round, oblate, donut-shaped, and pentagonal-faceted forms. These forms are commonly found associated at archaeological sites (e.g., Davis 1972; Good 1972; Karklins and Schrire 1991; Mason 1986) with other very large beads that were doubtless furnace wound including oval (pigeon egg), raspberry (clamped in a mold to impart a series of nodes), ridged tube (five-sided cylinder), and disc or tabular specimens, the latter often decorated with a crescent moon, stars, and comets (man-in-the-moon) (Figure 25). All of these forms, excluding the disc beads, are commonly referred to as "Dutch" because many have been found in Amsterdam and other centers in the Netherlands (Karklins 1983) as well as in Dutch contexts around the world (e.g., Karklins and Schrire 1991; van der Sleen 1967). There is, however, no historical nor archaeological evidence for their manufacture in Holland and, considering that they are furnace-wound, they are almost certainly the products of the Fichtelgebirge which were exported from various European ports, including Amsterdam. Based on the three Fichtelgebirge specimens that were analyzed (KAR 9, 11, 13), the beads produced during the 18th and 19th centuries were made using potash glass. Examples of like forms and compositions are present at 18th-19th-centuries sites in Europe, the United States, and Africa (Table 4).

The beads found in the wasters of beadmakers at Birnstengel and Mehlmeisel likely all date to the late 19th and/or early 20th centuries. They are generally made of soda glass though one robin's egg blue specimen from Mehlmeisel and a yellow bead colored with uranium from Birnstengel are composed of mixed-alkali and lead glass, respectively.

While their composition is similar to lampworked Venetian beads, furnace-wound beads do exhibit certain features that may allow them to be distinguished. They are often irregular in form and, since the smaller forms were often made in a series with a thread of glass extending from one bead to the next, may exhibit a small broken projection at either end. The perforations are also generally larger than those of lampworked beads because the mandrels used were thicker, having to withstand the heat of the furnace and the weight of large and heavy or multiple beads.

CONCLUSION

While much is known about the history of the Fichtelgebirge beadmakers and their technology, we still know very little about their products. The excavation of the Wolfslohe furnace site has provided a glimpse at what was made during the mid-17th century, but the 18th and 19th centuries are represented by only a handful of beads and buttons from scattered surface sites in the Fichtelgebirge region. Quite a bit of material has been surface collected at several late 19th-20th-century sites such as Birnstengel and Mehlmeisel, but even here it is not certain which specimens relate to the 19th and early 20th centuries, which to the interwar period, and which to postwar times. It is the fervent hope of the authors that additional sites will be excavated in the region which will help to fill the numerous gaps in our knowledge about what was produced in the Fichtelgebirge *Paterlhütten*, when, and using what ingredients.

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Figure 25. Various forms of furnace-wound beads from the Potawatomi Indian occupation of the Rock Island site (ca. 1670-1730), Wisconsin. Most, if not all, of the beads were likely produced in the Fichtelgebirge (Mason 1986: Color Plate 4, detail; reprinted with permission by The Kent State University Press).

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ENDNOTES

1. Preiss (2009:145) proposes that the tool (*Zange*) used consisted of a long metal rod with a split end which

expanded slightly towards the tip. The iron button shank was inserted in the split and held in place with a sliding ring.

2. It should be mentioned that furnace-wound beads were also produced in the Bavarian Forest some 160 km to the southeast of the Fichtelgebirge. A *Paternosterhütte* was already operating in Rabenstein near Zwiesel around 1420, and there were several others in Spiegelau, Bodenmais, and other villages during the 15th and 16th centuries (Vierke 2006:55-56). Unfortunately, it is not known how long this bead industry lasted or what exactly it produced.

REFERENCES CITED

Amthor, Max
1881 *Industriegeographie des Königreichs Bayern*. Eduard Amthor, Gera.

Bucher, Bruno
1893 *Geschichte der technischen Künste*. Union deutsche verlagsgesellschaft, Stuttgart, Berlin, Leipzig.

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.

Burton, Richard F.
1860 *The Lake Regions of Central Africa*. Vol. 2. Longman, Green, Longman, and Roberts, London.

Cofield, Sara Rivers
2014 Bavarian Black Buttons. Jefferson Patterson Park and Museum. http://www.jefpat.org/CuratorsChoiceArchive/2014CuratorsChoice/May2014-BavarianBlackButtons-.html, accessed 19 October 2016.

Davis, Wayne L.
1972 Glass Trade Beads of the Northern Plains – Upper Missouri Region. M.A. thesis. Department of Archaeology, University of Calgary, Calgary.

Dussubieux, Laure
2016 Fichtelgebirge Glass Project. Report on file. Elemental Analysis Facility, The Field Museum, Chicago.

Flurl, Matthias von
1792 *Beschreibung der Gebirge von Baiern und der oberen Pfalz*. Joseph Lentner, Munich.

Goldfuss, Georg August and Gustav Bischof
1817 *Physikalisch, statistische Beschreibung des Fichtelgebirges*. Steinschen Buchhandlung, Nürnberg.

Good, Mary Elizabeth
1972 Guebert Site: An 18th Century, Historic Kaskaskia Indian Village in Randolph County, Illinois. *Central States Archaeological Societies, Memoir* 2.

Hawthorne, J.G. and C.S. Smith (eds.)
1979 *Theophilus: On Divers Arts*. Dover Publications, New York.

Heidenreich, Anja
2007 Der Kühlofen einer Glasmacherhütte am Ochsenkopf bei Fichtelberg, Neubau, Gemeinde Fichtelberg, Landkreis Bayreuth, Oberfranken. *Das Archäologische Jahr in Bayern 2006*:165-168.

Herrmann, Harald
2008 *Warmensteinacher Glass*. Heinrichs-Verlag, Bamberg.

Humboldt, Alexander von
1792 *Über den Zustand des Bergbaus und des Hüttenwesens in den Fürstentümern Bayreuth und Ansbach im Jahr 1792*. Akademie Verlag, Berlin.

Jargstorf, Sibylle
1995 *Glass Beads from Europe*. Schiffer Publishing, Atglen, PA.

Karklins, Karlis
1983 Dutch Trade Beads in North America. *In* Proceedings of the 1982 Glass Trade Bead Conference, edited by Charles F. Hayes III, pp. 111-116. *Rochester Museum and Science Center, Research Records* 16.

Karklins, Karlis and Norman F. Barka
1989 The Beads of St. Eustatius, Netherlands Antilles. *Beads: Journal of the Society of Bead Researchers* 1:55-80.

Karklins, Karlis and Carmel Schrire
1991 The Beads from Oudespost I, A Dutch East India Company Outpost, Cape, South Africa. *Beads: Journal of the Society of Bead Researchers* 3:61-72.

Kühnert, Herbert
1924 *Einige ältere Glashütten des oberpfälzischen Böhmerwaldes und des Fichtelgebirges*.

Lorenzini, Michele A. and Karlis Karklins
2000-2001 Man-in-the-Moon Beads. *Beads: Journal of the Society of Bead Researchers* 12/13:39-47.

Mason, Ronald J.
1986 Rock Island: Historical Indian Archaeology in the Northern Lake Michigan Basin. *Midcontinental Journal of Archaeology Special Papers* 6.

Pachelbel-Gehag, Johann Christoph von
1932 [1716] Beschreibung des Fichtelbergs. In *Vom ehemaligen Knopfhüttenbetrieb in Bischofsgrün*, edited by Christian Seidel. Siebenstern.

Pratt, Peter P.
1961 *Oneida Iroquois Glass Trade Bead Sequence, 1585-1745*. Fort Stanwix Museum, Rome, NY.

Preiss, Florian
2010 Zwarte knoopjes van de Ossenkop. De opgraving van een vroegmoderne glashut in Fichtelberg-Neubau (Beieren). In *Soja Bundel 2009: Akten van het symposium gehouden aan de Universiteit van Amsterdam, 13 maart 2009*, edited by Rogier A.A. Kalkers, Dorien te Kiefte, and Marleen K. Termeer, pp. 139-149. Amsterdam.

Sackur, Dr.
1861 Über die Fabrication der massiven Glasperlen. *Polytechnischen Journal* Band 159, Art. LIV, pp. 214-215. From the *Breslauer Gewerbeblatt*, 1860, No. 26.

Schaller, Christoph
1989 Johann Heinrich Scherbers Umsichten auf dem Ochsenkopf aus dem Jahre 1811. *Das Fichtelgebirge* 2.

Sleen, W.G.N. van der
1967 *A Handbook on Beads*. Musée du Verre, Liège.

Steppuhn, Peter
2005 Archäologische Untersuchungen an einer Proterobas-Glashütte im Fichtelgebirge, Neubau, Gemeinde Fichtelberg, Landkreis Bayreuth, Oberfranken. *Das Archäologische Jahr in Bayern 2004*:166-168.
2008 Eine Hütte der Zeit um 1640 im Fichtelgebirge zur Herstellung von Knöpfen aus Proterobas und Glas. In *Glashüttenlandschaft Europa. Beiträge zum 3. Glassymposium in Heigenbrücken/Spessart*, edited by Helmut Flachenecker, Gerrit Himmelsbach, and Peter Steppuhn, pp. 105-108. Schnell & Steiner, Regensburg.

Strahan, Donna
2001 Uranium in Glass, Glazes and Enamels: History, Identification and Handling. *Studies in Conservation* 46(3):181-195.

Tieck, Ludwig and Wilhelm Heinrich Wackenroder
1970 [1793] *Die Pfingstreise von 1793 durch die Fränkische Schweiz, den Frankenwald und das Fichtelgebirge*. Saalfrank, Helmbrechts.

Veh, Frieda Maria
1965 Die Glasknopf- und Glasperlenindustrie im Fichtelgebirge. *Bayrisches Jahrbuch für Volkskunde* 1964/1965:97-107.

Vierke, Ulf
2006 Die Spur der Glasperlen. *Bayreuth African Studies Online* 4.

Warmensteinach
2013 Hüttenhaus-Perlenhütte. Glaswanderweg Warmensteinach. http://www.warmensteinach.de/Huettenhaus.276.0.html, accessed 5 August 2015.

Weiss, Gustav
1971 *The Book of Glass*. Praeger, New York.

Willen, Johann
1881 [1692] Das Teutsche Paradeiss in dem vortrefflichen Fichtelberg. In *Archiv für Geschichte und Altertumskunde in Oberfranken*, Bd. 15, 16, 22, and 37.

Karlis Karklins
Ottawa, Ontario
Canada
karlis4444@gmail.com

Sibylle Jargstorf
Glücksburg
Germany
s.jargstorf@gmx.de

Gerhard Zeh
Bischofsgrün
Germany

Laure Dussubieux
Elemental Analysis Facility
The Field Museum
Chicago, Illinois
U.S.A.
ldussubieux@fieldmuseum.org

BEADS AND PENDANTS FROM THE TUMULI CEMETERIES AT WADI QITNA AND KALABSHA-SOUTH, NUBIA

Joanna Then-Obłuska

More than 500 beads and pendants were excavated by a Czechoslovakian team in the early 1960s at two sites in Lower Nubia. The beads were associated with 40 tumuli in the Wadi Qitna cemetery and two tumuli in the Kalabsha-South cemetery. These 4th-century cemeteries are related to the Blemmyes, the Eastern Desert dwellers whose pottery has been commonly recognized in the region between the Nile Valley and the Red Sea coast at a time of intensive overseas trade contacts. The bead assemblage, stored at the Naprstek Museum in Prague, was recently restudied and its materials and parallels could be more specifically identified. In addition to ostrich eggshell of Nubian Desert origin, Red Sea shells and glass beads of Eastern Mediterranean and South Asian origin are present. Some beads are modern European intrusions.

INTRODUCTION

The Wadi Qitna and Kalabsha-South tumuli cemeteries lie to the west of the Nile Valley in the Lower Nubian region, 65 km to the south of Aswan (Figure 1). They are ascribed to the Blemmyes, the Eastern Desert dwellers. After the fall of the Meroitic state and the withdrawal of the Romans from Lower Nubia around A.D. 298, the Nobadians, possibly from the Western Desert, and the Blemmyes, from the Eastern Desert, encroached. The Blemmyes are well attested in the written sources (e.g., Dijkstra 2012). They, and other groups, occupied the region of the emerald and beryl mines in the Eastern Desert called *Mons Smaragdus*. The ethnic term "Blemmye" needs to be used with care since it probably included a wide variety of people living between the Red Sea and the Nile Valley (Dijkstra 2012).

The presence of the Eastern Desert dwellers in the Nile Valley is marked by their handmade pottery, the so-called Eastern Desert Ware that can be traced in the Eastern Desert as far as the Egyptian Red Sea ports of Berenike, Marsa Nakari, and Quseir to the east, and the Fifth Cataract region in Sudan to the south (Barnard 2006, 2008; Barnard and Magid 2006). Additionally, their graves are found on the west and left bank of the Lower Nubian Nile Valley and date to the mid-4th century A.D.; i.e., ca. A.D. 330/340-370/380 (Williams 1991b:12). Tumuli graves ascribed to the Blemmyes were excavated by the Oriental Institute Nubian Expedition at cemeteries A and B at Kalabsha-North, cemetery E to the north of Bab Kalabsha, and cemetery C at Kalabsha-South (Ricke 1967). Furthermore, a continuation of the Kalabsha-South cemetery and a cemetery at Wadi Qitna were explored in the 1960s by a Czechoslovakian team under the direction of Eugene Strouhal (1984). More than 500 beads and pendants recorded at the two cemeteries have been published in the excavation report (Strouhal 1984:223-227, Table 40, Figures 151-152, Plates 73-74). The beads are presently stored in the Naprstek Museum in Prague and are the subject of this paper.

Beads are said to come from 40 tumuli in the Wadi Qitna cemetery and from two tumuli in the investigated part of the Kalabsha-South cemetery (Strouhal 1984:223). While some beads were found in tumulus graves, others were surface collected. The latter were ascribed to the nearest tumulus and considered as ancient. Since the cemeteries had been heavily robbed, many beads were found as dispersed items. Nevertheless, some beads were found in a linen bag (Figure 2: P 3010) or with the original stringing (Figures 3: P 3027; 4: P 3011, P 3013b; 5: P 3019-3021; 6: P 3035, P3037; 7: P 3041; 8: P 3048). The latter were interpreted as necklaces (Strouhal 1984:223). It should, however, be mentioned that earrings in the form of beads threaded on a string or a metal wire have been recorded at other Blemmyan sites (Habachi 1967:68, 70). In accordance with a long-standing Nubian tradition (e.g., Then-Obłuska 2014), not only women and children, but also men were buried with their bead adornments (Strouhal 1984:223, Table 40).

The typology of beads in the excavation report was mainly based on material and shape, and many parallels were drawn accordingly. For this reason, the beads were generally considered as not very interesting from a chronological viewpoint since their shapes covered extensive chronological and geographical scopes (Strouhal 1984:226).

Figure 1. Map of Egypt and Nubia showing the locations of the sites mentioned in text (drawing: Szymon Maślak).

Figure 2. Beads from Tumuli 1 (P 3006, P 3007), 2c (P 3008), 9 (P 3009), and F (P 3010) (modern stringing) (all photos by author).

Studies by the author at the Naprstek Museum in 2015 permitted the identification of materials and manufacturing techniques, and the drawing of more specific parallels with contemporary sites. It also allowed the identification of a few modern intrusions which had previously been deemed ancient objects.

LATE ANTIQUE BEADS

The antique beads and pendants are made of organic (wood, mollusk shells, ostrich eggshell, bone), inorganic (stone), and man-made (faience, glass) materials. They are illustrated according to their excavation number.

Wood

A fragment of a long, square-sectioned, wood cylinder with traces of a perforation (Figure 3: P 3028) was found in Tumulus 173. The species has yet to be determined. There are not many wood beads at Nubian sites (cf. the section on modern beads), but among them is a set of long tubular beads found at a Blemmyan site at Bab Kalabsha (Habachi 1967:68, object B 9/3-4, Figure 77, Plate 27). It is presently in the Oriental Institute Museum of the University of Chicago (OIM E20378). Other wooden beads were recovered from the forecourts of two royal tombs at the Nobadian cemetery at Qustul (Emery and Kirwan 1938:201, no. 82, Tomb Q 2-92, Burial M; 204, no. 106, Q17-33, Burial T).

Mollusk Shell

Thirteen small shells of *Conus taeniatus* sp. originated in the Red Sea (Figure 2: P 3010a). Their apexes have been ground down or cut off. Shell beads of Red Sea origin have been recorded at Nubian sites dated to the Meroitic period (Then-Obłuska 2015a) and especially those dated to the post-Meroitic period (Then-Obłuska 2017b). They were also found at the Red Sea port of Berenike (Then-Obłuska 2015b: Figure 1:13). Beads of mollusk shell or ostrich eggshell found at this Roman port site may indicate the presence of coastal or Eastern Desert dwellers there.

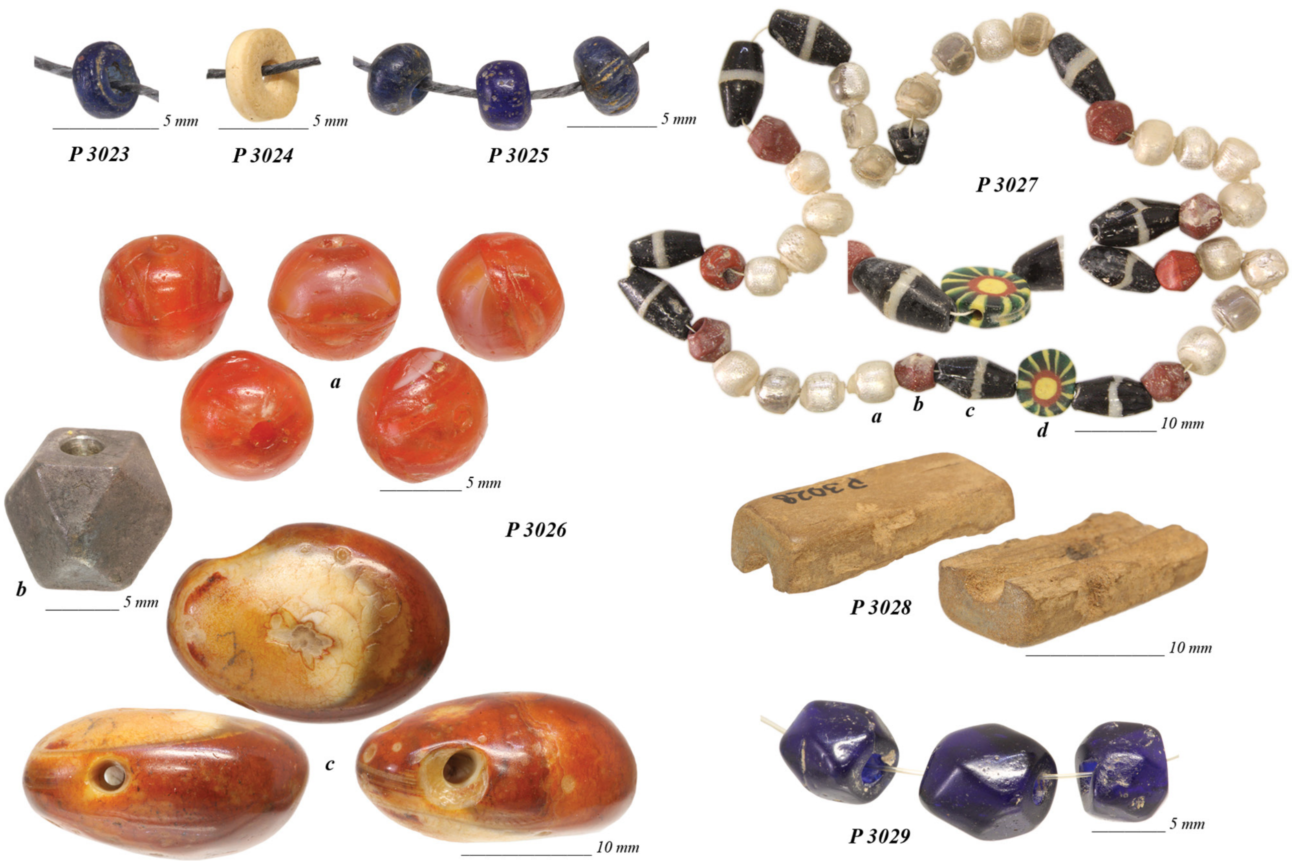

Figure 3. Beads from Tumuli 125 (P 3023), 130G (P 3024), 138 (P 3025), 161 (P 3026), 170B (P 3027), 173 (P 3028), and 195 (P 3029) (modern stringing).

Ostrich Eggshell

Whereas the majority of the beads found at Wadi Qitna were previously identified as bone (Strouhal 1984:226), 330 beads appear to be made of ostrich eggshell (Figures 3: P 3024; 4: P 3011, 3016, 3017; 5: P 3019, 3020, 3021a; 6: P 3035, 3037; 7: P 3045; 9: P3030, P3032). This is one of the oldest and most common bead materials in Nubia. The beads became especially numerous at Nobadian and Blemmyan sites after the fall of the Meroitic state (Then-Obłuska 2014). Interestingly, they were also recognized at the contemporary Late Roman Red Sea port sites of Berenike and Marsa Nakari (Then-Obłuska 2015b: Figure 2.7, 2017a).

Bone

A globular pendant (Figure 4: P 3013a), a globular bead (Figure 4: P 3015), and three standard tubular beads are made of bone (Figure 8: P 3049). The pendant was found threaded on a plaited dark brown string around which red thread had been twisted (Figure 4: P 3013b). A globular bone bead was also found at another Blemmyan site at Bab Kalabsha (OIM E42043D).

Stone

Small carnelian beads perforated from one end (Figure 4: P 3014) show characteristic saw traces across the larger opening. This feature has been noted on stone beads from the Meroitic period. Small, oblate, and well-polished carnelian beads are also commonly recognized Meroitic types (Then-Obłuska 2015a).

Faience

Faience beads ceased to be produced in Egypt in the 3rd century A.D. They still continued to be produced in Nubia, however, and a few specimens were found at Wadi Qitna and Kalabsha-South. These are a tiny short cylinder (Figure 8: P 3046a), a disc cylinder (Figure 8: P 3046b), and a larger

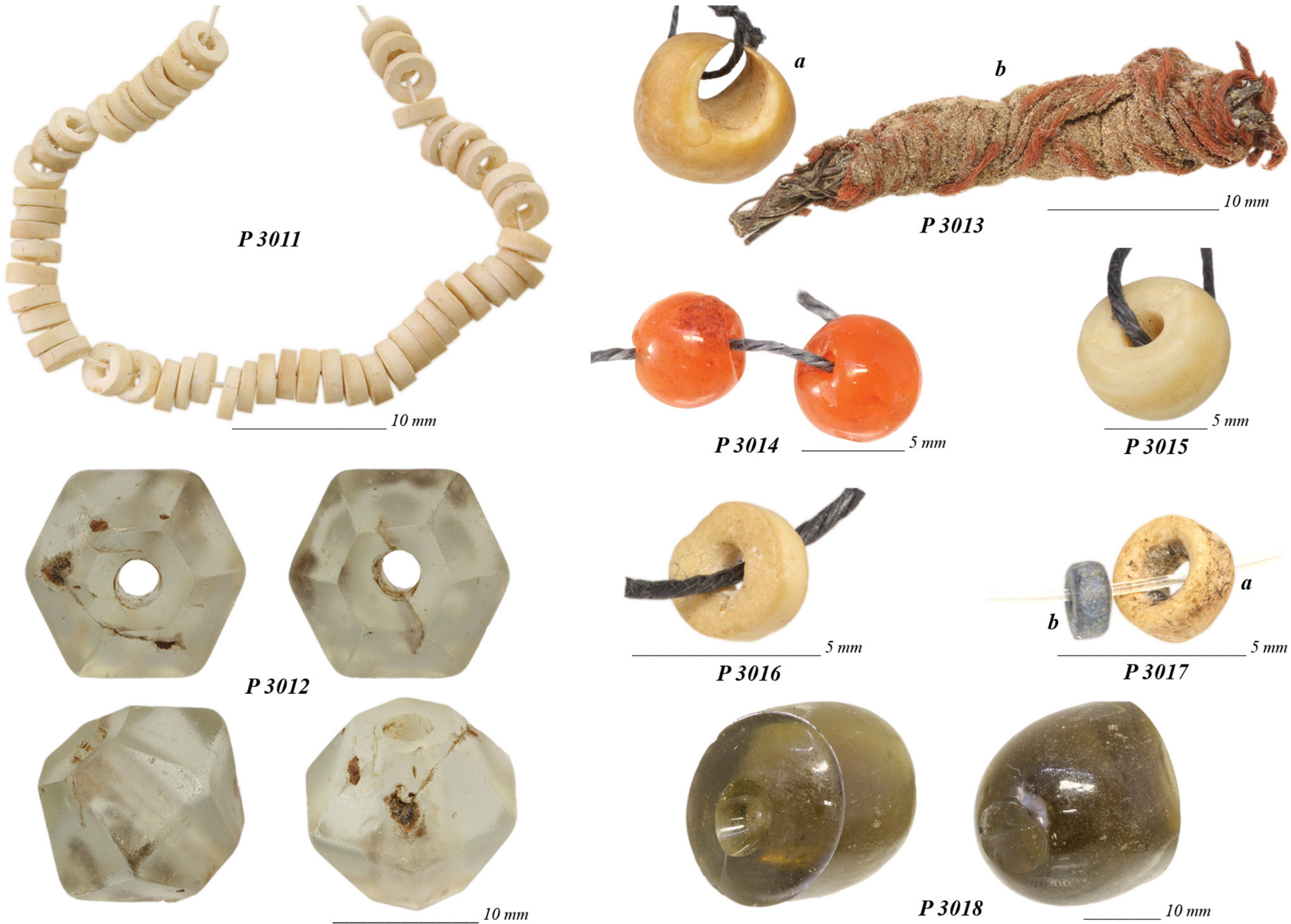

Figure 4. Beads from Tumuli 17B (P 3011), 29 (P3012), 74 (P 3013), 77 (P 3014), 80 (P 3015), 86B (P 3016), 88 (P 3017), and 90A (P 3018) (modern stringing on all but P 3013b).

tubular specimen (Figure 2: P 3006). While tiny beads are present at Meroitic sites (e.g., Then-Obłuska 2015a: Figure 7, T268 c1/b), larger tubular beads are commonly found at Late Meroitic and post-Meroitic sites in Nubia (e.g., Then-Obłuska 2014: Figure 2).

Glass

The recovered glass beads fall into five groups: drawn segmented, drawn rounded, mandrel-wound, mandrel-formed, and rod-pierced.

Drawn Segmented Beads

Short and standard oblate beads made of drawn and segmented glass are dark blue (Figure 3: P 3023, P 3025), yellow (Figure 6: P 3040), and black (Figure 9: P 3033) in color. Molds for segmenting drawn glass tubes are known from both Early Roman and Early Byzantine contexts at Alexandria, Egypt (Kucharczyk 2011; Rodziewicz 1984). Single- and multiple-segment beads are the most common type at Meroitic sites in Nubia (Then-Obłuska 2015a), as well as at post-Meroitic Nubian sites (Then-Obłuska 2017b) and Late Roman contexts at the port of Berenike (Then-Obłuska 2015b).

Other single-segment drawn beads are long tubes of opaque red, black, and translucent blue (Figures 5: P3022; 8: P 3048a-c). Two long red beads are in the shape of a bicone (Figure 8: P 3048d). Long red tubes are known from a Blemmyan cemetery at Bab Kalabsha (OIM E42033).

Twenty-three metal-in-glass beads have silver foil between two transparent glass layers (Figure 3: P3027a). While gold foil dominates in metal-in-glass beads during the Early Roman period in Egypt and the Meroitic period in Nubia (e.g., Then-Obłuska 2015a, b), silver-in-glass beads

Figure 5. Beads from Tumuli 106 (P 3019), 112 (P 3020), 114 (P 3021), and 118 (P 3022) (modern stringing).

were more common during the post-Meroitic period in Nubia (e.g., Then-Obłuska 2014).

Drawn Rounded Beads

Three green glass beads were found together with ostrich-eggshell beads in an infant's grave in Tumulus 114 at Wadi Qitna (Figure 5: P 3021b). Drawn glass tubes were cut into sections and their sharp ends were heat-rounded. These types are associated with the Indo-Pacific bead tradition and their presence in northeast Africa is said to be restricted to port sites (Francis 2002). A yellow drawn and rounded bead from the port of Quseir (*Myos Hormos*) was found to have a South Indian or Sri Lankan origin through laboratory analysis (Then-Obłuska and Dussubieux 2016). Green beads, such as found at Wadi Qitna, belong to one of the most common South Asian types (drawn and rounded beads) which have been found at the Late Roman ports of Berenike (Francis 2002; Then-Obłuska 2015b) and Marsa Nakari (Nechesia) (Then-Obłuska 2017a), as well as at Late Antique Nubian sites that include other Blemmyan cemeteries (Then-Obłuska 2017b).

Mandrel-Wound Beads

Some beads were made by winding glass around a mandrel. They are usually globular in shape and blue and green in color (Figures 2: P 3009; 8: P 3047b-c, P 3048e). A black collared oblong-ovate is decorated with a central white trail (Figure 8: P 3047a) whereas long black cylinders are decorated with a spiral white trail (Figure 8: P 3048f). The latter have analogies in beads of Eastern Mediterranean provenance dating to the 4th century A.D. (Arveiller-Dulong and Nenna 2011: no. 296.39-40).

Three single- and multiple-coiled blue beads are rather large in size (Figure 6: P 3039), measuring ca. 8 mm in diameter. Similar beads are present at a Blemmyan site at Bab Kalabsha (OIM E 42035) and at the Red Sea port of Berenike (Then-Obłuska 2015b: Fig. 5: 7, 9).

Thirteen opaque and glossy red glass beads are single-, double-, and quintuple-coiled (Figure 7: P 3041). Similarly shaped beads have correlatives at Late Roman sites in Egypt (Arveiller-Dulong and Nenna 2011:175, cat. 214, double-segment wound glass beads; Lankton 2003: Figure 7.0: 636).

Figure 6. Beads from Tumuli 255c (P 3035, P3036, P 3037), 330 (P 3038), 337 (P 3039), and 363 (P 3040) (modern stringing).

Two beads are faceted, having been marvered into a cornerless cube (Figure 2: P 3007) and a hexagonal bicone (Figure 7: P 3042). Another bead in the form of a hexagonal bicone, 14 mm in diameter, is made of transparent glass (Figure 4: P 3012). It is uncertain whether this large bead is late antique or modern.

Mandrel-Formed Beads

Several large globular blue beads were most probably made by folding a glass strip around a mandrel and fusing the ends together (Figure 9: P 3034). Traces of seams can be discerned on some of them. Black-and-white banded mosaic strips were folded into elongated beads (Figure 3: P 3027c). Similar specimens are present at other Blemmyan sites (OIM E42033, OIM E42038). Another bead was made by joining two glass segments of different shades of green (Figure 7: P 3044a). A semi-translucent green bead is most probably also mandrel-formed (Figure 9: P 3031).

Some mandrel-formed beads were additionally marvered to produce faceted shapes. These include a green biconical bead fragment (Figure 6: P 3036) and slightly faceted opaque red bicones (Figure 3: P 3027b). Roughly shaped, dark blue cornerless cuboids (Figure 3: P 3029) have also been found in the Bab Kalabsha tumuli (OIM E42043B, OIM E42035).

Rod-Pierced Beads

Rod-pierced mosaic cane sections belong to one of the most recognized glass types in Early Roman and Meroitic assemblages, although tabular mosaic beads with a so-called flower motif with radial "petals" in yellow and green emanating from a yellow center within a red ring (Figure 3: P 3027d) have been found at the post-Meroitic Lower Nubian sites of Qustul (Williams 1991b:143 and 300c; ca. A.D. 370/380-410), Serra East (Then-Obłuska, 2017b: Figure 7), and Ballana (Williams 1991a:235, Fig. 48h). In the latter instance, although published as Meroitic, the beads relate to the post-Meroitic reuse of the grave (Williams 1991b: 401). Among Egyptian parallels are specimens from Late Roman sites at Bagawat in Kharga Oasis (Metropolitan Museum

Figure 7. Beads from Tumuli 367A (P 3041), 377A (P 3042), 385A (P 3043), 386 (P 3044), and 387 (P 3045) (modern stringing).

of Art, accession no. 31.8.6, 4th-7th centuries), Gurob in the Fayum (Petrie Museum, UC58113, Late Roman), and the Berenike port (Then-Obłuska 2015b: Fig. 5: 37, Late Roman). Similar yellow and green beads, but with a red center, come from Late Meroitic contexts at Karanog (Woolley and Randall MacIver 1910: Pl. 40: 7906).

A mosaic cane section with purple and white radial stripes atop a red-on-white layer was rod-pierced and shaped into a globular bead (Figure 7: P 3044b). Traces of the red and white glass that comprise the core are visible in the chipped area at one end of the hole. Although tabular in shape, a bead with the same mosaic pattern is present at Late Roman Berenike (Then-Obłuska 2015b: Fig. 5:38).

Metal

A bronze coin with a single perforation (Figure 8: P 3058) was found with three beads in a child's grave in tumulus 195 (Figure 3: P 3029). Based on iconographic comparison, it could be dated to Constantius II (Augustus, A.D. 337-361) (Strouhal 1984:230). A coin of Roman emperor Julian II (Augustus, A.D. 361-363) perforated with three holes was found in the Late Roman Harbor Temple at Berenike (Sidebotham and Zych 2010; Sidebotham et al. 2015). Coin settings were used in jewelry in late antiquity and this practice continues into modern times (Bruhn 1993). Pierced coins might be necklace components as suggested for the Wadi Qitna find (Strouhal 1984). Multiple pierced coins could be sewn or plaited into textiles. A pair of textile earrings (?) with sewn coral and glass beads bordering small perforated circular medallions, most probably coins, is dated to the 4th century A.D. and comes from Egypt (J. Paul Getty Museum 82.AI.76.26.1).

Twenty-three standard barrels (Figure 2: P 3010b), previously identified as glass (Strouhal 1984: Figure 151; Table 40) but most probably silver, were found together with *Conus taeniatus* sp. beads (see above). They were with a ribbon made of crudely woven linen in a linen bag.

Figure 8. Beads and pendants from Tumuli 387/1 (P 3046), 393 (P 3047), 431 (P 3048), K1c (P 3049), K20/74 (P 3050), and 195 (P 3058) (modern stringing).

MODERN BEADS

Some specimens found at the Wadi Qitna and Kalabsha-South cemeteries are modern intrusions, and a few others are tentatively ascribed to this group.

A red mold-pressed glass bead with a raised seam around the middle was collected together with a metal cornerless cube and a perforated jasper pebble (Figure 3: P 3026a-c). The glass bead could be a Bohemian product (K. Karklins 2016: pers. comm.). The metal bead was tested and said to be made of pure silver (Strouhal 1984:223). The pebble pendant was perforated from either side creating a double-cylinder perforation with a conical indentation at one opening.

A globular wooden bead (Figure 2: P 3008) might also be a modern object. Similar beads were found together with some modern beads at Serra East (OIM E24513).

A red-on-white drawn bead, three yellow mold-pressed beads, and one drawn red cylinder bead form another group (Figure 6: P 3038a-c). The translucent red-on-opaque white bead is often referred to as *cornaline d'Aleppo* (Billeck 2008). They are also called *corniola perla* on a Nissim Namer bead sample card from Sudan, presently in the Royal Ontario Museum (Accession No. 907.31.11). The card exhibits European beads that were used by Sheikh Abdullah in about 1870. The handwritten note on the card speaks of Sheikh Abdullah being with the Mahdi during this period (Billeck 2008:50, Plates IXC, XA). Translucent red-on-opaque white drawn beads were probably first made in Venice and continue to be made today in several countries (Billeck 2008:51).

Although a large plastic fragment (Figure 4: P 3018) was said to have an analogy in ancient Nubian beadwork (Strouhal 1984:227), it is neither a bead nor an ancient object. A yellow oval bead (Figure 8: P 3050) and a yellow cube-shaped bead (Figure 7: P 3043) appear to be made of molded plastic.

Figure 9. Beads from Tumuli 201F (P 3030), 215 (P 3031), 220 (P 3032), 240 (P 3033), and 253 (P 3034) (modern stringing).

CONCLUSION

The beads and pendants found at the 4th-century tumuli cemeteries at Wadi Qitna and Kalabsha-South are associated with the Eastern Desert dwelling Blemmyes. According to textual and archaeological sources, they were very active between the Nile Valley and Red Sea coastal sites. The beads found in their graves are made of a variety of materials whose sources can be traced to the neighboring deserts, the Red Sea coast, the Eastern Mediterranean region, and as far as South India or Sri Lanka.

Previously identified as bone, beads of ostrich eggshell, a material readily available in the Nubian deserts, dominate the collection. *Conus taeniatus* sp. shells come from the Red Sea. Perfectly polished tiny carnelian beads with traces of saw marks next to the perforation are well known in the Meroitic period in Nubia.

Glass beads were made using diverse techniques including drawing, winding, folding, joining, and rod-piercing. Trail-decorated wound glass beads are elsewhere thought to be of Eastern Mediterranean production. Mosaic glass beads are paralleled at other contemporary Egyptian and Nubian sites. While drawn and segmented glass and metal-in-glass beads are well known in Egypt and Nubia, a few drawn and rounded beads are most probably of South Asian origin. Asian bead imports have already been identified at Red Sea ports in Egypt and recently they have also been identified at many post-Meroitic sites in the Nile Valley. That was a time of intensified maritime trade in the West Indian Ocean basin and it is possible that the Blemmyes, active between the Nile Valley and the Red Sea coast, played an intermediary role in the distribution of imported items.

A number of beads appear to be modern intrusions. In addition to the types already recognized at Lower Nubian sites (Then-Obłuska 2016) are the red-on-white and globular mold-pressed glass beads, as well as the yellow oval and cube-shaped plastic ones. A globular wooden bead, a large silver cornerless cube, and a perforated jasper pebble also appear to be modern.

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REFERENCES CITED

Arveiller-Dulong, Véronique and Marie-Dominique Nenna

2011 *Les verres antiques du Musée du Louvre III. Parures, instruments et éléments d'incrustation*. Musée du Louvre, Paris.

Barnard, Hans

2006 Eastern Desert Ware from Marsa Nakari and Wadi Sikait. *Journal of the American Research Center in Egypt* 42:131-146.

2008 Eastern Desert Ware: Traces of the Inhabitants of the Eastern Deserts in Egypt and Sudan During the 4th-6th Centuries CE. *British Archaeological Reports International Series* 1824. Oxford.

Barnard, Hans and Anwar A. Magid

2006 Eastern Desert Ware from Tabot (Sudan): More Links to the North. *Archéologie du Nil Moyen* 10:15-34.

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.

Bruhn, Jutta-Anette

1993 *Coins and Costume in Late Antiquity*. Dumbarton Oaks Research Library and Collection, Washington.

Dijkstra, Jitse H.F.

2012 Blemmyes, Noubades and the Eastern Desert in Late Antiquity: Reassessing the Written Sources. In *The History of the Peoples of the Eastern Desert*, edited by H. Barnard and K. Duistermaat, pp. 239-247. Cotsen Institute of Archaeology Press, Los Angeles.

Emery, Walter B. and Laurence P. Kirwan

1938 *The Royal Tombs of Ballana and Qustul*. 2 vols. Government Press, Cairo.

Francis, Peter Jr.

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

Habachi, Labib

1967 Kleinfunde. In *Ausgrabungen von Khor-Dehmit bis Bet el Wali*, edited by H. Ricke, pp. 68-70. The University of Chicago Press, Chicago.

Kucharczyk, Renata

2011 Glass from Area F on Kom El-Dikka (Alexandria). Excavations 2008. *Polish Archaeology in the Mediterranean* 20:56-67.

Lankton, James W.

2003 *A Bead Timeline, Vol. I: Prehistory to 1200 CE. A Resource for Identification, Classification and Dating*. The Bead Museum, Washington.

Ricke, Herbert

1967 Ausgrabungen von Khor-Dehmit bis Bet El-Wali. *Oriental Institute Nubian Expedition* 2.

Rodziewicz, Mieczysław

1984 *Les habitations romaines tardives d'Alexandrie: A la lumiere des fouilles polonaises a Kom el-Dikka*. Editions Scientifiques de Pologne, Warsaw.

Sidebotham, Steven E. and Iwona Zych

2010 Berenike: Archaeological Fieldwork at a Ptolemaic-Roman Port on the Red Sea Coast of Egypt 2008-2010. *Sahara* 21:7-26.

Sidebotham, Steven. E., Iwona Zych, Joanna. K. Rądkowska, and Marek Woźniak

2015 Berenike Project. Hellenistic Fort, Roman Harbor, Late Roman Temple, and Other Projects. Archaeological Work in the 2012 and 2013 Seasons. *Polish Archaeology in the Mediterranean* 24(1):297-324.

Strouhal, Eugene

1984 *Wadi Qitna and Kalabsha-South: Late Roman–Early Byzantine Tumuli Cemeteries in Egyptian Nubia I*. Charles University, Prague.

Then-Obłuska, Joanna

2014 The Code of the Hidden Beads – From the Kerma to the Islamic Period According to the 4th Cataract Material from the Gdańsk Archaeological Museum Collection. *In* The Fourth Cataract and Beyond: Proceedings of the 12th International Conference for Nubian Studies, edited by J.R. Anderson and D.A. Welsby, pp. 1069-1090. *British Museum Publications on Egypt and Sudan* 1.

2015a Beads and Pendants from Sedeinga, Nubia. *Beads: Journal of the Society of Bead Researches* 27:29-45.

2015b Cross-Cultural Bead Encounters at the Red Sea Port Site of Berenike, Egypt, Preliminary Assessment (Seasons 2009-2012). *Polish Archaeology in the Mediterranean* 24(1):735-777.

2016 The 'Bead Side' Story of Medieval and Post-Medieval Nubia: Tentative Approach to the Bead Collection of the Museum of Archaeology University of Stavanger, Norway. In *Aegyptus et Nubia Christiana. The Włodzimierz Godlewski Jubilee Volume on the Occasion of his 70th Birthday*, edited by A. Łajtar, A. Obłuski, and I. Zych, pp. 579-612. Polish Centre of Mediterranean Archaeology UW, Warsaw.

2017a Bead Trade in Roman Ports – A View from the Red Sea Port Marsa Nakari. In *The Red Sea and the Gulf: Two Alternative Maritime Routes in the Development of Global Economy, from the Late Prehistory to Modern Times*, edited by A. Manzo and Ch. Zazzaro. Proceedings of the Seventh International Conference on the Peoples of the Red Sea Region and Their Environment, 26-30 May, Naples – Procida. Brill, Leiden, forthcoming.

2017b Short and Long Distance Contacts of Late Antique Nubia: A View Through the Bead Hole. In *Proceedings of the 13th International Conference for Nubian Studies, University of Neuchâtel, 1-6 September 2014*, edited by M. Honegger et al. *Orientalia Lovaniensia Analecta*, Peeters Editions, forthcoming.

Then-Obłuska, Joanna and Laure Dussubieux

2016 Glass Bead Trade in the Early Roman and Mamluk Quseir Ports – A View from the Oriental Institute Museum Assemblage. *Archaeological Research in Asia* 6:81-103; http://doi.org/10.1016/j.ara.2016.02.008, accessed 10 October 2016.

Williams, Bruce B.

1991a Meroitic Remains from Qustul Cemetery Q, Ballana Cemetery B, and a Ballana Settlement. *Oriental Institute Nubian Expedition* 8.

1991b Noubadian X-Group Remains from Royal Complexes in Cemeteries Q and 219 and from Private Cemeteries Q, R, V, W, B, J, and M at Qustul and Ballana. *Oriental Institute Nubian Expedition* 9.

Woolley, C. Leonard and David Randall-MacIver

1910 *Karanòg: The Romano-Nubian Cemetery*. Vols. 3-4. The University Museum, Philadelphia.

Joanna Then-Obłuska
Polish Centre of Mediterranean Archaeology
University of Warsaw
Warsaw
Poland
j.then-obluska@uw.edu.pl

BEADS AT *THE PLACE OF WHITE EARTH* – LATE NEOLITHIC AND EARLY CHALCOLITHIC AKTOPRAKLIK, NORTHWESTERN TURKEY

Emma L. Baysal

The site of Aktopraklık in northwestern Turkey was inhabited during the Late Neolithic and Early Chalcolithic periods, from the mid-7th to mid-6th millennia B.C. The site lies in a region that came to link Anatolia with Europe through the introduction of early farming practices and has already provided much information about the groups which inhabited the area along with their domesticated plants and animals. Although scientific techniques have led to recent breakthroughs in our understanding of the dynamics of change in the region, it is material culture that continues to form the foundation of archaeological research into daily life. Aktopraklık saw a particularly prolific use of beads that indicates complex networks of communication and exchange with other areas, both near and far, as well as possible early craft specialization. This article provides a brief introduction to these beads and their implications for the archaeology of prehistoric northwestern Turkey.

INTRODUCTION

Northwestern Turkey is an important region in prehistory for a number of reasons. Although it was not at the forefront of the major innovations of the Neolithic period – animal domestication and agriculture – it was an area through which various movements of ideas, materials, and people seem to have been channeled on their way to Greece and the Balkans. As such, the area can be considered as both well connected and important in understanding the processes of prehistoric change, particularly from the Late Neolithic period onwards.

Scientific techniques, particularly DNA analyses, have played an increasingly important role in explaining processes of change; material culture, however, has provided the foundation of archaeological research in the region. Pottery has traditionally been the focus of research of the Late Neolithic and Early Chalcolithic periods, and the assemblages of northwestern Anatolia are well understood. Other items of material culture, among them beads, have received less attention. Indeed, personal ornaments of the Turkish Neolithic and Chalcolithic periods have only recently begun to receive the attention of researchers. It has already been shown that ornaments – mostly beads and bracelets – have much to offer archaeologists trying to understand wider questions in prehistory: How did people interact with the landscape? How did human groups interact with one another? How did ideas spread? How did trade and exchange routes work? How was production organized?

The site of Aktopraklık, located in the Marmara region of northwestern Turkey and excavated under the direction of Necmi Karul of Istanbul University since 2004, has extensive deposits of Late Neolithic and Early Chalcolithic date containing considerable quantities of personal ornaments. In this article, the approximately 13,000 beads excavated at Aktopraklık between 2004 and 2014 will be considered in the light of the questions outlined above, with particular emphasis on evidence for connections and specialized production.

AKTOPRAKLIK AND THE LATE NEOLITHIC AND EARLY CHALCOLITHIC OF NORTHWESTERN TURKEY

Northwestern Turkey, particularly the Asian side of the Marmara region (Figure 1), has seen intensive archaeological research into the Neolithic and Chalcolithic periods (Özdoğan et al. 2013). The region has proved to be important in providing evidence about the process of neolithization – how ideas, subsistence technologies, and human populations moved and spread. Recent studies of DNA sequences have shown that people moved from northwestern Turkey and the Aegean region into central and southwestern Europe (Hofmanová et al. 2016). While it was previously thought that ideas may have spread gradually via interactions, new sources of evidence highlight the ties between people, technologies, and material culture, and provides incentive to improve our understanding of the people who seem to have, at least in some respects, provided

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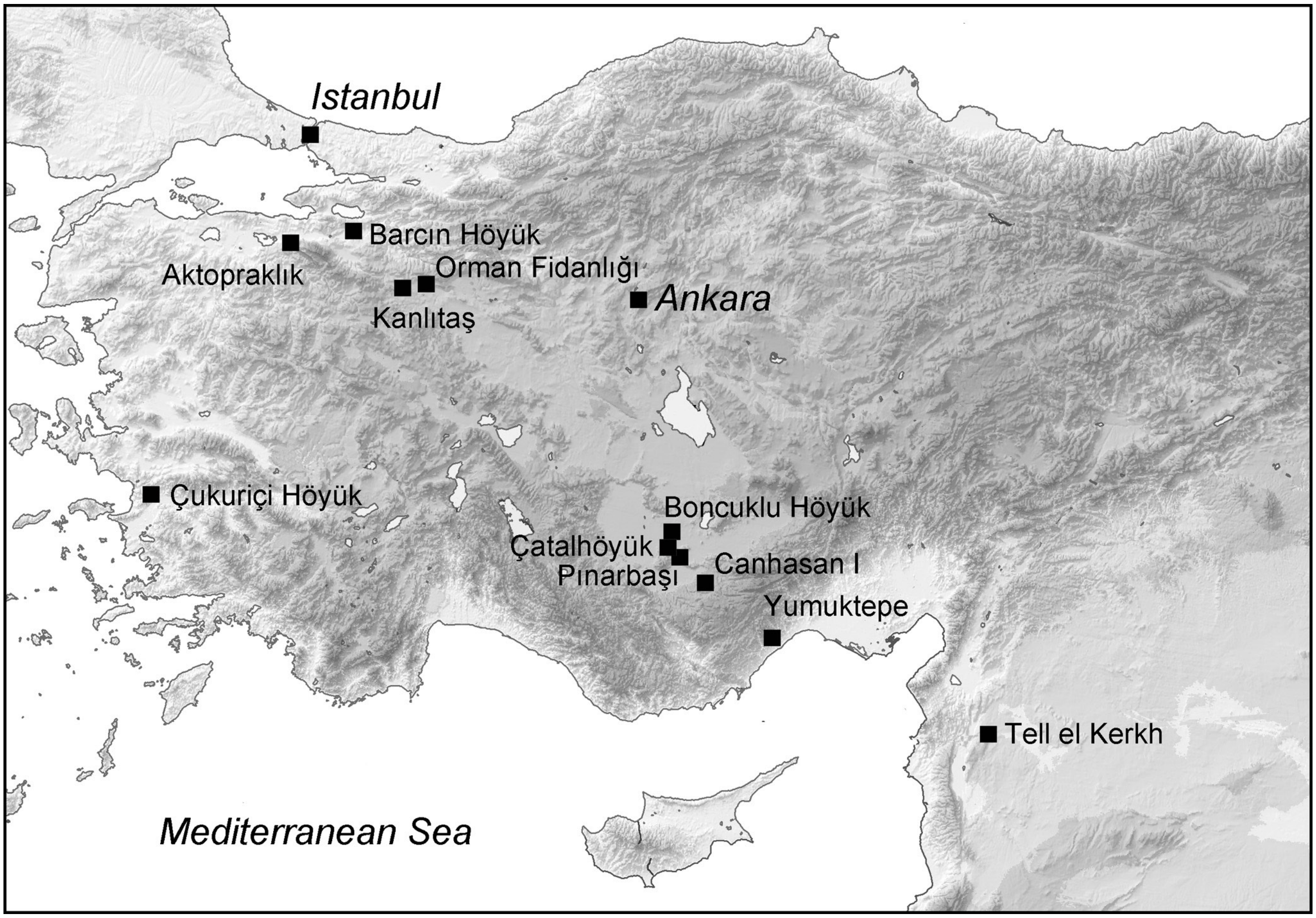

Figure 1. Map showing sites mentioned in the text.

the foundation for farming populations in large areas of the European continent.

Although recent focus has been on the transmission of neolithization towards Europe, interest in the history of the Neolithic people and material culture in northwestern Anatolia has led to much research into their possible links to other areas. It seems that from the middle of the 7th millennium onwards, a mixture of new elements and existing local culture and populations resulted in a gradual decline of the hunter-gatherer lifestyle that had been characteristic in the region. Northwestern Turkey has a well-known and relatively coherent pottery culture originally named after the site of Fikirtepe but now known to cover a much wider geographical area (Karul 2011). The development of the ceramic traditions of the region has been used to suggest patterns of development, including the suggestion by Thissen (1999) that the traditions of central Anatolia played a part. The pottery of the region has also opened doors to understanding food culture and the use of secondary products including milk (*see* Thissen et al. 2010 for details). There are other characteristic features such as bone spoons that are strongly associated with the region and probably also relate to specific food practices (e.g., Erdalkıran 2015).

The site of Aktopraklık is located close to the modern city of Bursa, currently a major Turkish trading hub. The settlement itself is close to a small lake, Uluabat, with two nearby springs, and in a diverse environmental zone that incorporates fertile plains and forested mountains (Karul and Avcı 2013:45). The site has good connectivity to the Eskişehir area, also known to have been inhabited in the prehistoric period. The settlement of Aktopraklık was inhabited from the mid-7th to mid-6th millennia B.C. and, unlike the classic large mound sites of prehistory, changed location repeatedly within the same area (Karul and Avcı 2011).

The site consists of three distinct mound settlements that have been investigated to varying degrees, emphasis being on mounds B and C, which are of Early Chalcolithic and Late Neolithic date, respectively. C consists of round wattle-and-daub huts with surrounding open areas, probably used for food preparation and other activities. Burials were found under the floors of the houses (Karul and Avcı 2013:46) in a tradition familiar to central Anatolian sites such as Çatalhöyük. During the Early Chalcolithic period, C became a cemetery used by the inhabitants of mound B. Grave goods, including pots, polished stone axes, and beads, were found with these burials (Karul and Avcı 2013:47).

Aktopraklık B (Figure 2) consists of two significant settlement layers. The earlier level is formed of adjoining, rectilinear mudbrick buildings; the later one of squarish wattle-and-daub huts (Karul and Avcı 2013:48). The Early Chalcolithic portion of this area of the site appears to include standard buildings that are encompassed by a large ditch, suggesting that there was a division between the inside and the outside world, although the households within the site can be considered to be largely independent of one another (*see* Karul 2013 for details).

According to isotope analyses, it is likely that the inhabitants of Aktopraklık relied on a diet based on animal and plant domesticates that was considerably different from the consumption habits of the earlier populations of the region which made more use of marine, as well as other, hunted-and-gathered resources (Budd et al. 2013).

THE PREHISTORY OF PERSONAL ORNAMENTS IN NORTHWESTERN TURKEY

The Neolithic personal ornaments of Anatolia vary greatly not only by region but also within regions as well as within single assemblages which can be made up of both simple natural forms and complex and well-finished products (*see* Baysal 2015 for discussion). During the earlier Neolithic, there was relatively little repeated production of very similar items and a greater emphasis on individual pieces, some of which show significant signs of long-term use and even recycling after breakage (Baysal and Miller 2016). Although there is little evidence of highly standardized typologies, there were connections through exchange or direct procurement; marine shells were consistently moved around as evidenced by their appearance at inland sites such as Pınarbaşı, Boncuklu Höyük, and Çatalhöyük in central Anatolia, as well as in a wide range of Levantine sites.

Figure 2. Aerial view of the Aktopraklık B excavation area (all photographs by Yusuf Aslan, Aktopraklık Project Archive).

Personal ornamentation practices in Anatolia underwent a period of significant change during the later 7th millennium B.C. From around 6400 B.C. (the Late Neolithic) onwards, the aesthetic of beads moved towards larger, more visible items with an emphasis on the color white and a significant increase in instances of repeated production. Marine shells continued to be important and continued to be moved from place to place, but the preference for the types of shell changed from small carnivorous species not used as a food source to much larger bivalves such as *Spondylus* and *Glycymeris* that were also a source of nutrition. The exploitation of raw material sources, particularly white marble, intensified and seems to be linked to the use of other white materials, including shells.

Before considering the beads of Aktopraklık in detail, it is worth introducing the ornaments of northwestern Turkey and outlining how they relate to wider trends. The prehistoric ornaments of this region have received little attention until recently so the picture we have of both manufacture and use remains very patchy. The most detailed study to date was carried out at the nearby 7th-millennium-B.C. early farming settlement of Barcın Höyük, with an assemblage of more than 700 beads. This assemblage encompasses a wide range of materials and forms, including marine shells and various types of stone, especially artificially colored blue apatite which dominates the assemblage. There is no evidence of mass production, although there is evidence of repeated production in which specific typologies are associated with certain materials. Likewise, although there is not an overwhelming preference for white materials, they are used repeatedly in the form of freshwater- and marine-shell pendants and beads, as well as some marble beads. Some typological trends have been identified, although there are relatively few examples of each type (Baysal 2014).

In addition to beads, bracelets are an important facet of ornamentation practices in the region, specifically within the Eskişehir area where sources of white marble are known to have been exploited extensively at settlements such as Orman Fidanlığı (Ay-Efe 2001) and Kanlıtaş (Baysal et al. 2015). By the Chalcolithic period, bracelet production seems to have been an important activity at these locations and was probably part of wide-reaching networks of exchange that extended through the Aegean and southeastern Balkans (*see* e.g., Ifantidis and Papageorgiou 2011). Evidence of the reuse of broken bracelets seems to attest to a value system that was not purely economic but that relied instead on some presently unknown, socially attributed significance.

THE BEADS OF AKTOPRAKLIK

Spanning both the Late Neolithic and Early Chalcolithic phases, the 13,000 beads recovered from the site of Aktopraklık reveal clear patterns in material choices as well as use. The beads are discussed according to the material from which they are made (stone and shell), but it should be noted that in some cases there is overlap in forms between materials.

Stone Beads

White limestone discs constitute the bulk of the assemblage. They are small, less than 5mm in diameter, and have variable lengths (Figure 3). They are not very neatly made; perforations are often off-center and were produced with varying degrees of accuracy. The shape of the beads is often somewhat uneven in both plan and profile. Fairly deep abrasion marks are visible on most specimens. There was no further finishing process. It seems that the nature of the soft limestone made it difficult to achieve a finer surface finish. The preliminary contextual evidence suggests that these beads were intended to be used in large composite items. They are frequently found in groups of several hundred (Figure 4), suggesting that they were produced in large numbers and formed the core of the ornamentation practices at Aktopraklık. It is likely that these beads were produced on site.

Figure 3. Small white limestone disc beads.

In addition to the many simple, small disc beads are other stone bead forms that appear in much smaller numbers (Figure 4). Indeed, there are both small and larger discs made of a number of materials. These include reddish limestone discs similar in size and form to the white examples and other larger discs of darker colors and harder stones. The use of white stone is also not limited to small discs. White marble was used to produce a number of forms including

Figure 4. Stone and shell beads/pendants: a, serpentine; b, k-l, marble; c, mother-of-pearl, probably *Unio*; d, i, serpentinite/peridotite; e, meerschaum; f, j, apatite; g, *Spondylus*; h, possible heated serpentinite.

Figure 5. Green stone "basket" beads.

flat pierced pebble types, barrels, short barrels, large flat discs, and roughly triangular pendants (Figure 4,b, k-l).

The most distinctive white stone material at Aktopraklık is meerschaum, a very soft and light magnesium silicate that is only found in the Eskişehir region and is commonly used in the modern-day manufacture of tobacco pipes. It was used to make long biconical beads, only a few of which have been recovered (Figure 4,e).

Although the disc beads are usually of relatively low quality, without well smoothed or polished surfaces, some of the stone beads were finished with great care and attention. Among these are basket forms, made from green stones such as jadeite and serpentine, that are very well shaped and highly polished (Figure 5). Some of these beads were used to the extent that the perforation was worn right through. Other beads of much lower manufacturing quality and less regular, although similar, form show a similarity to these. They can be defined as small asymmetrical pierced shapes, not carefully shaped nor carefully finished, but perhaps bearing a general resemblance to the basket form. It may be that the intention behind the shaping of these beads may have been important, and indeed that individual beads, and a bead's individuality, may have been important in themselves (Baysal and Miller 2016). The extreme degree of wear of some hard-stone examples, as mentioned above, suggests very prolonged use, possibly over the course of several decades or more than one generation.

There are a number of pierced flat pebbles and uneven forms. Some are made from common materials such as marble, others were produced from materials that were probably chosen for convenience, such as grayish shades of limestone, suggesting again that sometimes intention may have been more important than finish. These beads probably represent an expedient technology – the piercing of readily available suitable natural items.

The second largest component of the Aktopraklık stone bead assemblage consists of striking blue specimens with white interiors, seen clearly in broken examples, in a variety of forms (Figure 6). Blue is an exceptionally rare color in archaeological artifacts of the Neolithic and Chalcolithic periods. The surface finish of these beads varies from matte to polished and the color ranges from a very pale washed-out blue to a deep cobalt shade. The most common shape is an elongated and lenticular-profiled barrel form. There are also some shorter versions of this same form as well as disc beads and flat "chip" shapes. These beads are made of fossil ivory or bone (defined geologically as apatite). After shaping a subsequent process was used to produce the blue coloring. It is not yet known how this was achieved, an issue that is discussed in more detail below.

Shell Beads

After stone, shell is the next most common bead material and both marine and freshwater species were in use side by side. It should be noted that isotope analyses of the human remains from Aktopraklık indicate that the inhabitants were not making regular use of marine resources in their diet (Budd et al. 2013), although marine shells were obviously being used as ornaments, which supports the idea of contact with coastal areas.

Figure 6. Various forms of blue apatite beads.

Shells were used to make beads in a variety of ways. Complete perforated shells contrast with pieces of shell worked into flat shapes and typical bead forms (Figure 7). The simplest are complete marine shells with a hole, either natural or man-made, through the umbo (Figure 7,b), some of which show signs of wear. Likewise dentalia, one of the most commonly used shells of the prehistoric period, were cut into segments and also occasionally used in longer forms. The segments are large in size and very worn.

The changes in the use of marine shells that occurred in the Late Neolithic can be clearly seen in the use of *Spondylus* – one of the largest shells employed in ornament manufacture in prehistory – to make large barrel and cylinder-form beads (Figure 5,g). The material, which is hard, can be worked in much the same way as stone: drilled from both sides, and abraded and polished so that the end product strongly resembles, and in some cases is almost indistinguishable from, white marble.

Freshwater shells play a newly important role in the later Neolithic and Chalcolithic periods. At Aktopraklık, *Unio* shells were used to produce pierced shapes (Figure 7,c, e) which emphasize the shiny property of the shell's inner mother-of-pearl. There are some identifiable repeated forms, although many seem to be somewhat random shapes with one or two perforations. It is likely that these shells were chosen for their large, shiny, and visually arresting

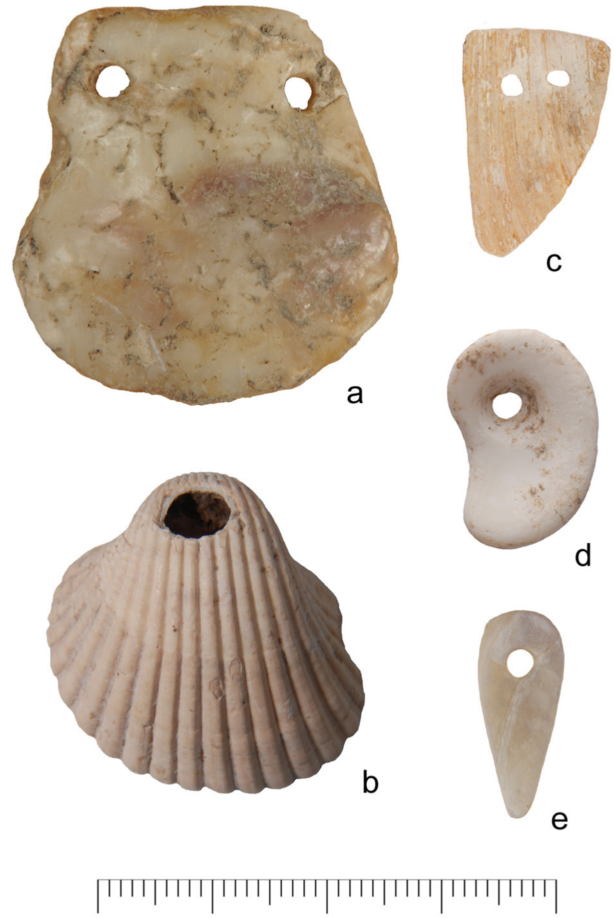

Figure 7. Shell beads/pendants: a, worn *Spondylus*; b, *Cerastoderma glaucum*; c, shaped *Unio* piece; d, unidentified shell; e, mother-of-pearl, probably *Unio*.

surface area, as well as the relative ease with which they could be procured, perhaps from nearby Lake Uluabat.

In addition to these larger shell forms, neat, flat, button-like discs with a single central hole were made from small pieces of bivalve shell. As with the larger *Spondylus* beads, these are often difficult to distinguish from stone and the material can only be identified upon close inspection.

Overall, the shell beads range from natural forms adapted for use as ornaments to highly worked products in which shell served as a raw material and the finished product was almost indistinguishable from stone. The products also range from small and visually insignificant items, presumably intended for use in combination with other beads, to large, visually striking items that would have made an impact either alone or in groups.

CONTACTS AND THE BEGINNING OF SPECIALIZATION?

A preliminary assessment of the Aktopraklık bead assemblage reveals a number of interesting indications of possible interactions, contacts, influences, and high-volume production that help to link the site to wider ornamentation trends of the Late Neolithic and Early Chalcolithic. Those that can be given special attention here are the clear resemblance of the artifacts to those from other assemblages (e.g., some of the shell items), those that indicate participation in wider exchange networks (the blue apatite beads), and the beads that argue for an increase in the quantity of beads produced (as with the simple, white disc beads).

The blue beads made from apatite that appear in significant quantities at Aktopraklık are a manifestation of one of the largest technological and stylistic trends of the end of the Neolithic period. According to current evidence, these blue beads first appear in the archaeological record around 6400 B.C. and are found at sites ranging from Tell el Kerkh in Syria (Taniguchi et al. 2002) to western Anatolia. The proportion of these beads within each assemblage varies greatly; at some sites such as Barcın Höyük, they form the largest component, while at others they are relatively rare, as at Canhasan I, Çukuriçi Höyük, and Çatalhöyük (Bains et al. 2013). Despite their varying quantities, they are more or less ubiquitous and can be said to have formed a consistent component of individual composite items of ornamentation, as can be seen in examples from Yumuktepe (Caneva 2012). Unfortunately there is relatively little data regarding their use, although some examples from Çatalhöyük suggest they may have been strung in very mixed necklaces with beads of a variety of materials and forms (e.g., *see* Çatalhöyük Image Collection at www.catalhoyuk.com).

The blue beads appear in a very limited number of forms (Figure 6; also *see* Baysal 2014) and these are not generally repeated in other materials within the same assemblages, as is the case at Aktopraklık. This suggests that these beads share either a common source or a culturally reinforced expectation about the forms suitable for a blue bead. An explanation for the technical process of their manufacture has remained elusive despite ongoing efforts to identify and replicate their chemical composition (Baysal and Bursalı 2016; Taniguchi et al. 2002). It is certain that a source of fossil bone or ivory as well as knowledge of a particular chemical process was required for their production.

The question of where these blue beads originated, whether in terms of their place of manufacture or the conception of the technology that was necessary for their production, has yet to be answered. As mentioned above, the limited set of forms in which they were made indicates a single source; otherwise a meaning associated with the forms would be the only likely explanation for their consistent similarity. The rapidity of their geographical dispersal suggests networks that had the capacity to carry materials over very long distances in relatively short periods of time. The best known networks of the Neolithic and Chalcolithic are those that distributed obsidian, an easily traceable raw material that was widely used in the production of stone tools. The case for the beads is different for two reasons. First, they are not items with an obvious utilitarian purpose, but may be considered to have had social meaning and uses, perhaps in gift exchange or the display of status, medicine, or magic. Second, a specific source or sources for them has not been determined as yet. Thus, although we can plot the places where these beads were deposited and therefore assess the extent of their spread, it is currently not possible to discuss the reasons for or the direction of their movement, nor the mechanisms of their distribution. It is hoped that precise dating of the deposits which yielded them at different sites, coupled with further excavated evidence from additional sites, will help to answer the many questions about their origins and distribution.

Some other stone materials also contribute to our understanding of wider trends. Meerschaum has a single source in the Eskişehir region and the distinctive long biconical beads found at Aktopraklık have parallels at other sites such as Canhasan I in central Anatolia (Baysal 2016b). This suggests that this material was also used in the repeated production of a specific bead type that was then widely distributed, though apparently in lesser numbers than the blue beads.

The use of *Spondylus* as a raw material in bead manufacture is less common. Although the use of the shells themselves is widespread, the large bead forms seen at Aktopraklık currently only have parallels at nearby Barcın Höyük (Baysal 2014). The use of *Spondylus* in beadmaking apparently predates a significant increase in the use of the shells for bracelets or annulets that becomes important in the Aegean, the Balkans, and western Anatolia during the Chalcolithic period. It is uncertain to what extent these two phenomena are related, or indeed whether one is a forerunner of the other.

In contrast, the use of flat mother-of-pearl shapes, with single or multiple perforations, is much better attested with evidence coming from a number of other sites of similar date. As with the *Spondylus* examples, this seems to be part of the general trend towards larger and more visually striking ornaments after 6400 B.C. While a wide range of shapes is known, particularly from Canhasan I where some exceptionally complex examples were recovered (French 2010:94-97), evidence increasingly supports the idea that there were some relatively standardized forms among them. “Fin” shapes (Figure 5,a), an asymmetrical form seen in small numbers at Barcın Höyük (Baysal 2014), Canhasan I, and also Suluin (Taşkıran et al. 2016), as well as at Aktopraklık, seem to belong among these recognizable types. These beads are usually made from freshwater *Unio* shells, a resource that was readily available. The remainder of these shiny flat forms varies from neat geometric shapes such as squares to apparently serendipitous forms, possibly made from broken and water-worn shell fragments. The manner in which these items were used is unknown, though they may have been worn as pendants. Those with multiple perforations may have been sewn onto clothing or other items, a suggestion that is reinforced by the many multi-holed examples from Canhasan I. In either case, their shiny surfaces would have made them an eye-catching ornament.

The prolific use of small white disc beads raises questions about repeated production and possible organized manufacture. “Specialized” production activities have traditionally been associated with the social complexity that rose to prominence in the Bronze Age. There is much debate about the nature of early craft specialization, how it was organized, what were the conditions necessary for it to operate, and whether it constituted a significant, differentiated economic activity (e.g., Costin 1991, 2007). Evidence from the Chalcolithic period now makes it clear that there were significant steps towards organized production earlier in prehistory than was previously thought, and that the process leading to long-term and highly organized specialization was a long one. The non-linearity of the path is marked by occurrences of intensive production that then ended and were replaced by other, often unrelated, activities.

The examples of regular production of certain artifacts from specific materials in northwestern Anatolia at the end of the Neolithic and during the Early Chalcolithic seem to be based on the availability of raw materials that suited the prevalent ornamentation trends. Such resource-based specializations fit well into emerging systems of shared ornamentation practices and aesthetic values that spread across large areas. In the case of the fashion for white marble and shell products, this includes the Aegean region, western and northwestern Turkey, and large parts of the Balkans. This is not to say that the use of white ornaments was the same in all these areas but that there is a marked preference for larger single or composite white items of ornamentation that was shared across a large geographical region. Given that research into the ornamentation of these areas is still in its early stages, the area exhibiting similar preferences is likely to expand.

The nature of prehistoric evidence, and particularly the small number of known production areas, generally makes it difficult to identify how and where manufacturing was carried out. There are, however, a number of suggested examples of specialized production in northwestern Anatolia during the Chalcolithic period, all of which relate to the use of white marble. The bracelet production at Kanlıtaş was so prolific that surface survey was sufficient to reveal the full production sequence through wasters (Baysal et al. 2015) and excavated evidence from Orman Fidanlığı also shows a similar intensity of production (*see* Ay-Efe 2001 for details). It is likely that this intensification of production was not unique to ornaments. Takaoğlu’s (2005) evidence from Coşkuntepe indicates that querns might also have been subject to some degree of control in procurement and distribution. Likewise convincing arguments have been made for different standards and different levels of manufacturing expertise in ornament production during the late Neolithic (Healey and Campbell 2014), suggesting that different skill levels as well as access to raw materials may have played a part.

While there is much evidence for increased intensity of ornament production in northwestern Turkey, particularly from the Early Chalcolithic onwards, recent data have begun to show that the phenomenon was much more widespread. At the site of Yumuktepe, a complex composite item dating to around 5800 B.C. composed of nearly 1,500 small red and white beads indicates large-scale production and consumption (Baysal 2016a). This again relates to the composite use of large numbers of simple products. The manufacture of artificial enstatite beads later in the Chalcolithic is related to high-volume production as well as new technologies (Pickard and Schoop 2013) and perhaps also has its roots in these earlier manufacturing practices.

Although the presence of high-volume production of beads is well supported, there is a lack of direct archaeological evidence for production centers of these ornaments. This makes it difficult to understand how production was organized and whether households were producing a surplus, or communities were producing for local trade with other settlements. There was definitely a great increase in production of certain types of beads at particular locations. This implies an increase in consumption, the nature of which may be discoverable through the use of raw material source analysis as research progresses. Indeed, it may eventually be possible to identify the distribution patterns of products, even if the mechanisms of movement remain obscure.

CONCLUSION

Preliminary assessment of the beads from Aktopraklık reveals that in many respects they fit into the wider trends of the later Neolithic and Chalcolithic periods. The use of marine and freshwater shells finds parallels at a number of other sites in central and western/northwestern Turkey. It is interesting to note that a community that did not rely heavily on aquatic resources as a food source did employ them for ornamentation purposes. This is reflected in the inland use of marine shells at sites such as Canhasan I where mollusks certainly were not used for nutritional purposes.

Many of the stone beads have local connections and some have direct parallels at a greater distance. There is no doubt that ongoing research will reveal further details of these connections. The blue apatite beads tie Aktopraklık into one of the largest trade networks of the period and the quantity in which they were found places the site among the more intensive users of the products. Coupled with information from nearby Barcın Höyük, this suggests that sites in this region may have had privileged access to, or a preference for, this material.

Less distinct testimony for the inclusion of Aktopraklık in wider regional and interregional trends is the mass production of small white disc beads. Was there specialization in this region during the later Neolithic and Chalcolithic periods? What was the purpose of mass bead production? At the moment the response to these questions depends largely on interpretation, as evidence cannot yet provide us with a definite answer. The manufacture of large quantities of very similar products – stone beads in the case of Aktopraklık and marble bracelets at other sites – suggests that there was an increasing desire for certain fixed types of products in much larger quantities than had previously been the case. The consumption of these products is not yet understood and their role in trade – whether they remained within the settlement in which they were made or moved within networks of economic or gift exchange – remains to be seen.

There are still many aspects of prehistoric beads that need to be explored and many questions remain unanswered. It is clear that in order to understand the changes that occurred in ornamentation practices towards the end of the Neolithic period it is necessary to have a better understanding of the meaning that was attributed to beads and other items by the people and communities that made and used them. Do the beads of Aktopraklık evidence the site's connectedness? The variety of influences and connections traced in this preliminary study offer much promise, when integrated with data from other assemblages, to formulate an understanding of regional and interregional relationships at Aktopraklık – a geographical and temporal crossroads in prehistory.

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REFERENCES CITED

Ay-Efe, Deniz

2001 The Small Finds of Orman Fidanlığı. In *The Salvage Excavations at Orman Fidanlığı, A Chalcolithic Site in Inland Northwestern Anatolia*, edited by Turan Efe, pp. 127-158. TASK Vakfı, Istanbul.

Bains, Roseleen, Milena Vasić, Daniella Bar-Yosef Mayer, Nerissa Russell, Katherine Wright, and Chris Doherty

2013 A Technological Approach to the Study of Personal Ornamentation and Social Expression at Çatalhöyük. In *Substantive Technologies at Çatalhöyük: Reports from the 2000-2008 Seasons, Volume 9*, edited by Ian Hodder, pp. 331-363. Cotsen Institute of Archaeology Press, Los Angeles.

Baysal, Emma

2014 A Preliminary Typology of the Neolithic and Chalcolithic Beads of Barcın Höyük. *Anatolia Antiqua* 22:1-11.

2015 Neolitik Dönem Kişisel Süs Eşyaları: Yeni Yaklaşımlar ve Türkiye'deki Son Araştırmalar. *TÜBA-AR* 18:9-24.

2016a Beadwork in a Basket: An Ornamental Item from the Last Halaf Level of Mersin Yumuktepe. *Adalya* 19:17-30.

2016b Reflections of Far Away Places: The Chalcolithic Personal Ornaments of Canhasan I. In preparation.

Baysal, Emma, Adnan Baysal, Ali Umut Türkcan, and Adam Nazaroff

2015 Early Specialized Craft? A Chalcolithic Stone Bracelet Workshop at Kanlıtaş, Eskişehir, Turkey. *Oxford Journal of Archaeology* 34(3):232-254.

Baysal, Emma and Ayşe Bursalı

2016 Turkey's First Evil Eye? The Manufacture and Use of Blue Beads in the Neolithic. *PAST* 82:14-15.

Baysal, Emma and Holly Miller

2016 Teoride süs eşyalari: arkeolojik kontekstlerde prehistorik boncukların yorumu. *Journal of Anatolian Prehistoric Research* 2: 11-32.

Budd, Chelsea, Malcolm Lillie, Songül Alpaslan-Roodenberg, Necmi Karul, and Ron Pinhasi
2013 Stable Isotope Analysis of Neolithic and Chalcolithic Populations from Aktopraklık, Northern Anatolia. *Journal of Archaeological Science* 40:860-867.

Caneva, Isabella
2012 Mersin-Yumuktepe. In *The Neolithic in Turkey: Volume 3, Central Turkey*, edited by Mehmet Özdoğan, Nezih Başgelen, and Peter Kuniholm, pp. 1-29. Arkeoloji ve Sanat Yayınları, Istanbul.

Costin, Cathy L.
1991 Craft Specialization: Issues in Defining, Documenting and Explaining the Organization of Production. In *Archaeological Methods and Theory 3*, edited by Michael B. Schiffer, pp. 1-56. University of Arizona Press, Tucson.
2007 Thinking About Production: Phenomenological Classification and Lexical Semantics. *Archaeological Papers of the American Anthropological Association* 17(1):143-162.

Erdalkıran, Mücella
2015 Neolithic Bone Spoons from Barcin Höyük. *TÜBA-AR* 18: 25-36.

French, David
2010 *Canhasan Sites 3, Canhasan I: The Small Finds*. The British Institute at Ankara, London.

Healey, Elizabeth and Stuart Campbell
2014 Producing Adornment: Evidence of Different Levels of Expertise in the Production of Obsidian Items of Adornment at Two Late Neolithic Communities in Northern Mesopotamia. *Journal of Lithic Studies* 1(2):79-99.

Hofmanová, Zuzana et al.
2016 Early Farmers from Across Europe Directly Descended from Neolithic Aegeans. *PNAS* 113(25):6886-6891.

Ifantidis, Fotis and Paraskevi Papageorgiou
2011 Sur un anneau Néolithique en marbre fragmenté (Dispilio, Grèce). In *Profils d'objets. Approches d'anthropologues et d'archéologues*, edited by F. Wateau, pp. 33-43. de Boccard, Paris.

Karul, Necmi
2011 The Emergence of Neolithic Life in South and East Marmara Region. In *Beginnings – New Research in the Appearance of the Neolithic between Northwest Anatolia and the Carpathian Basin. Papers of the International Workshop 8th – 9th April 2009, Istanbul*, edited by R. Krauß, pp. 57-65. Rahden/Westf, Leidorf.
2013 İlk Kalkolitik Çağ'da Konut ve Yerleşlme: Aktopraklık Höyük. *Arkeoloji ve Sanat* 143:41-50.

Karul, Necmi and Mert B. Avcı
2011 Neolithic Communities in the Eastern Marmara Region: Aktopraklik C. *Anatolica* 37:1-11.
2013 Aktopraklık. In *The Neolithic in Turkey: Volume 5, Northwestern Turkey and Istanbul*, edited by Mehmet Özdoğan, Nezih Başgelen, and Peter Kuniholm, pp. 45-68. Arkeoloji ve Sanat Yayınları, Istanbul.

Özdoğan, Mehmet, Nezih Başgelen, and Peter Kuniholm
2013 *The Neolithic in Turkey, Volume 5: Northwestern Turkey and Istanbul*. Arkeoloji ve Sanat Yayınları, Istanbul.

Pickard, Catriona and Ulf-Dietrich Schoop
2013 Characterization of Late Chalcolithic Micro Beads from Çamlıbel Tarlası, North-Central Anatolia. *Archaeometry* 55(1):14-32.

Takaoğlu, Turan
2005 Coşkuntepe: An Early Neolithic Quern Production Site in NW Turkey. *Journal of Field Archaeology* 30:419-433.

Taniguchi, Yoko, Yoshimitsu Hirao, Yoshiko Shimadzu, and Akira Tsuneki
2002 The First Fake? Imitation Turquoise Beads Recovered from a Syrian Neolithic Site, Tell el-Kerkh. *Studies in Conservation* 47(3):175-183.

Taşkıran, Harun, Kadriye Özçelik, Beray Kösem, Eşref Erbil, and Yavuz Aydın
2016 2014 Yılı Suluin Mağarası kazıları. *Kazı Sonuçları Toplantısı* 37(1):215-234.

Thissen, Laurens
1999 Trajectories Towards the Neolithisation of NW Turkey. *Documenta Praehistorica* 26:29-39.

Thissen, Laurens, Hadi Özbal, Ayla Türkekül Bıyık, Fokke Gerritsen, and Rana Özbal
2010 The Land of Milk? Approaching Dietary Preferences of Late Neolithic Communities in NW Anatolia. *Leiden Journal of Pottery Studies* 26:157-172.

Emma L. Baysal
Department of Archaeology
Trakya University
Balkan Campus
Edirne
Turkey
emmabaysal@gmail.com

FRIT-CORE BEADS IN NORTH AMERICA

Karlis Karklins

Among the earliest European beads to reach North America is a distinctive group generally referred to in the archaeological literature as frit-core or frit-cored, so called because their interiors consist of sintered sand rather than solid glass. Likely produced in France, they are restricted to northeastern North America and have short temporal ranges, making them ideal chronological indicators for the latter part of the 16th century and the very early 17th century.

INTRODUCTION

Frit-core beads differ from those of glass in that while the exterior is vitreous, the core is composed of sintered quartz sand or crushed quartz. In this respect, they are reminiscent of ancient faience beads but were made using different technology. To date, frit-core beads have been recovered from 17 archaeological sites in eastern Canada and the northeastern United States (Figure 1; Table 1).

PHYSICAL ATTRIBUTES

The beads are almost exclusively oval in shape though there are a few round specimens. The Kenyons (1983:60) also mention a "melon or ridged" form found at the Carton site in southern Ontario, but this has yet to be verified. The uniform shape of most specimens suggests that they were formed in molds.

Six stylistic forms have been recorded (Figure 2). The type numbers are those assigned by Fitzgerald (1990:174) except for Type 6 which is a new form based on information provided by Wayne Lenig (2016: pers. comm.).

Type 1. A loop with 6 dots around a single dot in its center is situated on opposite sides of the bead. The space between the two loops contains a longitudinal row of 4-5 dots on either side.

Type 2. This exhibits 4 or 6 longitudinal stripes between each pair of which is a row of 3-5 dots.

Type 3. No decoration.

Type 4. A configuration of 6 "petals" encircles each end of the perforation and there is a line around the middle.

Type 5. There are three or more longitudinal stripes, between each pair of which is a configuration of 5-6 dots around a single dot with a short stripe at either opening of the perforation.

Type 6. An undulating line encircles the middle. In each of the five undulations is a dot encircled by five dots.

The beads are generally a dark navy blue color and may exhibit white, raised decorative elements. There are, however, scarce variants where the body and raised decoration are dark blue with the low areas covered with off-white glaze. These latter are identified by the letter A appended to the type number (e.g., Type 4A).

Regarding size, the Type 3 beads from the Hopps and Northport sites in Nova Scotia are 6-7 mm in diameter and 8-11 mm in length. The Type 1 bead from the former site is 10 mm in diameter and 11 mm long (Whitehead 1993:103, 110). The Type 1, 2, and 5 beads from the Adams site are, on average, 13 mm long and 9 mm in diameter (Wray 1973:7-1). The average length of the Type 2 beads from the Funk site is 15 mm (Smith and Graybill 1977:57). The atypical Type 5A bead from Pointe à Callière is 7.8 mm in diameter and 11.4 mm long (Delmas 2016:100), while the Type 4A Jamestown specimen is 9.8 mm in diameter and 11.9 mm in length (Merry Outlaw 2016: pers. comm.). Thus, the beads range 6-10 mm in diameter and 8-15 mm in length.

DISTRIBUTION

The spatial range of the frit-core beads is restricted to a relatively small area in northeastern North America. It extends from Nova Scotia at the southern extent of the Gulf of St. Lawrence west along the St. Lawrence waterway to southern Ontario and western New York state. An isolated find site is in southeastern Pennsylvania with another at Jamestown, Virginia (Lapham 2001: Section 2.3). The latter is the southernmost find to date.

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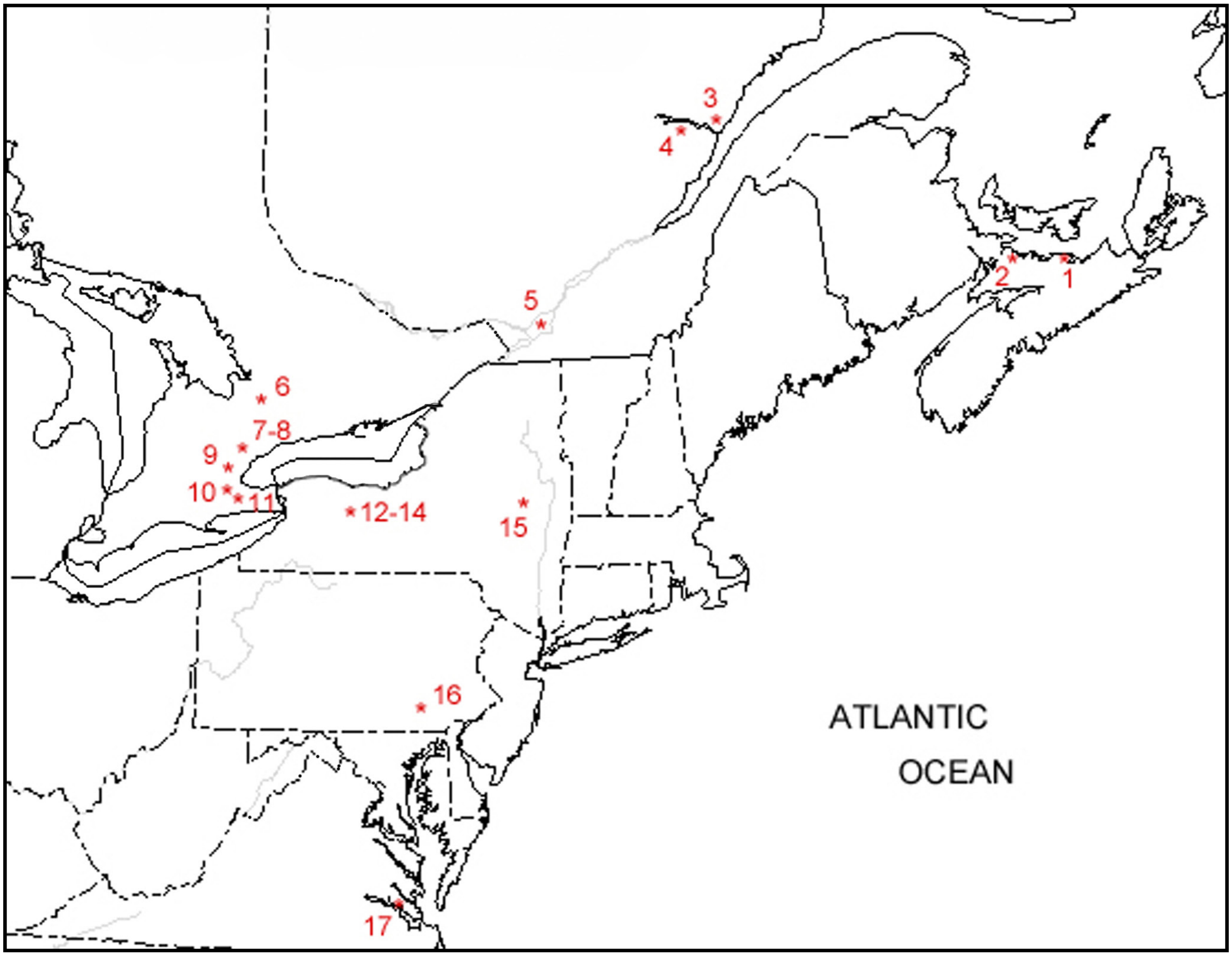

Figure 1. The distribution of frit-core beads in northeastern North America (*see* Table 1 for site identities) (drawing: Karlis Karklins).

The largest concentration of frit-core beads was uncovered at the Hopps site (n = 107) in Nova Scotia with a secondary concentration at the not-too-distant Northport site (n = 54+). This is a minimal count as additional beads remain encased in several lumps of organic material, mostly moose hide with the hair attached. All but one of the beads are Type 3. The exception is Type 1. Some of the beads formed part of a necklace strand at the Northport site while three beads were found strung on vegetal-fiber cordage at the Hopps site suggesting they too likely were strung in a necklace (Whitehead 1993:44). The Nova Scotia sites are the only ones that yielded Type 3 beads, possibly because these beads may have been identified as glass in other early bead assemblages.

The next highest concentration (n = 22) was found at the Adams site in western New York with an additional two beads recovered from the nearby and contemporaneous Culbertson site (Wray et al. 1987:115, 211). Here Types 1, 2, and 5 were found together (Figure 3).

The Funk Site in Lancaster Co., Pennsylvania, has a minor concentration (n = 11) of Type 2 beads (Smith and Graybill 1977:57). The remaining eleven sites – in southern Quebec, southern Ontario, western and eastern New York, and eastern Virginia – each produced only 1-2 specimens.

Type 1 beads have the widest distribution, being found in Nova Scotia, Quebec, Ontario, and New York. Type 2 is restricted to western New York and southeastern Pennsylvania, Type 3 to Nova Scotia, and Type 4 to southern Ontario (Figure 4). Type 4A has only been found in eastern Virginia (Figure 5). Type 5 is present at sites in both southern Ontario and western New York, while Type 5A has only been encountered at Pointe-à-Callière, Quebec (Figure 6). Type 6 is restricted to eastern New York.

Table 1. Distribution of Frit-Core Beads in North America.

Map No.	Site	Location	Bead Type (Quantity)	Date	Cultural Affiliation
1	Hopps Site (Whitehead 1993:66, 110-111)	Pictou, Nova Scotia	Type 1 (1) Type 3 (106)	1580-1600	Mi'kmaq
2	Northport (Whitehead 1993:103)	Northport, Nova Scotia	Type 3 (54+)	1580-1600	Mi'kmaq
3	Tadoussac (Delmas 2016:102)	Tadoussac, Quebec	Type 1 (1)	1580-1600 (?)	St. Lawrence Iroquoians
4	Chicoutimi (Moreau et al. 2016:190)	Chicoutimi, Quebec	Type ? (1)	1580-1600 (?)	St. Lawrence Iroquoians
5	Pointe à Callière (Delmas 2016:100)	Montreal, Quebec	Type 5A (1)	1580-1600 (?)	St. Lawrence Iroquoians
6	Ball Site (Fitzgerald 1990:171)	Warminster, Ontario	Type 1 (2)	1590-1620	Huron-Wendat
7	Skandatut Village Site (Williamson 2012:5)	Vaughan, Ontario	Type ? (1)	1580-1600	Huron-Wendat, Petun
8	Kleinburg Ossuary (Fitzgerald 1990:171)	Vaughan, Ontario	Type 4 (2)	1580-1600	Huron-Wendat, Petun
9	Carton Ossuary (Fitzgerald 1990:171)	Milton, Ontario	Type 4 (2) Type 5 (2)	1580-1600	Neutral
10	Tregunno Cemetery (Fitzgerald 1990:171)	Carlisle, Ontario	Type 1 (?)	1580-1600	Neutral
11	Snider Cemetery (Fitzgerald 1990:171)	Duffs Corner, Ontario	Type 1 (?)	1580-1600	Neutral
12	Culbertson Site (Sempowski and Saunders 2001:6; Wray et al. 1987:211)	Livonia, New York	Type 2 (2)	1570-1585	Seneca
13	Adams Site (Sempowski and Saunders 2001:6; Wray et al. 1987:115)	Livonia, New York	Type 1 (9) Type 2 (3) Type 5 (9) Type ? (1)	1575-1590	Seneca
14	Factory Hollow (Sempowski and Saunders 2001:198, 831)	Livonia, New York	Type 2 (2)	1610-1625	Seneca
15	Barker Site (Bradley 2007:196, n. 25)	Fonda, New York	Type 6 (1)	1600-1614	Mohawk
16	Funk Site (Smith and Graybill 1977:57)	Lancaster Co., Pennsylvania	Type 2 (11)	1550-1600	Susquehannock
17	Jamestown (Lapham 2001)	Jamestown, Virginia	Type 4A (1)	1608-1610	Powhatan

TEMPORAL PLACEMENT

Frit-core beads are the "most characteristic bead type" of Glass Bead Period I (GBP I) in southern Ontario (Kenyon and Kenyon 1983:60). Based on data recovered from the Carton and Kleinburg ossuaries, the date assigned to this period is 1580-1600. The beads from the two Mi'kmaq sites in Nova Scotia are also assigned to this period (Whitehead

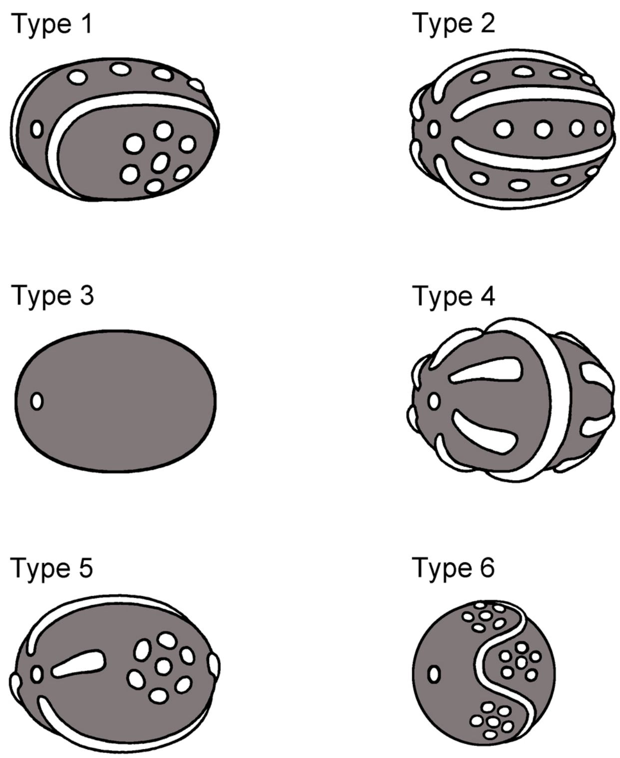

Figure 2. Frit-core bead stylistic forms (drawing: Dorothea Larsen).

Figure 3. Frit-core beads from the Adams site, New York, showing Types 1, 2, and 5 (on loan to the Rochester Museum and Science Center; courtesy of the Rock Foundation).

Figure 4. Type 1 with associated beads from Tadoussac, Quebec (courtesy of McCord Museum, Montreal; cat. no. M2185A [detail]).

1993:70), though Loewen (2016:276, 284) feels that frit-core beads could have been introduced into the general region (Acadia and Tadoussac) from France as early as 1559. Thus, the beads from the three Quebec sites might also have arrived this early.

The Culbertson and Adams sites are assigned to the period 1570-1590, based on a revised chronology for Seneca sites in western New York (Sempowski and Saunders 2001:6). They were previously attributed to the 1560-1575 period (Wray et al. 1987:115, 211). The nearby Factory Hollow site is dated to 1610-1625 (Sempowski and Saunders 2001:5), while the Barker site in eastern New York was occupied from about 1600 to 1614 (Bradley 2007:43). The date for the Funk Site in southeastern Pennsylvania is 1550-1600 (Smith and Graybill 1977:57).

Figure 5. Type 4 from the Kleinburg ossuary (photo: John Howarth; courtesy of Archaeological Services Inc., Toronto).

Figure 6. Type 4A from Jamestown, Virginia (photo: Bly Straube; collection of the Jamestown Rediscovery Foundation).

The Jamestown specimen is the only one found in a tightly dated context. It was recovered from the well John Smith ordered the colonists to dig in 1608, which was filled in upon the arrival of Lord De La Warr in 1610 (Merry Outlaw 2016: pers. comm.). This find confirms that frit-core beads spill over into the first decade of the 17th century. Thus, while the 1580-1600 date range is viable for frit-core beads in southern Ontario, it seems to be a bit restrictive for some of those found elsewhere. A more accurate date range for beads recovered from sites outside southern Ontario might be 1560-1610 or even later.

Figure 7. Type 5A bead from Pointe-à-Callière, Montreal, Quebec (photo: Alain Vandal; courtesy of Musée Pointe-à-Callière).

SOURCING

We now turn to the probable source of these distinctive beads. The likelihood is that they were produced in France which had a thriving beadmaking industry during the 16th century that operated in Paris and several other cities. The beadmakers worked with glass and enamel, as well as several other materials. Turgeon (2001:67) ascribes the frit-core beads to "the enamel category since they were fired and had an enamel type glaze" and equates them to the *olives à cottes mouchetées aussi d'émail* (olives with speckled coats also of enamel) that appear in the post-mortem inventories of Parisian beadmakers.

Support for a French origin for the frit-core beads is in the form of two specimens recovered from archaeological contexts attributed to the 1590-1605 period at the Jardins du Carrousel in Paris (Turgeon 2001:63). One is a Type 1 bead that is 11.7 mm long and 9.9 mm in diameter which is near identical to the one measured Type 1 bead from Nova Scotia. The other is round with a whitish body and has lost its glaze. It measures 7.3 mm in length and 7.0 mm in diameter (Turgeon 2001:61). A whitish ovoid example also missing its glaze was uncovered at Chicoutimi, Quebec. It is larger, measuring 11 mm in length and 9 mm in diameter (Moreau 2016:191). Certainly, the presence of two frit-core beads in Paris does not necessarily mean they were made there, but in the absence of other alternatives, the indication is that they are domestic products.

That various combinations of Types 1-5 were found at the Adams, Carton, and Hopps sites suggests they were all made in the same production center, quite possibly in related workshops. Chemical analysis of a sample of the beads from North America and the Paris specimen might corroborate this. It would also provide information about the composition of the beads.

CONCLUSION

Aside from the Type 1 specimen excavated in Paris, no other correlatives of the frit-core beads found in North America have so far been encountered elsewhere in the world. Could it be that these beads were only produced for trade to North America? Does their relative scarcity imply that they were considered special by the aboriginal population and only certain status individuals could wear them? Or does it mean that they were of less interest than the more colorful glass beads that they have been found with? Unfortunately, questions like these are very difficult to answer on just the basis of archaeological remains.

ACKNOWLEDGEMENTS

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REFERENCES CITED

Bradley, James W.

2007 Before Albany: An Archaeology of Native-Dutch Relations in the Capital Region, 1600-1664. *New York State Museum Bulletin* 509.

Delmas, Vincent

2016 Chapter 4. Beads and Trade Routes: Tracing Sixteenth-Century Beads Around the Gulf and Into the Saint Lawrence Valley. In *Contact in the 16th Century: Networks Among Fishers, Foragers and Farmers*, edited by Brad Loewen and Claude Chapdelaine, pp. 77-118. University of Ottawa Press, Ottawa, ON.

Fitzgerald, William R.

1990 Chronology to Cultural Process: Lower Great Lakes Archaeology, 1500-1650. Ph.D. dissertation. Department of Anthropology, McGill University, Montreal.

Kenyon, Ian T. and Thomas Kenyon

1983 Comments on Seventeenth Century Glass Trade Beads from Ontario. *In* Proceedings of the 1982 Glass Trade Bead Conference, edited by Charles F. Hayes III, pp. 59-74. *Rochester Museum and Science Center, Research Record* 16.

Lapham, Heather

2001 More Than "A Few Blew Beads": The Glass and Stone Beads from *Jamestown Rediscovery's* 1994-1997 Excavations. *The Journal of the Jamestown Rediscovery Center* 1.

Loewen, Brad

2016 Chapter 12. Sixteenth-Century Beads: New Data, New Directions. In *Contact in the 16th Century: Networks Among Fishers, Foragers and Farmers*, edited by Brad Loewen and Claude Chapdelaine, pp. 269-286. University of Ottawa Press, Ottawa, ON.

Moreau, Jean-François, François Guindon, and Érik Langevin

2016 Chapter 7. The Northern Route, Between the Saguenay and Georgian Bay: Construction of a Hypothesis. In *Contact in the 16th Century: Networks Among Fishers, Foragers and Farmers*, edited by Brad Loewen and Claude Chapdelaine, pp. 171-198. University of Ottawa Press, Ottawa, ON.

Sempowski, M.L. and L.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.

Smith, Ira F., III and Jeffrey R. Graybill

1977 A Report on the Shenks Ferry and Susquehannock Components at the Funk Site, Lancaster County, Pennsylvania. *Man in the Northeast* 13:45-65.

Turgeon, Laurier

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

Whitehead, Ruth

1993 Nova Scotia: The Protohistoric Period, 1500-1630. *Nova Scotia Museum, Curatorial Report* 75.

Williamson, Ronald

2012 Stage 3 Archaeological Resource Assessment Beyond the North Limits of the Skandatut Site (AlGv-193), Lot 24, Concession 7, Geographic Township of Vaughan, City of Vaughan, Ontario. Report prepared for Zzen Developments, Willowdale, Ontario. Archaeological Services, Inc., Toronto.

Wray, Charles F.

1973 Manual for Seneca Iroquois Archeology. Cultures Primitive, Honeoye Falls, NY.

Wray, C.F., M.L. Sempowski, L.P. Saunders, and G. Cervone

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

Karlis Karklins
Independent Researcher
Ottawa, ON
Canada
karlis4444@gmail.com

BEAD NETTING AND PLAITING TECHNIQUES IN THE PERANAKAN WORLD

Valerie Hector

It has long been recognized that the Peranakan Chinese peoples of Southeast Asia were expert bead embroiderers. As it happens, they were also expert bead netters and plaiters. After establishing a conceptual framework for discussing bead netting and plaiting techniques in general, this article discusses 14 pieces of Peranakan Chinese (or Minangkabau) beadwork and various techniques. The techniques likely derived not just from Europe, as early researchers tended to assume, but from island Southeast Asia and China as well. Knowledge of these and other needleworking techniques helped Peranakan beaders devise radically new permutations, some of them highly complex. Additional factors in the creation of new beading techniques are also considered.

INTRODUCTION

At first glance, the repertoire of Peranakan Chinese beadworking techniques appears to be small and static. Yet, as previously published examples are re-examined and additional pieces located, startling surprises come to light. This article explores some of the bead netting and plaiting techniques that flourished in the Peranakan world from ca. 1895 to ca. 1945, on the assumption that techniques, carefully interpreted, teach us things we cannot learn from motifs, patterns, or contexts of use (Nabholz-Kartaschoff 2010). Techniques emerge in worlds of practice, where tradition and innovation come face to face, as makers shape materials to ever-changing ends.[1] Peranakan Chinese bead netters and plaiters shaped beads in diverse ways, using traditional techniques common in many cultures, and innovative techniques used nowhere else in the world. This study examines a small portion of an exceptional legacy, one that expands the world's repertoire of beading techniques. The remainder awaits further research.

The "Peranakan World" and "Peranakan Beadwork"

Since at least the Southern Song dynasty (1127-1279), Chinese peoples have been sailing to the *Nanyang* or southern oceans in mainland and island Southeast Asia to trade or, in the early Ming dynasty (1368-1644), exact imperial tribute from local rulers during maritime missions lasting many months (Reid 1996:17 ff.). These contacts infused "Chinese blood, wealth and technology" into the region, eventually enabling Chinese to "assume key positions in Southeast Asian trade and statecraft" (Reid 1996:25-27). From the late 14th or early 15th century, the Chinese apparently began to establish small commercial settlements in Java, Sumatra, and elsewhere (Lee 2014:82; Reid 1996), while retaining ties to their ancestral homelands on periodic return visits, or through relatives, friends, and associates. Thus, the Chinese, many of whom originated in Fujian and Guangdong provinces in south China, were already on the scene when the Portuguese, Dutch, and British arrived in Southeast Asia to assert European commercial and colonial interests. In 1619, the Dutch East India Company (*Vereenigde Oost-Indische Compagnie* or VOC) made Batavia (modern-day Jakarta, on the island of Java in Indonesia) the capital of what would eventually become the Netherlands Indies, comprising most of the islands of what is now Indonesia. In 1826, the British East India Company founded the British Straits Settlements along the Straits of Malacca separating what is now peninsular Malaysia from Indonesia; the early Straits Settlements included Penang, Malacca, Singapore, and Dinding in what is now Perak state, peninsular Malaysia.

Because Chinese women did not leave China in significant numbers until the late 19th century, Chinese men usually married native women, among them Batak, Balinese, and Javanese (Skinner 1996:57), Bugis from South Sulawesi, Siamese from Kelantan, Thai-speaking Muslims from peninsular Malaysia (Tan 1999:49), Dayaks from Borneo (Heidhues 2003:26, 33-35) as well as women from coastal India, Burma, and Papua (Lee 2014:83). That so many of these women were former slaves does not matter for our purposes; that a few might have known how to do beadwork, an activity gendered female in much of island Southeast Asia (Maxwell 1990:63) may be significant, as we shall see. Together, these Chinese men and native

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women spoke Malay and/or Chinese (including Mandarin or dialects such as Cantonese, Hokkienese, Hakka, or Teochiu), practiced Malay and Chinese customs, and taught their dual-heritage children Chinese rituals and values. For personal or political reasons, some of the Chinese men converted to Islam and took Islamic wives (Lombard and Salmon 1993). By the early 19th century, the creolized descendants of these intermarriages came to be known as *Peranakan* or "locally-born" (Lee 2014:90-94) in Indonesia, and as "Straits Chinese" in the Straits Settlements. A Malay word, *peranakan* was also used to refer to locally-born peoples of other nationalities as well. Herein, however, "Peranakan" refers solely to Peranakan Chinese, including the Straits Chinese, who are culturally Peranakan Chinese (Tan 1999:48).

The hard-working Chinese and their offspring did well in European colonial port cities, adopting lucrative occupations ranging from "purchasing monopolies and state tax farms" to growing and trading lucrative cash crops such as sugar; mining and trading tin; shipping and ship chandlering; and acting as agents or compradores for European enterprises. All the small enterprises and services in the colonial towns were also run by Chinese, from the retail of sundry goods to metalsmithing, carpentry, construction, and the like (Lee 2014:95).

From 1850 to 1881, the number of immigrants from south China to Southeast Asia swelled; in Penang, Malacca, and Singapore alone it tripled (Cheah 2010:67). Known as *xin ke* or *sinkhek* (Chinese/Hokkienese: newcomer) in Malaysia and *totok* (Malay: pure) in Indonesia, these new immigrants – poor, rough, and often uneducated – formed communities apart from the Peranakan Chinese whose fluency in Western languages and familiarity with European colonial systems conferred wealth, social prestige, and an elite material culture in which beadwork flourished, reaching its apogee during the late 19th and early 20th centuries (Cheah 2010:61 ff.; Khoo 1996:35 ff.). The import into Southeast Asia of European glass and metal "seed" beads in beautiful colors and surface finishes did much to stimulate Peranakan beadwork production (Cheah 2010:31 ff.). We have no proof that *xin ke* or *totok* owned beadwork or produced it for others, although the latter seems a distinct possibility.

Lacking access to sources and research methods that we take for granted, early researchers such as Ho Wing Meng assumed that Chinese *nyonyas*, or "womenfolk of the Peranakan Chinese" communities (Cheah 2010:1) living in the area now known as Malaysia and Indonesia, likely produced the beadwork themselves within the confines of their homes, usually in preparation for elaborate family weddings replete with sumptuous, beadwork-embellished bridal chambers (Ho 1987:13, 57). In 1989, evidence surfaced that pieces of beadwork had been produced for sale by local Chinese shops which stamped the pieces with their chop marks (Cheah 2010:117; Eng-Lee 1989:78, bottom).

Pioneering research by Hwei-F'en Cheah complicates the narrative still further by suggesting that a number of pieces may have been made in China, Burma, Vietnam, or elsewhere, possibly to designs specified by the Peranakan Chinese or their intermediaries (Cheah 2010:29, 2016). Cheah has found the names of women who made beadwork for sale. In the late 19th century, one of them, a resident of Penang, Siti Rahmah binte Haji Yahya, of Hadrhami heritage, reportedly made the earliest known examples of "Peranakan Chinese" bead nets and plaits using several sophisticated techniques (Cheah 2010:117 ff.). How she came to learn these techniques we do not know; they began to appear around 1895, out of the blue, as it were. These findings have destabilized our notions of "Peranakan beadwork" (Cheah 2016). No longer can we view it as a homogeneous genre; nor can we be sure that the work was performed exclusively by women (Cheah 2010:314). Inevitably, our assumptions about where a piece was made and by whom – whether in a private home by Peranakan "domesticated daughters" and "dutiful wives," meeting family needs, or for sale through personal contacts or a commercial workshop – inflect the histories we write. Our assumptions are all the more important because so few pieces of Peranakan beadwork bear the makers' names and provenance tends to be sketchy or nonexistent; we are often reduced to guesswork (Cheah 2016).

As used here, the term "Peranakan beaders" refers to a heterogeneous set of makers, first and foremost, to Nyonyas in Malaysia, Indonesia, and parts of mainland Southeast Asia, beading at home for personal or familial use, but also to others, beading for commercial purposes, whether female or male, residing in Southeast Asia or China. Thus, "Peranakan beadwork" is a pluralistic genre, the multifaceted product of intersecting lives. Perhaps this is not surprising, since the "Peranakan world" was a cosmopolitan, multicultural place, geographically localized in what is now Malaysia and Indonesia plus parts of mainland Southeast Asia, but linked genetically, economically, and notionally to other regions, especially to China and Europe. Visitors and settlers from India, the Middle East, and elsewhere brought their own ideas, customs, and methods to the heady colonial mix as they settled or passed through.

Instead of positing a single, definitive style of Peranakan beadwork, it probably makes more sense to identify several more or less closely related regional or local styles that changed over time (Cheah 2010:231 ff.). For, like Peranakan culture itself, Peranakan beadwork was highly sensitive to shifting tastes and "regional and global trends" (Lee 2014:80-81). It was also a platform for brilliant advances in how beads were worked. Before taking a closer look, we pause for a short tutorial on beadwork technique.

General Beadwork Concepts and Terms

Unlike bead embroideries, in which beads are stitched to textiles or other grounds, bead nets and plaits are textiles in their own right – freestanding two- or three-dimensional beaded structures – which may or may not be stitched to a ground (Loebèr 1913:32). No classification system exists for the techniques used to produce such beaded textiles, nor has a standard terminology been established, although early beadwork scholars did offer diagrams of some techniques (Lemaire 1960:228-233; Orchard 1975:106 ff.). To promote clarity, I introduce a simple conceptual framework with a series of terms drawn partially from the textile and beadwork literature, incorporating diagrams as space allows. All of the terms are subject to change as research continues. Appearing initially in italics, the terms are applicable to both two- and three-dimensional bead nets and plaits. The universe of three-dimensional bead netting and plaiting techniques is complex, however, and merits a further set of terms. On the whole, Peranakan Chinese beaders favored techniques for creating two-dimensional bead nets and plaits, often adapting the techniques to three-dimensional purposes, rather than using true three-dimensional techniques per se, which build hollow structures (Hector 2005:32-37), generate self-replicating internal armatures (Hector 2005:91, top), or both.

Thread structure denotes the number and organization of threads in a given technique. Reframing distinctions long implicit in the beadwork literature,[2] I will call a piece a *net* when it is formed with a single thread that is periodically tied off and replaced with a new thread (Figures 1-2) and a *plait* when it is formed with one or more sets of threads.[3] In beadwork there are at least two types of plaits: single thread and multiple thread. A *single-thread plait* typically begins when a single thread is folded in half to create two parallel threads which are then beaded together to form a single beaded strand (Figure 3).[4] A *multiple-thread plait* typically begins either with a single-thread plait to which at least one column is added (Figure 4) or with a separate *horizontal anchor thread*, over which single threads are doubled and secured in place with a knot or one or more beads (Figure 5). There are many exceptions to the foregoing generalities; at least three may be observed in Peranakan Chinese beadwork. First, nets and plaits may begin with threads that are stitched to a ground fabric. Second, like multiple-thread plaits, nets may also incorporate separate horizontal anchor threads (Lemaire 1960: Figures 14-15). Third, single-thread plaits can morph into multiple-thread plaits and vice versa within the span of a few centimeters; innovative Peranakan bead plaiters seem to have been fond of such *dual-thread structures*. It is much more difficult for a net to morph into a multiple-thread plait or vice versa.

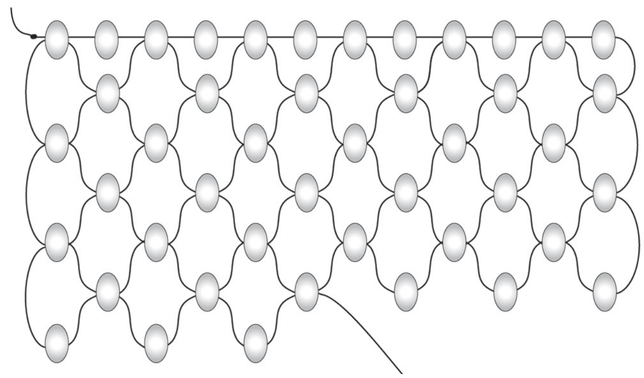

Figure 1. Simple closed-diamond net with four beads per cell, colloquially known as "peyote stitch" (one bead is added per stitch in this diagram and two beads per stitch in the panel in Figure 30) (all drawings by Carrie Iverson).

Bead nets and plaits are distinct from bead weaves, which entail the use of a separate weft thread. This distinction is often overlooked in the beadwork literature. Many researchers, myself included, have referred to bead nets and plaits either inconsistently, as "nets" or "weaves" (Hector 1995, 2005) or, ambiguously, as examples of "threading" (Ho 1987:54 ff.). Woven beadwork constitutes a category of its own, parallel to that of netted and plaited beadwork. No evidence of bead weaving has yet been found among the Peranakan Chinese (Eng-Lee 1989:27). Although a few pieces of bead crochet have been found, that technique lies beyond the scope of this study.

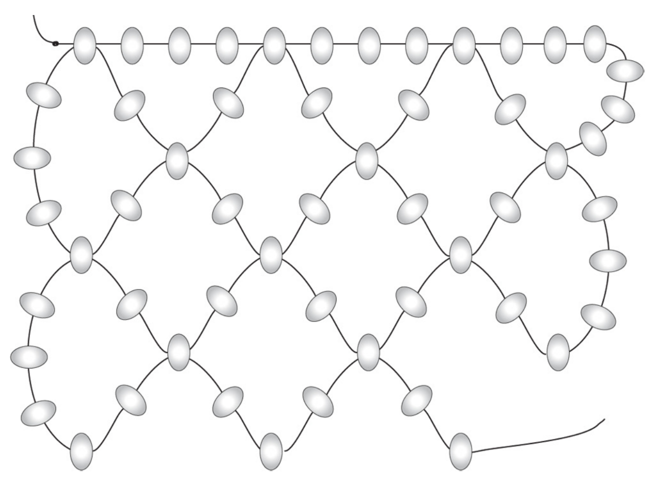

Figure 2. Simple open-diamond net with eight beads per cell (*see* Figures 8-9, 29 [lower register]).

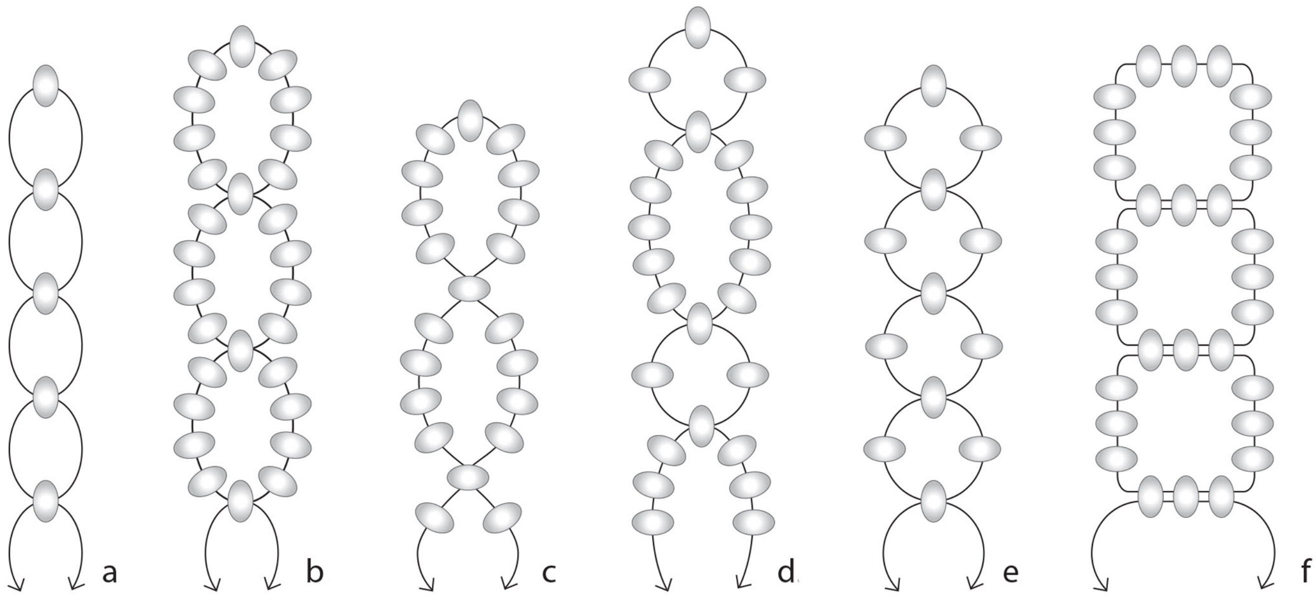

Figure 3. Single-thread plaits: a) beads connected in a simple 180° line, colloquially known as "ladder stitch," rarely used in Peranakan beadwork; b) simple open ovals with connecting beads aligned vertically which form the scalloped edging in Figure 9; c) simple open ovals with connecting beads aligned horizontally; d) a compound of closed right-angle cells and open ovals; e) simple closed right-angle cells used to construct the chains in Figure 26; and f) simple open right-angle cells, used to create the parallel vertical bands connecting circular platelets in Figures 12-13.

The threads used to create bead nets and both kinds of bead plaits may move horizontally, vertically, diagonally, spirally, or in other directions along a *thread path* specific to the technique in use. Maintaining even *thread tension* is crucial for a smooth, regular appearance. If threads are pulled too tightly or not tightly enough, beads may bunch together or slide apart, exposing empty threads. It is also possible to net or plait beads without using an established technique or a predetermined thread path, which is how new techniques and approaches are invented. For example, starting in the 1980s, Joyce J. Scott of Baltimore, Maryland, revolutionized American beadwork by working intuitively to

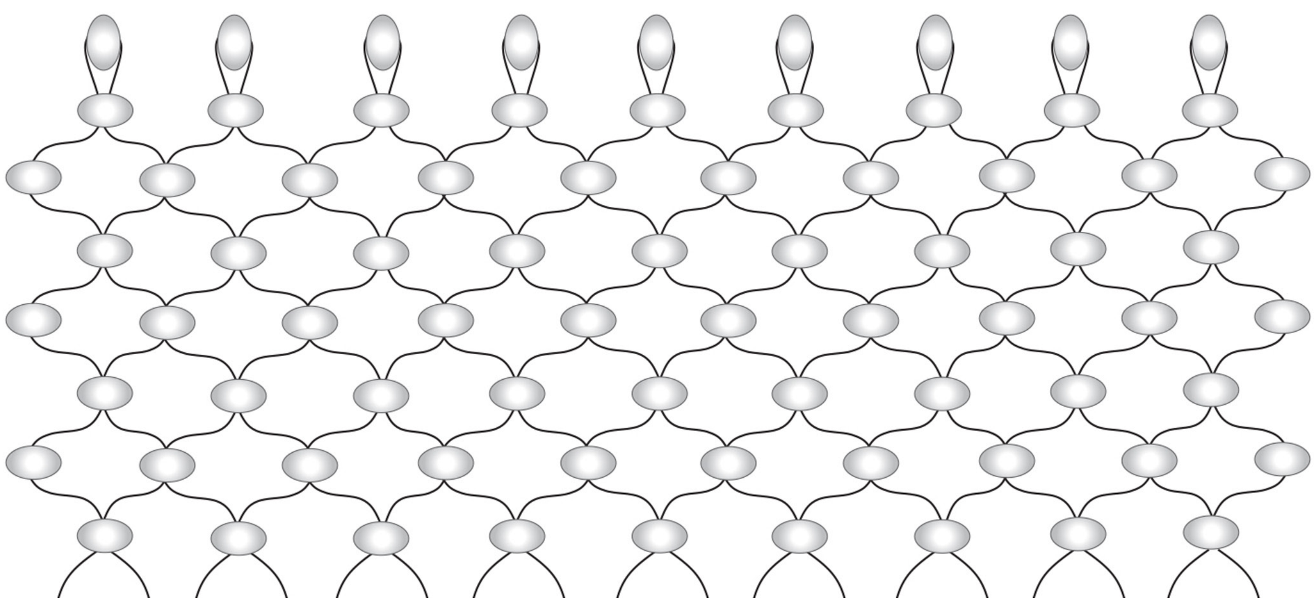

Figure 4. Simple closed-diamond plait with four beads per cell, rarely used by Peranakan beaders.

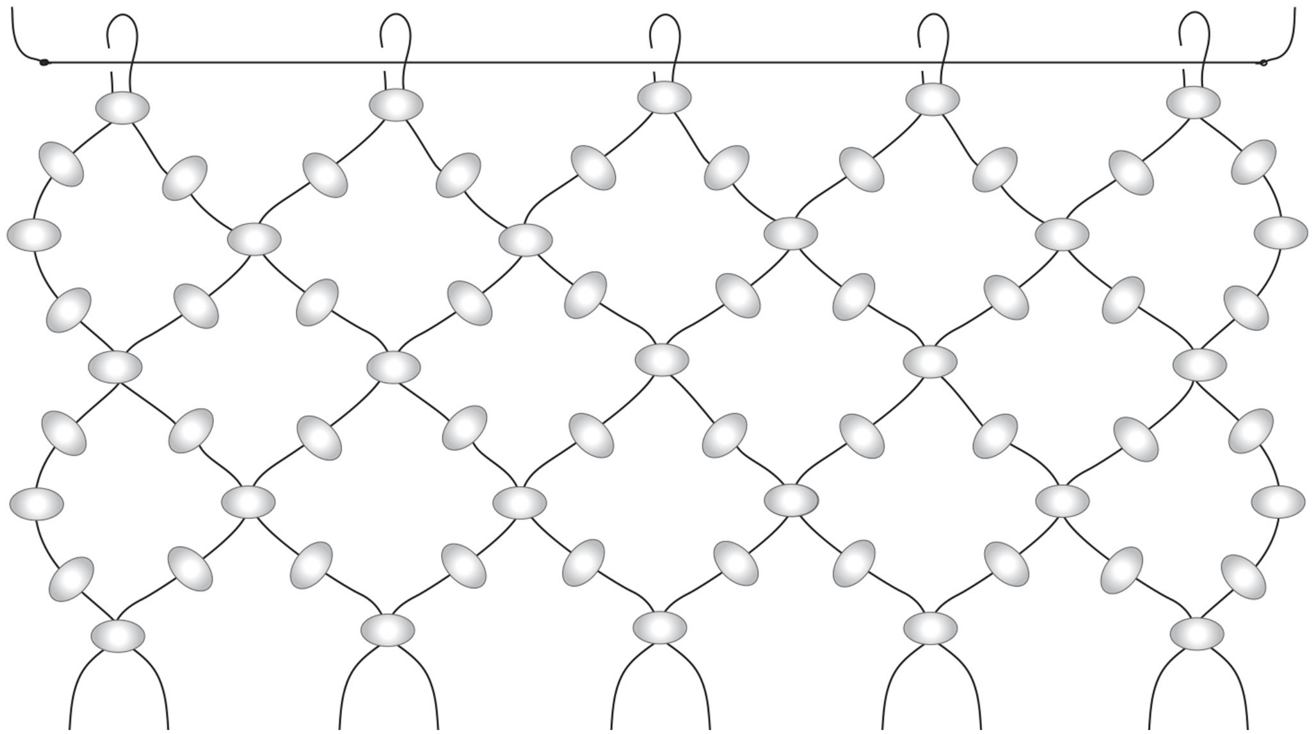

Figure 5. Simple open-diamond plait with eight beads per cell (*see* Figure 8, top edge).

construct asymmetrical, three-dimensional, hollow human figures using complex variations of the ancient, closed-diamond net known as "peyote stitch," shown in Figure 1 (Scott et al. 2000: Figures 42-46).[5]

At this point we must raise a caveat familiar to textile analysts (Rowe 1984). From photos alone, one cannot conclusively determine whether a freestanding beaded panel was made with a netting or a plaiting technique. This is because panels with identical *surface-level bead patterns* may have different underlying thread structures. In other words, in some cases, nets and plaits may look alike. One way to resolve the ambiguity is to examine the upper and lower edges of a piece, which may reveal its thread structure. Another way is to unravel threads in a small area. When close personal examination of a piece is not possible, I will call the technique in question *a net or a plait*.[6]

While a beading technique can be thought of as a process (or a recipe for a process), a bead pattern can be viewed as a product of that process. Surface-level bead patterns (or simply "bead patterns") comprise groups of individual *cells*. A cell is a two- or three-dimensional unit, symmetrical or asymmetrical in shape, composed of beads, which shares some of its beads with one or more neighboring cells. Usually, we judge the shape of a cell by looking at the edges or equators of beads, not the holes. Common cell shapes include triangles, squares, diamonds, pentagons, and hexagons. For the introductory purposes of this article, a bead pattern is *simple* if it conjoins cells of one shape and *compound* if it conjoins cells of two or more shapes; future researchers may wish to make other distinctions. Both types of cell configurations may be present in different areas of a single piece. Techniques can also be divided into those that produce simple vs. compound bead patterns.

Cells may be *open*, enclosing negative spaces that are easily seen, or *closed*, with negative spaces that are difficult to discern. *Mesh* refers to the degree of openness of a beaded structure; most bead netting or plaiting techniques may be adapted to render either *open-meshed* (or *open*) (e.g., Figures 2, 3,b-d, f, 5) or *closed-meshed* (or *closed*) (e.g., Figures 3,a,e, 4) structures. In some pieces, open and closed techniques are combined. Thanks to contemporary computer graphics programs, the degree of openness can be estimated, with the estimate expressed as the *diaphaneity*, or percentage of open spaces vs. beads.[7] Both mesh and diaphaneity are determined by a combination of thread path and number of beads per stitch, with a *stitch* being a unit of progress involving the addition of one or more beads at a time to the whole. "Stitch" also serves as a generic label for a technique; both usages are utilized herein, with context determining which is meant.

The more beads added per stitch, the greater the diaphaneity. Thus, a single technique may produce structures that are more or less diaphanous, depending on how many beads are added per stitch (compare Figures 1-2 and 4-5). As a general guideline, we may say that closed beaded nets and plaits manifest a diaphaneity of approximately 15% or less, which tends to inhibit the passage of light, while their open counterparts manifest a diaphaneity of 25% or more, which facilitates the passage of light. We will call the former *minimally diaphanous* and the latter *appreciably diaphanous*, reserving *maximally diaphanous* for nets and plaits exhibiting diaphaneities of 70% or more. Examples of the latter seem to be rare not just in Southeast Asia but around the world. A 20th-century Balinese temple ornament or *salang* stands as one notable exception (Brinkgreve 2015: pers. comm.; Newman 1977:274), beaded in an open-diamond net or plait, and we will encounter another later on.

Connections between beads and threads impart structural integrity. Whereas techniques used to create non-beaded textiles typically form connections with intersecting threads, bead netting and plaiting techniques may form connections through beads, as Peranakan beaders usually chose to do, with threads, or a combination of the two (Hector 1995:17). The three types of connections are diagrammed in Figure 6. This expanded capacity to form connections sets beaded textiles apart from non-beaded textiles, for the simple reason that structures can be created with beads that cannot be created with threads alone. It follows that systems for classifying non-beaded textiles such as the one found in Emery (1966) are not fully adequate for their beaded counterparts, and that bead netting, plaiting, weaving, and related techniques constitute a distinct branch of textile technology.

As the three irreducible elements of any bead netting or plaiting technique, thread structure, thread path, and type(s) of connection(s) also determine the angles at which the outer edges (or equators) of beads are positioned and how the holes are oriented. For example, "right-angle" techniques orient bead edges and holes at right angles to one another. Although several recent theorists have advanced mathematical analyses of certain bead netting techniques as "angle weaves" or expressions of tiling theory (Fisher and Mellor 2010), the full potential of *angle theory* as a tool for describing bead patterns has yet to be realized. It might be possible, for instance, to express all netting, plaiting, and allied techniques in terms of angles and/or curves.

No matter their thread structure or how they form connections, all bead netting and plaiting techniques may be modified by the thread path, the type(s) of connections formed, or the number of beads added per stitch. If the modifications are minor, a variation results; if major, a new technique emerges. Developing adequate names for such departures is difficult and to some extent arbitrary; there is no perfect method. Leaving variations for another study, I will assign new techniques multi-part names consisting of surface-level bead patterns, thread structures, and basic degrees of diaphaneity, e.g., open or closed. I will either name pre-existing techniques in a similar manner or adopt pre-existing names such as "ladder stitch," "peyote stitch," and "square stitch."

We conclude this brief primer on beadwork techniques with terms that refer to geographic distributions. As a result of both diffusion and independent invention, *global techniques* are widely distributed, having been practiced in many parts of the world for periods of time extending in some cases to several millennia. Examples of bead nets or plaits with global or near-global distributions include those that incline beads at 45°, 90°, and, to a lesser extent, 180° angles.[8] For that matter, bead embroidery can also be thought of as a global technique. The ease with which global techniques can be learned probably contributes to their tenacity. *Regional* or *local techniques* are more sparsely distributed; they may have emerged more recently. Criteria for distinguishing regional vs. local techniques have yet to be established, but I suggest that "regional" compares to "local" as "nation" compares to "state." *Idiosyncratic techniques*, confined to one beader or a small group of beaders, might be seen as a sub-genre of local techniques. Of course, generalizations of this nature were easier to maintain in the pre-internet era, when the pieces illustrated in this article were made.

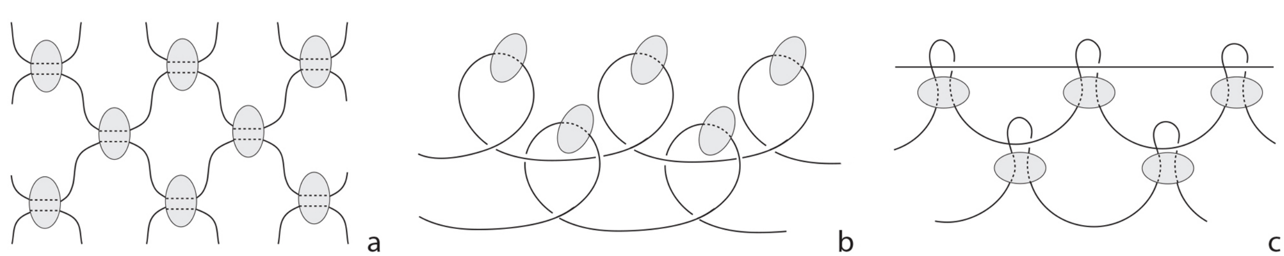

Figure 6. Connections: a) formed with beads alone, the preferred method of most Peranakan Chinese beaders; b) formed with threads alone; and c) formed with beads and threads.

SIMPLE DIAMOND NETS AND PLAITS AND COMPOUND INNOVATIONS

Simple diamond netting and plaiting techniques orienting beads at 45° angles (Figure 7) have been practiced around the globe following their apparent origin in ancient Egypt by about 2500 B.C. (O'Neill 1999: 306-307). The same techniques have long been practiced in the indigenous island Southeast Asian cultures amongst whom the mainland Chinese ancestors of the Peranakan Chinese settled in centuries past; countless examples have been published over the years (e.g., Gittinger 1979:74, Figure 660; Loebèr 1913: Figures VII-VIII, X-XVI; Maxwell 1990: Figures 29, 79, 82, 132-133); Newman 1977:274 [top]; Tillema 1989: Figures 27-28, 155-161; Westerkamp 2002:231, 234, 236). Scholars have suggested that diamond patterns or diagonal grids may have been "a common feature of prehistoric design" in island Southeast Asia (Maxwell 1990:218; cf. 262, 417). In fact, given that diamond patterns have been observed on impressions made in clay by knotted (non-beaded) nets dating to ca. 20,000-15,000 B.C. of the Eurasian Upper Paleolithic, we may conjecture that such patterns have long been basic elements of human textile design (Adovasio et al. 2007: Figure 8.1).[9]

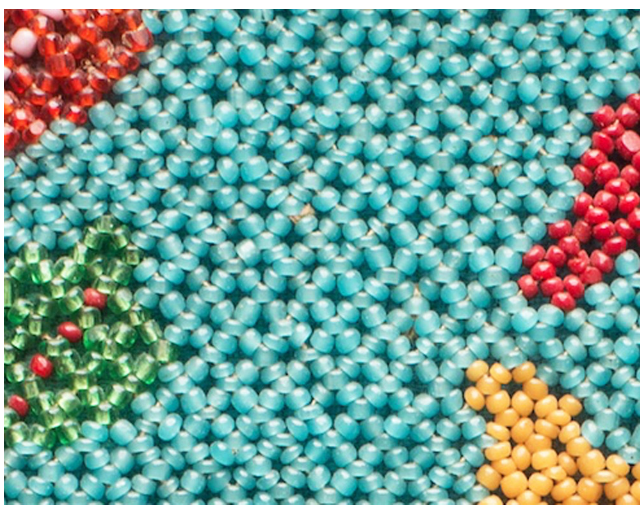

Figure 7. Detail of lower register in Figure 29, showing open-diamonds with eight beads per cell, a pattern preferred by many Peranakan beaders (photo: Edmond Lee; courtesy of Ken Yap).

Yet, Peranakan beaders did not necessarily derive techniques for making diamond-patterned bead nets and plaits entirely from indigenous island Southeast Asia cultures because the techniques were also employed in China and Europe, by cultures closely linked to Peranakan Chinese culture. Tentative evidence of simple diamond-patterned beading techniques emerges in China by the Late Western Zhou (ca. 1046-771 BCE) (Lü and Zhang 2007:91), resurfaces in the Tang dynasty (618-907) (Wang 2005: Figures 2.9-10, 2.14, 2.16), and continues into the Qing dynasty (1644-1911) (Garrett 1994: Figure 4.18; National Palace Museum 1986: Figure 324; Xu 2004: Figures 175-178) and beyond. In Europe, beads were netted or plaited in diamond patterns by the 17th century or before (Hector 2005:114; Jen Segrest 2015: pers. comm.). It is possible, even likely, that Europeans transmitted knowledge of these techniques to the Peranakan Chinese. But some of the latter may already have been familiar with them.

Many Peranakan beaders used these global diamond nets and plaits much as they had been used for centuries. Others transformed them.

Simple Diamond Nets and Plaits

As they practiced these simple diamond netting and plaiting techniques, Peranakan beadworkers made systematic choices. First, they favored open cells in which each diamond encloses a negative space that is easily seen. In such *simple open-diamond* bead nets and plaits (Figures 2 and 5) all cells are identical in shape and size, all cells share beads with one or more neighboring cells, all connections are formed with beads, and the holes of all connecting beads are oriented in the same direction, either east-west, or north-south (e.g., Cheah 2010: Figures 1, 8, 10; Eng-Lee 1989:33, 39, 42; Ho 1987: Figures 2, 5, 8).[10] The oldest published example of Peranakan beadwork, a *ba xian* or eight immortal headdress depicted in a 1724 engraving, bears witness to this preference (Chin 1991:150; Lee 2014:86, Figure 6.9),[11] as does an early-20th-century photo of the Tan Kheam Hock family which shows two women wearing *baju panjang* garments featuring designs evoking the bead or pearl bodices common in Chinese Buddhist visual culture since at least the Tang dynasty (Chin 1991:10-11; *see also* Scarpari 2000: Figure 70; Wang 2005: Figures 2.9-10, 2.14, 2.16).[12]

Second, when making simple, open-diamond nets and plaits, Peranakan beaders often added three beads per stitch, which assured a count of eight beads per cell. By adding only one bead per stitch, for a total of four beads per cell, Peranakan beaders could have fashioned the simple, closed-mesh, diamond-patterned nets and plaits that were common in indigenous island Southeast Asian cultures by the end of the 19th century, as well as in China, Europe, and elsewhere. But the Peranakan Chinese rarely used such *simple closed-diamond* nets and plaits (Figures 1 and 4); perhaps they too closely resembled what could more easily be created with bead embroidery, especially "petit-point bead embroidery" (Cheah 2010: Figures 5, 69-70, 128, 161). Time and again, Peranakan beaders opted for netting and plaiting techniques that would yield appreciable ratios of negative spaces to beads, manifesting a diaphaneity of 25% or more. In contrast, simple closed-diamond bead nets and plaits are generally less than 15% diaphanous.[13]

Two examples of Peranakan Chinese beadwork made with open-diamond techniques illustrate many of the points noted above. Cutting into small areas of each piece reveals that the first is made with a netting, the second with a plaiting technique. The diaphaneity of both pieces measures approximately 25%. The first example, a 20th-century bed curtain tie, juxtaposes modest bead embroidery in the upper register; simple open-diamond bead netting in the tall second and serrated third registers; and single-strand bead tasseling in the fourth register (Figure 8). The second and third registers were separately made, the former without a separate horizontal anchoring thread and the latter with one that was probably integrated as work progressed; the two approaches are diagrammed in Lemaire (1960: Figures 10-12, 14-15). Interestingly, the tassels were also separately produced and attached. These and other disparities in material and craftsmanship among the four registers leave us wondering whether this piece represents the labor of one young woman, working at home to familial standards of *alus* (good) craftsmanship (Cheah 2010:108, 115-116), as early researchers would likely have assumed, or whether one or more of the registers was commercially produced. Conceivably, both modes of production may have been in play; anecdotal evidence suggests that modular methods may have been adopted in some cases, with beaded borders, tassels, or edgings commercially available as add-ons for existing pieces (Cheah 2010: Figure 19, caption). Modular methods of production were common in China for centuries (Ledderose 2000:1-7). Once again, our analysis of the meaning of such a piece will vary according to the qualities of its workmanship, the context of its making, and the perceived identity of its maker(s).

The second example of an open-diamond technique forms the upper register of a wedding bed valance probably made in Penang during the early 20th century (Hector 1995: Plate IVB, 2005:52). The valance exhibits extraordinary levels of effort and expertise, delivering a consistent aesthetic with refined workmanship and a single type and size of the two-cut European glass beads known as "charlottes" (Cheah 2010:35). Close study confirms that work on the upper register began with the row of 104 semi-circular scallops that runs along the register's lower edge (Figures 9-10). A photo of a similar valance in progress reveals many yet-to-be-beaded threads with no needles at their ends (Figure 11); perhaps the ends were smoothed and/or stiffened with wax or another substance (Cheah 2010: Figure 105). We do not know whether plaiting progressed from the scallops up or the scallops down, but scallops, when present on a piece, are often situated at its lower edge. Each scallop in Figure 9 consists of three separate *single-thread open-oval plaits* of

Figure 8. Detail of a bed curtain tie, showing the second register from the top worked in an open-diamond net without a separate horizontal anchor thread at top, and the third, serrated register worked in the same way, with a separate horizontal anchor thread. Probably Peranakan Chinese, 20th century (photo: Valerie Hector; courtesy of Jan Smith, Dalmeny, Australia).

Figure 9. Detail of a wedding bed valance showing scalloped edging along the lower edge of a pictorial panel featuring bird and floral motifs. Probably Peranakan Chinese, Penang, late 19th or early 20th century (photo: Valerie Hector; private collection).

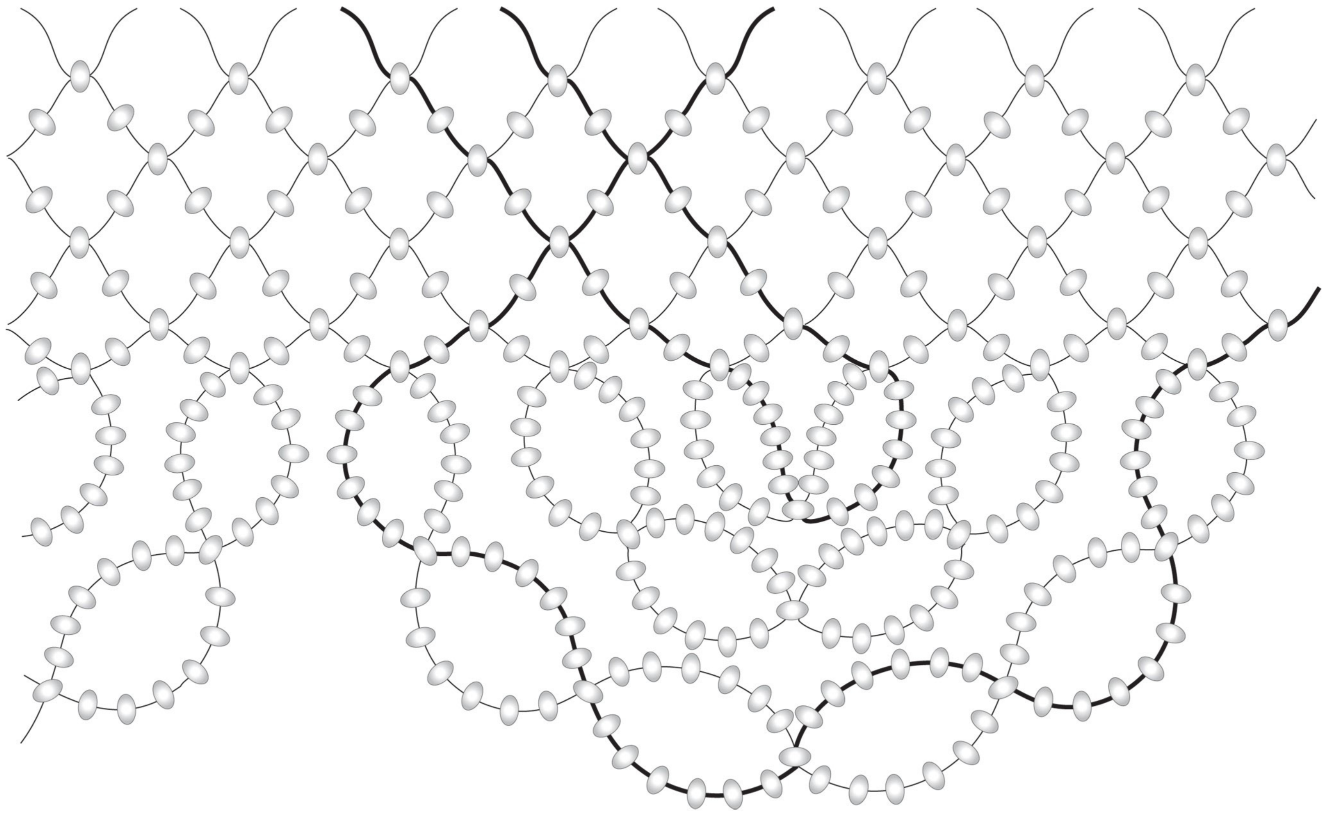

Figure 10. Diagram of the two techniques used in the wedding bed valance (Figure 9), showing three concentric, single-thread, open-oval plaits which transition into a simple open-diamond plait with a diagonal thread path.

the sort shown in Figure 3,b, arranged in concentric arcs in a manner recalling the European-inspired crochet or bobbin lace edgings on various non-beaded Peranakan Chinese textiles, especially the women's blouse known as the *kebaya* (Lee 2014:164, Figure 7.15).

As we shall see, Peranakan beaders made scalloped edgings with other techniques as well, typically using this fashionable stylistic device to soften rectilinear borders (e.g., Cheah 2004: Figures 6-7, 2010: Figures 63, 78,101; Ho 1987: Figures 2, 4, 10-11). In this case, once a number

Figure 11. Bead plait in progress, showing scalloped edging and multiple threads yet to be plaited. Probably Peranakan Chinese, late 19th or early 20th century (photo: Hwei-F'en Cheah; courtesy of Bebe Seet, Singapore).

of scallops were in place, the 12 threads emerging from each scallop began intersecting diagonally with threads from adjacent scallops, connecting beads three at a time in a *multiple-diagonal-thread, open-diamond plait* that was probably worked over a template (Cheah 2010: Figure 104), the better to render the intricate pictorial motifs scrolling across the register. In so doing, the scallops convert necessity – the need for a place to begin an open-diamond plait – into decoration. Efficiency may have been key for other Peranakan beaders as well. One of them began a multiple-thread open-diamond plait not at the perimeter but in the middle, thereby shortening the length of time needed to add new beads while reducing the risks of threads tangling (Cheah 2010:178, Figure 104).

Keeping 1,248 diagonally moving threads flowing properly in opposite directions while uniting an estimated 176,000 beads is incredibly difficult, even if only a few inches are worked at a time. It would have been easier to use a multiple-vertical-thread plait, which would have kept the threads parallel and flowing vertically. Was something gained by moving the threads diagonally instead of vertically? Once the valance was finished, even close observation could not determine its underlying thread structure. Did Peranakan Chinese beaders think diagonal-thread plaits were more traditional or durable? Or did the sheer labor intensiveness of the technique heighten the valance's monetary or symbolic value, perhaps underscoring the wealth or social standing of the family who owned it, or the virtues of the valance's maker, possibly the family's bride-to-be? Or did the longer lengths of thread that diagonal plaits consume resonate with traditional Chinese wishes for longevity, in this case, perhaps, the longevity of the family line? Questions of this nature speak to the nuanced meanings that individual beading techniques convey. Additional research is needed to determine how often Peranakan Chinese beaders and their counterparts in Southeast Asia, China, and Europe plaited beads with vertically vs. diagonally moving threads. As noted earlier, determining the direction of a thread path often requires prising apart or cutting into a piece of beadwork (for a photo of a circular diagonal bead plait produced by the Dayak peoples of Borneo, *see* Hector [2005:6]).

Compound Open-Diamond Techniques

Earlier, we distinguished simple from compound beading techniques, noting that compound techniques create bead patterns with dissimilar cell shapes. One of the earliest surviving examples in the Asian hemisphere may be found on a small scent bag attached to a woman's hair ornament which dates to China's late Southern Song dynasty (1127-1279). Published photos (Zhou et al. 1992: Plates 3, 6) are poor and existing diagrams (Gao 2001: Figure 266) inaccurate, but the technique conjoins diamonds and octagons (pers. obs. 2006, De'An County Museum, Jiujang, Jiangxi, Nanchang). Thus, the technique could be called a "diamond/octagon" or "octagon/diamond" net or plait. The following paragraphs examine four other compound diamond techniques, of which three are Peranakan innovations.

Not content to use pre-existing techniques for simple open-diamond nets and plaits, Peranakan beaders appear to have developed innovative compound techniques by deploying a strategy of permutation, incorporating into simple open-diamond nets and plaits cells abstracted from other techniques. In much the same way, it seems, Peranakan beaders abstracted motifs from European or Chinese visual culture and recombined them with indigenous Southeast Asian motifs (Cheah 2010:263).

A tiered hanging ornament from the Minangkabau region of West Sumatra reveals two such compounds. Like other hangings of its kind dating to the mid-20th century (Newman 1977:59), often attributed to the Islamic Minangkabau peoples with whom the Chinese intermarried, the hanging is composed of three circular, wire-framed beaded platelets connected by parallel vertical bands probably made of single-thread plaits, in this case, *open right-angle plaits* (Figure 3,f). Each platelet is stitched in a different technique, probably with wire instead of thread. The middle platelet (Figure 12) features a vertical cartouche that conjoins open diamonds with closed right-angle cells. The format echoes an element of mainland Chinese beadwork design visible in examples dating to the Ming dynasty (pers. obs.) and late Qing dynasty (Francis 1986: Figure 3). Such an *open-diamond/closed right-angle* technique is probably not unique to the Peranakan Chinese, although they may have invented their own versions of it (Crabtree and Stallebrass 2002:128 [top middle], 173 [second from left] and 192 [lower right]; Holm 1984: Figure 171). The cartouche is flanked by two halves of what appears to be a single Chinese macramé knot made of parallel lengths of beads strung on wires, then plaited to simulate the loops of the knot. The lower platelet features a technique which conjoins large open-diamond cells with small right-angle cells, plus open cells with three, four, or five sides, which may have been improvised to get the other cells to fit (Figure 13). This open-diamond/right-angle/polygon technique has not been documented elsewhere.

A third compound diamond plaiting technique used in a small rectangular panel of unknown function requires a kind of code-switching on the part of the beader, who must move dozens of threads vertically, diagonally, and horizontally while alternating between three very different plaiting techniques (Figures 14-15). That all connections are formed

Figure 12. Middle platelet of a tiered hanging collected in West Sumatra in 1946, showing a vertical cartouche containing compound open-diamond/closed right-angle net or plait, flanked by two halves of a single Chinese macramé knot. Probably Peranakan Chinese or Minangkabau (courtesy of National Museum of World Cultures; object no. TM 1678-5).

Figure 13. Detail of the lower platelet of the tiered hanging in Figure 12, featuring a compound open-diamond/closed right-angle/open-polygon net or plait (courtesy of National Museum of World Cultures; object no. TM 1678-5).

with beads must have made the task easier. The initial row contains cells composed of closed right-angle cells; threads flow first diagonally and then vertically before initiating an open-diamond plait whose threads move diagonally, shaping diamonds along with hexagons and other polygons. Soon, the open-diamond plait largely gives way to what could be called a *lateral-ladder plait* (Figure 16) whose threads move horizontally and vertically, laying down parallel rows of beads oriented at 180° angles to one another, which depict small, cross-shaped motifs. Structurally, the cross motifs are weak because the technique leaves alternating pairs of beads connected to the whole with only one as opposed to two threads. Furthermore, in the sample I made, I found it extremely difficult to maintain even thread tension because the threads kept going slack. Once the cross motifs are complete, the open diamonds return. Much more could be said about this *closed right-angle/open-diamond and polygon/lateral-ladder plait*, which ranks as one of the most difficult ever invented. The single example documented thus far may represent an idiosyncratic innovation. A series of tassels worked in single-thread, closed right-angle plaits (Figure 3,e) completes the bottom edge of the panel. The small metal platelets at the tips of the tassels connote a Sumatran provenance (Hwei-F'en Cheah 2016: pers. comm.).

In a fourth, seemingly rare compound, Peranakan beaders made three notable choices, probably to create visual variety and richness. First, they opted for a dual-thread structure, switching between multiple-thread and single-thread plaits. Second, they conjoined cells of different shapes and lengths, alternating elongated diamonds with short ovals. Third, they augmented dimensionality by increasing the number of vertical strands running through the holes of connecting beads. Thanks to these three choices, this *three-dimensional, elongated open-diamond/open-oval plait* gives a lush, volumetric appearance (Figures 17-18).

TECHNIQUES THAT MAY DERIVE FROM MAINLAND CHINESE INFLUENCE

Early researchers suspected that Peranakan beadwork was derived from or related to European influence (Cheah 2010:41, citing Eng-Lee 1989 and Khoo 1996).[14] It is true that European beading and needleworking techniques influenced Peranakan beaders, but not to the extent

Figure 14. Detail of a rectangular panel of unknown function. Possibly Peranakan Chinese, Sumatra (photo: Valerie Hector; private collection).

previously assumed. Here, we expand the scope of the inquiry, analyzing two Peranakan techniques with fairly close parallels in China, and two techniques which appear to be innovative departures, unknown outside the Peranakan world, yet bespeaking mainland Chinese influence.

Possible Routes of Mainland Chinese Influence

Influences from mainland China reached the Peranakan world in various ways, three of which are most pertinent. First, although little or no trace of them remains in historical documents, beaded items made in China were almost certainly carried to island Southeast Asia on ships that plied the ocean trade, either by Peranakans, returning home from visits to China, or as commercial exports, shipped in quantity. Although it is poorly documented, beadwork has been produced in China since ancient times (Hector 2013:42-43). By 1875, opera costume workshops in the *Zhuangyuan fang* neighborhood of Guangzhou (formerly Canton) reportedly specialized in beadwork. By 1910, "foreign merchants" using "foreign glass beads" began producing pieces specifically for export (Lin 1988:196). Second, beadwork may have been made in China to Nyonya tastes (Cheah 2010:167), just as other items such as porcelain were. Interestingly, pieces of "Peranakan beadwork" have been found in Southeast Asia bearing "made in China" labels (Cheah 2010:71, Figures 3, 7-10). Third, mainland Chinese bead embroiderers, netters, and plaiters might have emigrated to island Southeast Asia, hoping for a better life or responding to periodic invitations from island Southeast Asian officials, traders, or shopkeepers eager to satisfy a demand for luxury items (Brinkgreve and Sulistianingsih 2009:148).

Indeed, anecdotal evidence suggests that "professional Chinese male embroiderers" living in Southeast Asia may have made beadwork in the Peranakan style (Cheah 2010:314). Peter Francis (2002:62) established a credible precedent for such a technology transfer, arguing that mainland Chinese glass beadmakers set up shop in early-17th-century Banten, Java, and southern Borneo. Judging by the few published examples of Qing-dynasty netted and plaited beadwork, many of them imperial, these Chinese embroiderers – possibly including some of the recently arrived immigrants known as *xin ke* or *totok* – could have been familiar with open-diamond nets or plaits (Xu 2004: Figures 175-178); closed-diamond nets or plaits (National Palace Museum 1986: Figure 324); right-angle nets or plaits (National Palace Museum 1986: Figures 111, 119, 315; Yang and Kao 1987: Figure 61 [three beaded medallions on base]); hexagonal nets or plaits (Li et al. 1992: Figures 25, 69, 73-74, 103); hexagonal/octagonal nets or plaits (Xu 2004: Figure 182); bead dodecahedra (National Palace Museum 1986: Figure 165); wirework (Xu 2004: Figure 28); and other techniques (National Palace Museum 1986: Figure 324; Xu 2004: Figure 143). All of these techniques and more were used to create unpublished examples of non-imperial beadwork in China during the late 19th and early 20th centuries (pers. obs.). Of course, technical proficiency is one matter; the expertise gained from long-term experience in selecting and configuring techniques for different contexts, quite another. If beadworkers formerly employed in imperial workshops in Beijing or elsewhere settled in island Southeast Asia before or after the demise of the Qing dynasty in 1911, the impact might have been significant.

Close Parallels Between Mainland Chinese and Peranakan Chinese Beadwork

In some cases, the parallels are nearly exact. The *simple open-hexagon* net or plait used to construct the fringe of a Peranakan wedding headdress in the Asian Civilizations Museum (Figure 19) also appears on the fringe of a hair ornament made in China, anecdotally attributed to the Hokkien peoples of Fujian province, the ancestors of

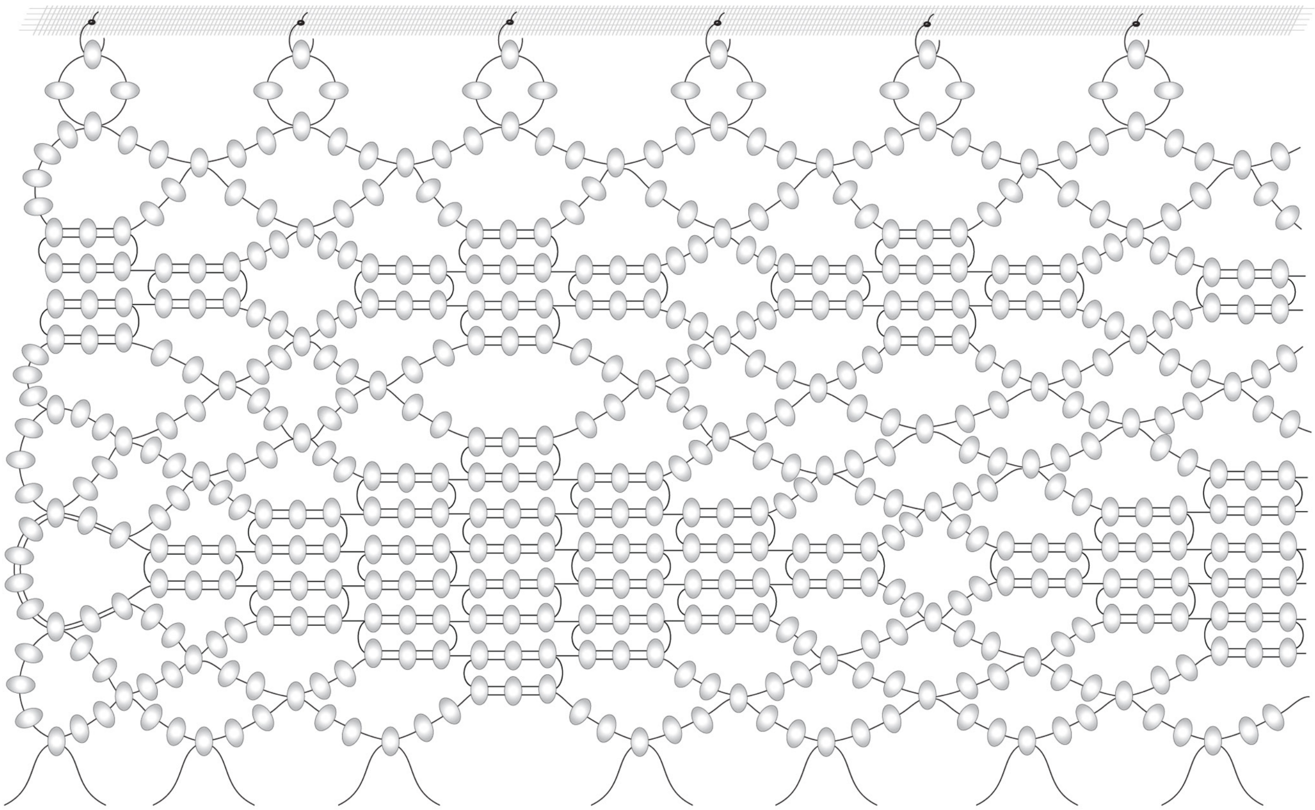

Figure 15. Diagram of the closed right-angle/compound open-diamond/lateral-ladder plait in Figure 14, one of the most difficult bead plaiting techniques ever invented.

many Peranakan Chinese (Figure 20; Tan 1999:38 ff.). The mainland Chinese example is somewhat more diaphanous, because more beads were added per stitch. Motifs on both pieces are quite similar, consisting of concentric, polychrome, hexagon motifs on backgrounds of clear beads. These technical and visual similarities could be accidental,

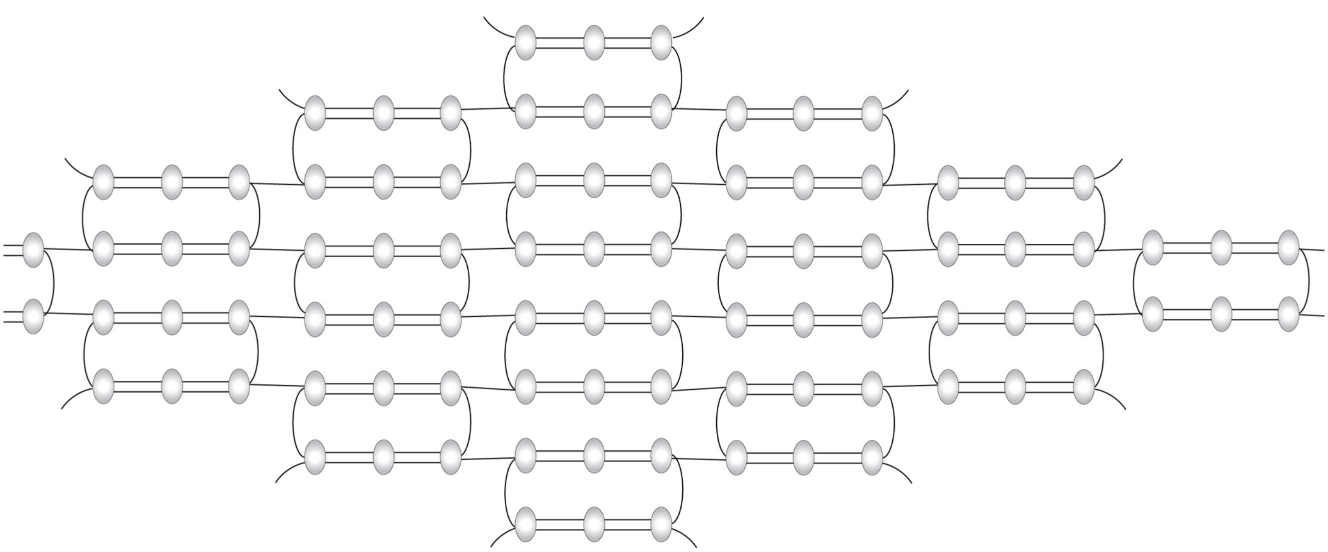

Figure 16. Detail of Figure 15, showing structurally fragile lateral-ladder plait with pairs of beads connected to the whole by one thread instead of two.

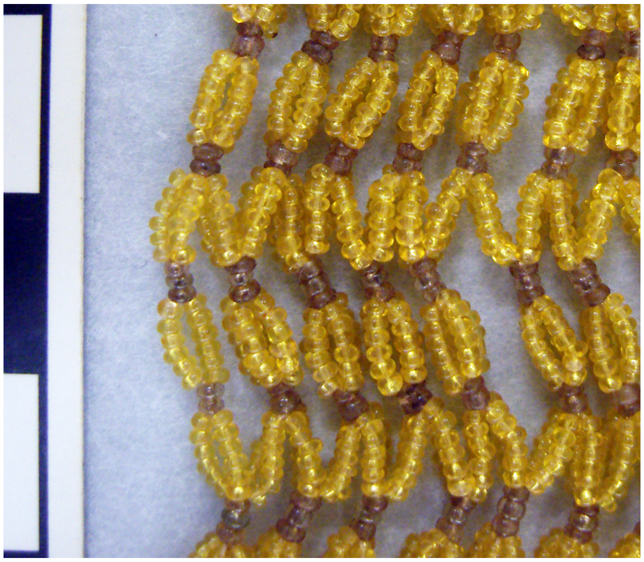

Figure 17. Detail of fringe on embroidered and beaded decoration for a bedpost. Peranakan Chinese, early 20th century (collection of the Asian Civilisations Museum, Singapore; object no. T-0415).

Figure 19. Detail of fringe worked in a simple open-hexagon net or plait on an embroidered headdress for a bridal attendant. Malacca, Penang (Malaysia) or Singapore, Peranakan Chinese, early 20th century (courtesy of National Museum of Singapore, National Heritage Board; accession no. G-0221-A).

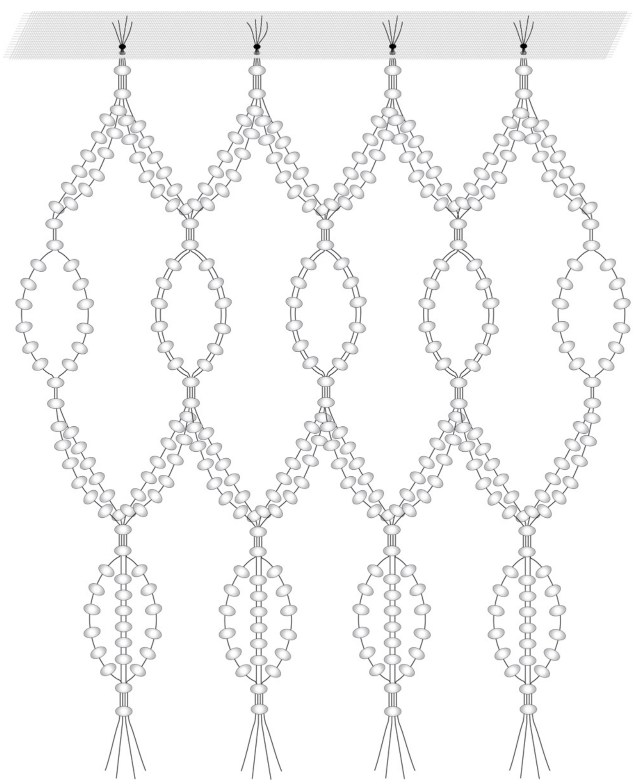

Figure 18. Diagram of the fringe in Figure 17, showing compound, three-dimensional, elongated open-diamond/open-oval plait, which could also be analyzed as a compound, three-dimensional, elongated open-oval/short open-oval plait.

but it seems unlikely, since hexagonal bead netting and plaiting techniques, well-established in China since at least the Qing dynasty (National Palace Museum 1986:126) are relatively rare in the Peranakan world.

In a second example, visible in the band of fringe encircling a bead-embroidered table cover in the Asian Civilizations Museum, the parallel is less exact (Figure 21). Construction of the fringe probably began with a row of scallops rendered in a *compound open-diamond/polygon plait* which changes to a *simple open-diamond/simple open-hexagon plait* that alternates two rows of open diamonds with one row of hexagons (Figure 22).[15] The latter plait patterns beads in ways reminiscent of the patterns on mainland Chinese bamboo-bead jackets (Figure 23) of the sort worn by Peranakan brides and grooms on their wedding day to promote ventilation under their heavy silk outer garments (Eng-Lee 1987: Figure 139; Garrett 1994: Figure 6.7, 2007: Figure 211; Khoo 1996:81). There are two important differences, however. First, the bamboo bead garments are netted, not plaited (Hector 1995: Figure 15). Second, connections are formed with knotted threads on the bamboo-bead net garments as opposed to beads on the Peranakan table cover fringe (Hector 2005:24). Perhaps a Peranakan beader, having seen a bamboo-bead garment, decided to render similar bead patterns using a more complex thread structure coupled with faster, easier connections.

Figure 20. Detail of a metal hair ornament with kingfisher feather decoration and a fringe worked in a simple open-hexagon net or plait. Probably Hokkien peoples, Fujian or Guangdong province, China, early 20th century (photo: Valerie Hector; private collection).

Innovative Departures from Mainland Chinese Approaches

Two further examples, both compound plaits with dual thread structures, can be seen as innovative departures from existing mainland Chinese techniques. The first plait, which serves as the fringe of a curtain tie, features what appear to be interlocking coins (Figure 24). Coins are conventional motifs in Chinese visual culture, depicted in various media, including the mainland Chinese bamboo-bead garments just discussed. Peranakan beaders invoked this auspicious motif in new and elaborate ways by alternating single rows of interlocking coins with single rows of elongated pointed ovals. While the coins are worked as multiple-thread plaits, the elongated ovals are worked as single-thread plaits (Figure 25). Because only a few examples of this *single-thread elongated-oval/multiple-thread interlocking-coin plait* have been found thus far, always worked in silver-lined, pale gold rocailles (Cheah 2010: fringe on Figure 161), it may be a local technique. Only one analogous plaiting technique has been found – on a pair of curtain ties at the Asian Civilizations Museum (cat. no. 2005-01302). The analogue is even more complex, alternating double rows of interlocking coins with double rows of elongated ovals, plaited in golden yellow rocailles.

The second example of an innovative bead plaiting technique with roots in China, a large rectangular panel

Figure 21. Detail of a beaded round tablecloth with floral and bird motifs and scallop-edged beadwork fringe. Probably Peranakan Chinese, early 20th century (collection of the Asian Civilisations Museum, Singapore; object no. 2005-01300).

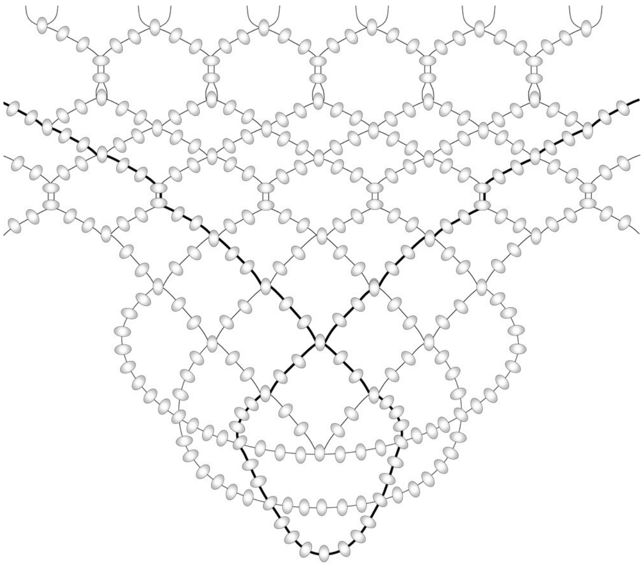

Figure 22. Diagram of the fringe in Figure 21.

of unknown purpose, seems to have been inspired not by mainland Chinese beadwork, but by traditional Chinese macramé (Figures 26-27). In fact, the technique looks like

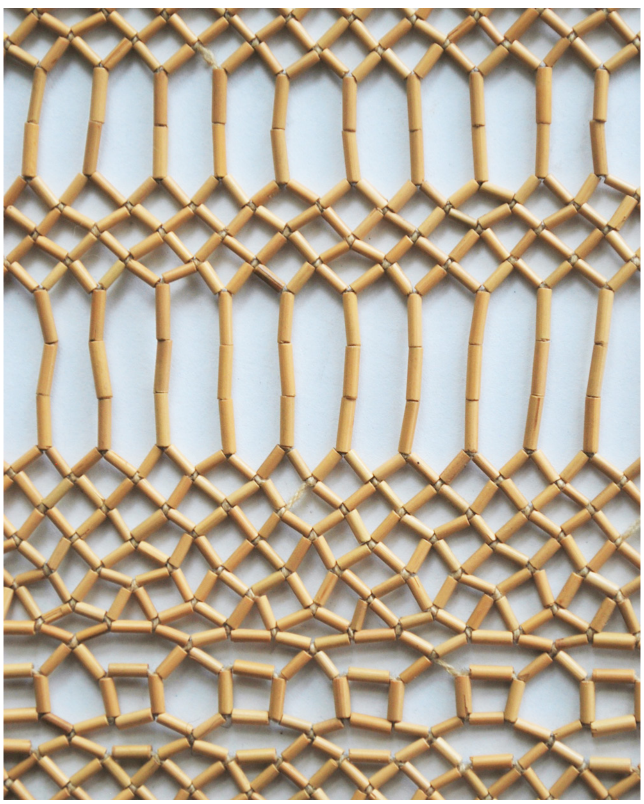

Figure 23. Detail of a knotted-net bamboo-bead jacket featuring bead patterns composed of compound open-diamond/hexagons and interlocking coins. China, late 19th century (photo: Valerie Hector; private collection).

Figure 24. Detail of compound fringe on a rectangular beadwork tapestry, featuring what appear to be interlocking coin motifs. Probably Peranakan Chinese, early 20th century (collection of Asian Civilisations Museum, Singapore; object no. T-0481-A).

a transposition into beads of a specific set of macramé knots observable, for example, in the non-beaded fringe of a white cotton hand towel attributed to Palembang in southern Sumatra (Figure 28) (Hwei-F'en Cheah 2015: pers. comm.). Transpositions of this nature probably made sense to Peranakan beaders, since the Peranakan Chinese often replaced "the knotted fringes traditionally used to enhance Chinese textiles" with beaded fringes (Eng-Lee 1989:27). In fact, we already witnessed one such transposition in the macramé knot formed of plaited, bead-strung wires. Twentieth-century beadworkers in south China also added glass beads to macramé structures (Szeto 1992:10, Figure 15, second band from top). Moreover, Peranakan beaders may also have transposed patterns visible in certain single-thread open-oval plaits into embroidery, or vice versa (compare Figure 3,b with the beaded edging in Cheah 2010: Figure 138, or Figure 3,d with the beaded edgings in her Figures 42 and 54, bottom).

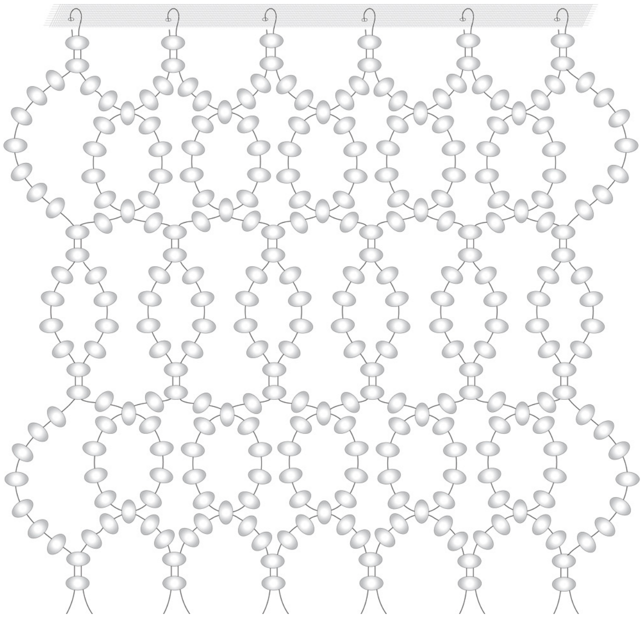

Figure 25. Diagram of the single-thread elongated-oval/multiple-thread interlocking-coin plait in Figure 24.

Like the coin/oval technique discussed above, this technique employs a dual-thread structure. Constructing thin chains of right-angle cells possibly imitating cross knots, flat knots or long *panchang* (longevity) knots (Chen et al. 1997:45, 58, 75), the single-thread plaits flow vertically and diagonally before morphing into multiple-thread plaits forming rectangular medallions possibly inspired by or transposed from *panchang* or "ten accord" knots (Chen et al. 1997:52-53, 86). The cells of the medallions vary from closed to open diamonds and other polygons, a complex assortment borne of the adjustments needed to navigate contingencies at points of transition. This *single-thread, closed right-angle chain/multiple-thread compound-diamond medallion plait* (Figure 27) seems to be rare; it has been documented on only one other piece, a panel of fringe in the Asian Civilizations Museum (cat. no. 2000-07538-003).

OTHER TECHNIQUES

Several Peranakan bead netting and plaiting techniques do not fit well into previous categories. These seeming anomalies invite us to question our assumptions anew as we search for related examples. Here we review three examples.

Having said that Peranakan beaders rarely used closed-diamond nets and plaits, we encounter the exception that proves the proverbial rule in a stylistically unusual panel (Figure 29) attributed to Kalimantan's west coast, home to various mainland southeast Chinese émigrés such as the Teochiu (Hoklo) and Hakka peoples of Guangdong province (Heidhues 2003:31 ff.). Possibly referencing an historical event, the upper register of the panel portrays human figures grasping ladders, lighting firecrackers, or holding aloft Dutch flags (Figure 30). To create this closed-diamond net, colloquially known as "peyote stitch," two beads were added per stitch, which dramatically reduced investments of labor and time. In the popular beadwork literature, this would be called "two-drop peyote stitch" (for a one-drop version, *see* Figure 1). How did this seldom-seen technique turn up in Kalimantan? Was the beadwork done in China, where peyote stitch was used to produce many objects around the turn of the 20th century, such as a small bead-net scent bag collected ca. 1900 by American missionaries in or near the town of Swatow (Shantou) in Guangdong province, then a Teochiu area (pers. obs. 2006, cat. no. 70/1753, American Museum of Natural History, New York; *see also* Hector 2005:15); or done in Kalimantan by Chinese or other beaders familiar with peyote stitch; or by Peranakan Chinese beaders living closer to the heartland of Peranakan Chinese culture? The presence of peyote stitch in Europe since at least the 17th century and European missionaries and teachers among the Peranakan Chinese introduces other variables (Cheah 2010:122-127).

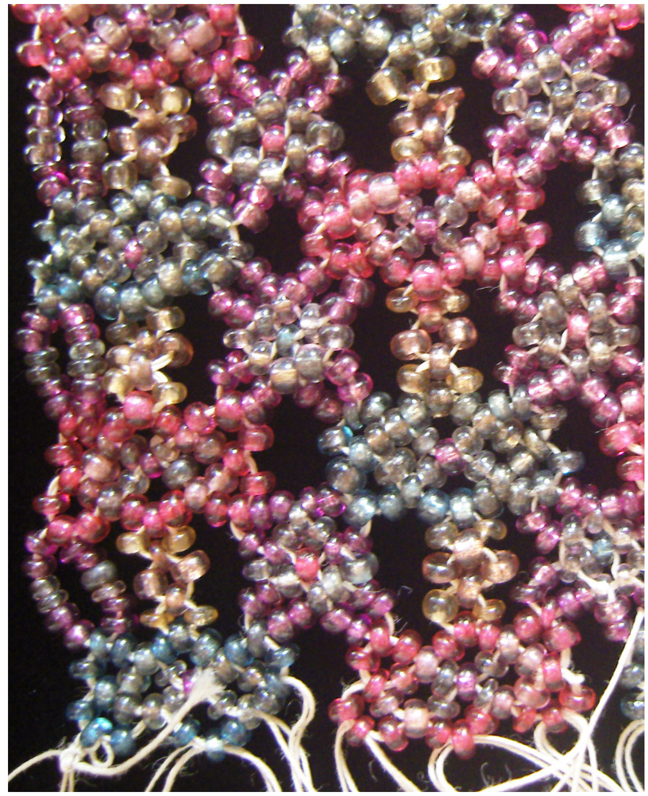

Figure 26. Detail of a large, unfinished rectangular beadwork panel. Probably Peranakan Chinese, early 20th century (photo: Hwei-F'en Cheah; courtesy of Datin Patricia Lim).

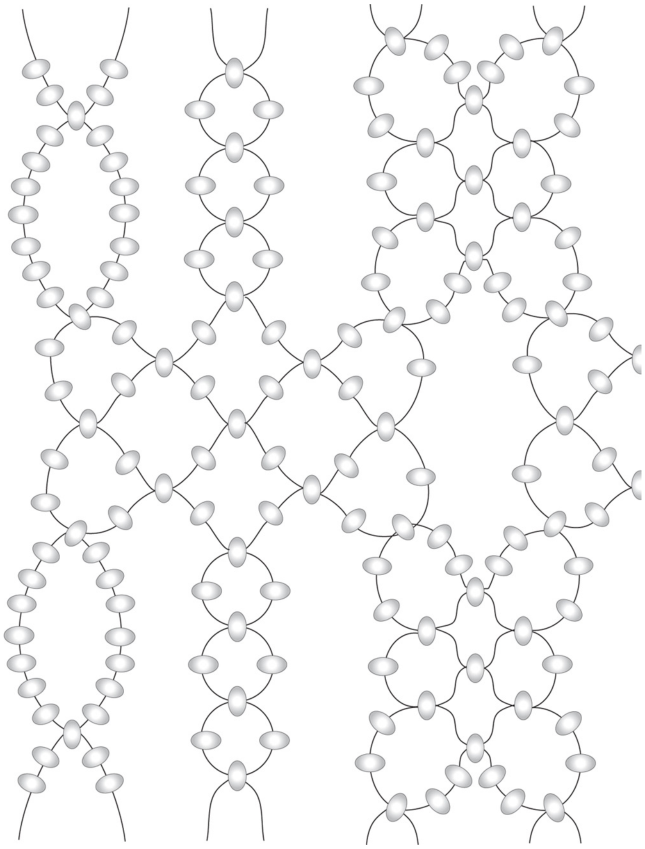

Figure 27. Diagram of the single-thread, closed right-angle chain/ multiple-thread, compound-diamond medallion plait in Figure 26.

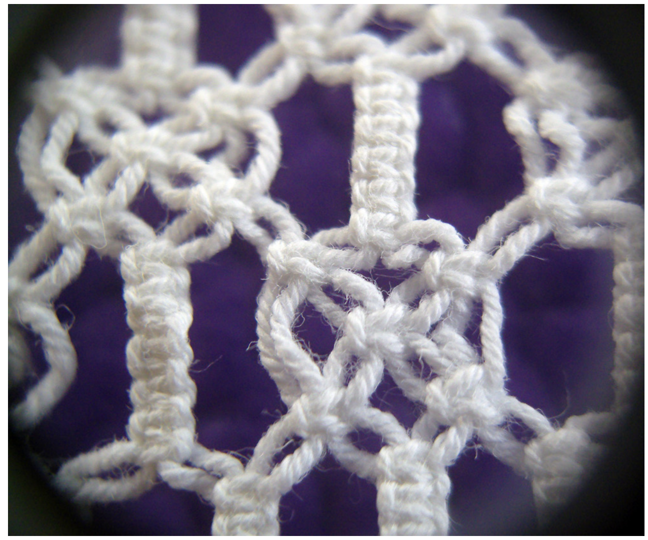

Figure 28. Detail of macramé edging of a hand towel. Probably Peranakan Chinese, Palembang, Sumatra, early 20th century (photo: Hwei-F'en Cheah; private collection).

Probably worked in the simple open-diamond netting technique favored by the Peranakan Chinese (Figure 2), the lower register of the panel in Figure 29 pairs bird and stick-figure tree motifs broadly recalling those on a "Dutch batik" *sarong* or tubular skirt cloth attributed to Pekalongan, East Java, or the island of Madura (Barnes and Kahlenberg 2010: Figure 48). Several unpublished pieces of beadwork formerly in the collection of a Mr. and Mrs. Ehrich, who lived in or near Padang, West Sumatra in the 1970s, feature similar bird motifs (Hwei-F'en Cheah 2015: pers. comm.).

The second anomaly appears in the beaded fringe of an embroidered 20th-century bed curtain tie (Figure 31). Not yet found outside the Peranakan world, this *open square-stitch net* (Figure 32) displays characteristics of square stitch, a closed-netting technique that arrays beads in parallel rows and columns, and peyote stitch. Examples have been published in Cheah (2010: Figures 108-109) and Ho (1987: Figure 21). While closed-square stitch and peyote stitch create structurally sound panels, open square-stitch net produces structurally fragile panels in which only alternating pairs of beads in a row are securely connected to the whole; the missing connections create negative spaces, slightly increasing diaphaneity to an estimated 15%. We observed the same structural fragility in the lateral-ladder plait described earlier (Figures 15 and 16), which used three beads per segment instead of two. Thus, it is conceivable that the open-square stitch net is somehow related to the lateral-ladder plait. Alternatively, open-square stitch may embody an attempt to reverse-engineer closed-square stitch or peyote stitch. That the handful of documented pieces of open-square-stitch net portray processional or other pictorial motifs worked at the relatively fast rate of two beads per stitch, often on a clear ground, points to a common geographic source, possibly Penang (Cheah 2016: pers. comm.).

A third anomaly lies in a long rectangular panel which may have been worked as a net or a plait, or both (Figures 33-34). The upper register is worked in a *simple open-triangle* technique recalling the sawtooth patterns on woven, printed, or beaded Indonesian textiles (Figure 6,b) (Gittinger 1979: Figure 14; Maxwell 1990: Figures 257-258, 267) and on mainland Chinese beadwork purses dating to ca. 1900 (pers. obs.). Connections are made through beads. The row of simple triangles gives way to a compound technique in the second register, also forming connections with beads, which conjoins horizontal arcs similar to those in European beadwork of the 19th and early 20th centuries (Pazaurek 1911: Figures 62, 67) with small, more or less ogival medallions consisting largely of seven four-bead cells evoking stylized flowers or *fleurs-de-lis* (Figure 35). An acceptable name for this second technique might be

Figure 29. Stylistically unusual, pictorial beadwork panel featuring two netted registers and single-strand beaded tassels. Probably Peranakan or other Chinese peoples, Kalimantan or Sumatra, late 19th or early 20th century, 56 x 181 cm (photo: Edmond Lee; courtesy of Ken Yap).

double arc/fleur-de-lis medallion. Approximately 70% open, this example achieves the highest diaphaneity of any documented piece of Peranakan Chinese beadwork.

If visual parallels for this technique exist, they are probably best sought in examples of European crochet, lace, or beadwork. Peranakan beaders may have learned European beading and needleworking techniques in schools run by Europeans or others (Cheah 2010:127); seen them in ladies' magazines such as *The Queen* (Cheah 2010:126, 260); or browsed catalogues devoted to the objects that could be produced with European glass beads, such as one published by Jablonex, the Czechoslovakian glass beadmaking concern (Chin 1991:35). Pieces of European beadwork may also have been seen on foreign women; a photo taken on April 22, 1854 (Chin 1991:90) shows a European (?) woman wearing a delicate, multi-strand, seed pearl choker of unknown origin.[16] The elaborate beaded edging on certain pieces of Peranakan beadwork was almost certainly influenced by techniques for making (non-beaded) European picot lace (Cheah 2010:178, n. 61, citing Crabtree and Stallebrass 2002:135 [lower left]).

Figure 30. Detail of the upper register of the panel in Figure 29 which is worked in a two-bead version of the closed-diamond net colloquially known as "peyote stitch" (photo: Edmond Lee).

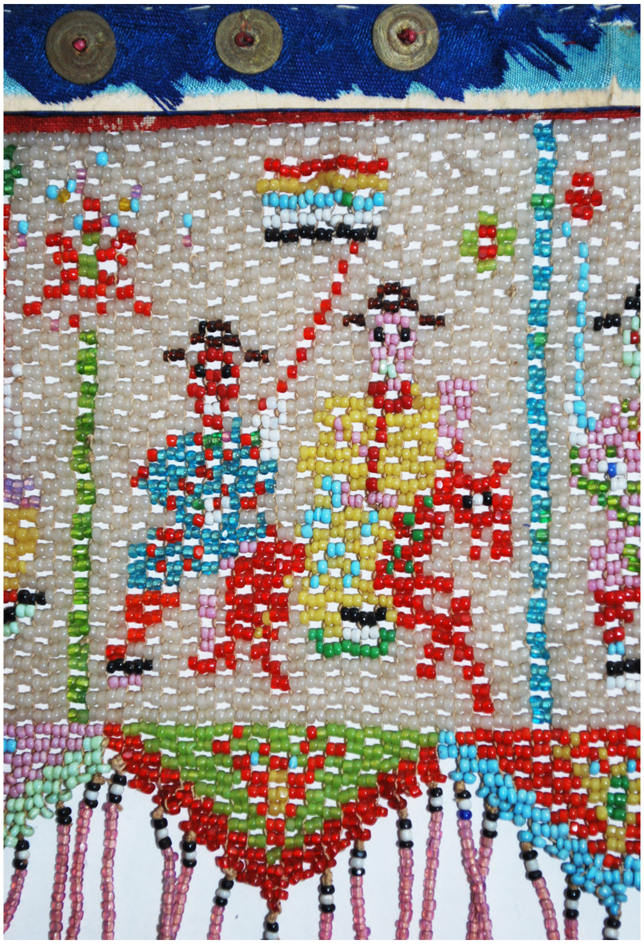

Figure 31. Detail of an embroidered and beaded bed curtain tie with fringe made of open square-stitch net. Probably Peranakan Chinese, early 20th century (photo: Valerie Hector; private collection).

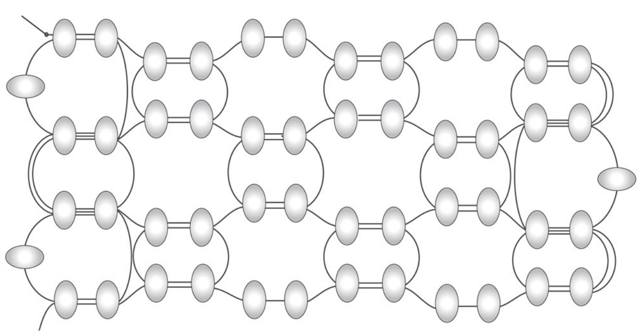

Figure 32. Diagram of the open square-stitch netting technique used to construct the beaded fringe in Figure 31.

Figure 33. Section of a highly diaphanous rectangular panel. Probably Peranakan Chinese, 20th century (photo: Hwei-F'en Cheah; courtesy of Imelda, Minang Art Shop, Bukittinggi, Padang Highlands, Sumatra).

Figure 34. Detail of the construction of a fleur-de-lis in Figure 33 (photo: Hwei-F'en Cheah).

CONCLUSIONS

Most Peranakan Chinese bead netters and plaiters seem to have favored open-diamond nets and plaits, techniques whose distribution, as we noted, is global in scope. In the published literature on Peranakan beadwork, pieces featuring open-diamond nets or plaits vastly outnumber

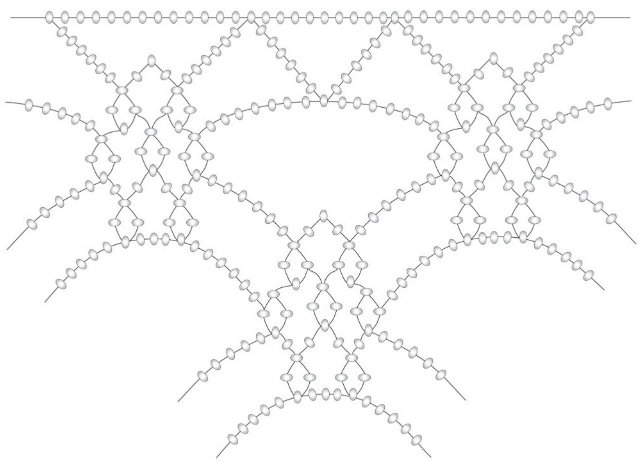

Figure 35. Diagram of the simple open-triangle/compound double-arc and fleur-de-lis medallion net or plait in Figure 33.

those featuring the other netting or plaiting techniques discussed herein. Yet, an unknown number of Peranakan Chinese beaders made the effort to innovate. Strategies for innovation ranged from replacing the horizontal anchoring thread commonly used to begin a multiple-thread plait with a row of decorative scallops; conjoining dissimilar cell shapes, abstracted from simpler techniques; or transposing into beadwork approaches common to crochet, macramé, or lace-making. Motifs, or imported pieces of beadwork, may also have inspired new techniques, requiring, for a start, a rethinking of how connections could be formed, threads structured, or cells conjoined or reduplicated. Finally, we may speculate that some techniques may have originated in an attempt to reproduce an unfamiliar technique or increase diaphaneity.

Achieving appreciable diaphaneity was important to many innovative Peranakan beaders. Although the preference for relatively open bead nets and plaits may have stemmed from a pragmatic concern such as reducing the number of beads consumed (Hwei-F'en Cheah 2016: pers. comm.), in most cases, aesthetic concerns may have taken precedence, such as a desire for contrast and openness. Appreciably diaphanous nets and plaits breathed new life, as it were, into traditional beading methods, "injecting some variety into an otherwise well-worn repertoire" (Cheah 2004:76). Most of the innovations discussed herein exhibit diaphaneities greater than the 25% characteristic of open-diamond nets and plaits with eight beads per cell. Innovators also cultivated structural hybridity, often favoring compound cell blends, dual-thread structures, or both.

Who engineered the innovations and how? Should they be credited to intellectually curious Nyonyas, eager to demonstrate virtuosity, reject familial constraints, or explore new aesthetic options – or to beaders working in a commercial capacity, hoping to enhance reputations or satisfy existing clients? Was innovation a solitary process or were close associates or clients involved in an "extensive exchange, involving successive steps of elaboration and reformulation of intentions in response to semantic, iconographic, or ideological concerns" (Kesner 2008:40)? We may never know for certain. Nonetheless, with every new technique they invented, Peranakan beaders expanded their aesthetic options while accruing the expertise to invent again. Innovations may have begun in the mind (or, for all we know, on paper), but ideas gained material form in the real world during a labor-intensive, experimental, and improvisatory process that unfolded in a "field of forces set up through the active and sensuous engagement of practitioner and material. This field is neither internal to the material nor external to the practitioner…; rather, it cuts across the emergent interface between them" (Ingold 2011:342). The more complex innovations almost certainly required multiple revisions. In some cases, end results may have been far more appealing than initial drafts.

What of the global techniques, the open-diamond nets and plaits, favored by the majority of Peranakan beaders? Was knowledge of them a prerequisite for innovation? Were they, along with bead embroidery techniques, associated with the received wisdom of previous generations: *alus* methods, linked to culturally prescribed rules of behavior? The perceived imprimatur of tradition, and the relative ease with which simple open-diamond nets and plaits could be worked, might help account for their prevalence in Peranakan Chinese beadwork.

The contexts in which innovative techniques occur spark further insights. Often, the innovative techniques discussed here appear in auxiliary registers, usually as edgings or fringe, situated below focal registers composed of open-diamond nets or plaits or bead embroideries. Further, with the exception of open square-stitch net, innovative techniques were seldom used to depict the pictorial scenes so common in open-diamond techniques. Innovative techniques kept to their place, as it were. Co-occurrences of this nature call to mind a tendency noted by scholars of Peranakan culture – innovations tend to present themselves in the context of tradition (Cheah 2010:251 ff.; Eng-Lee 1989:19, 34; Lee 2014:250). Inventing new techniques may have allowed Peranakan beaders of any affiliation to express "a modernized Chinese identity" or aesthetic (Cheah 2010:132) or thrive in a competitive marketplace. Juxtaposing new and traditional techniques in a single piece may have allowed Peranakan beaders to honor the past or reconnect to their roots. In such temporal hybrids, innovation, far from threatening tradition, complements it.

Situating multiple techniques in different registers of a single piece also allowed Peranakan beaders to accelerate the piece's visual and tactile interest, creating "a visual allusion to luxury" (Cheah 2010:241) while calling attention to their own technical mastery or fluency in multiple modes of needlework. In some pieces, up to five bead-netting, plaiting, wirework, or embroidery techniques are harmoniously blended. The visual hybridity of Peranakan beadwork richly expresses the overall hybridity of Peranakan culture.

In conclusion, bead-netting and plaiting techniques link places, peoples, and cultures, while attesting to values, resources, affinities, and aspirations. Meanings reside in the type, origin, and rendering of a technique, the context in which it was worked, and its juxtaposition to other techniques in a single piece. Future researchers might use comparative-technique analysis to determine, for example, whether the beaded portions of valances attributed to Perak or Kedah states in peninsular Malaysia (Cheah 2010: Figure 31, 2014) were made by Peranakan Chinese, non-Peranakan Chinese, Malay, or other beaders, singly or in combination. Compiling distributions of innovative techniques might even allow us to define regional or local styles. Further surprises are surely in store, for Peranakan beaders were endlessly imaginative and supremely resourceful.

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ENDNOTES

1. I am paraphrasing Timothy Ingold (2010:92), whose morphogenetic theory of making eschews the Aristotelian model of imposing form on matter, emphasizing process over product and "flows and transformations of materials as against states of matter." His ideas are especially helpful for understanding how new beading techniques get invented.

2. The distinctions are implicit in Lemaire (1960): compare Figures 12-14, 17-18, and 25, which depict nets, to Figures 9-11 and 15, which depict plaits; Orchard (1975): compare Figures 114, 116-117, 119, and 121, which depict nets, and Figures 118, 123-125, which depict plaits; and Seiler-Baldinger (1994): compare Figures 203-206, 220,a, 221, which depict nets, and Figures 220,b, 222,a-b, which depict plaits.

3. The definitions of "net" and "plait" I present do not correspond to the definitions provided by Irene Emery. Writing exclusively about non-beaded textiles, she suggests that the term "netting" be used to describe "open-meshed structures that are knotted" (Emery 1966:46). I use "netting" to refer to open- or closed-meshed beaded structures, knotted or unknotted, which are worked with a single thread. Emery (1966:61) seems to define "plaiting" as "one-set-of-element structures in which the elements *interlink* with adjacent ones." I use "plaiting" to refer to open- or closed-mesh beaded structures that are worked with a single set of threads connected either by interlinking or interlacing via beads, threads, or a combination of both. Additional distinctions within and between the categories of bead netting and bead plaiting will need to be articulated by future researchers. For rare examples of "plait" correctly used to describe a type of Indonesian beadwork, *see* Wassing-Visser (1982:32) and Wentholt (2013).

4. Four beadwork diagrams are shown in Ho (1987:56), which may represent nets or single-thread plaits. The top diagram appears to represent an open-diamond net or plait. The others do not look familiar to me, but Ho may have studied different examples of Peranakan beadwork. Alternatively, he might have appropriated diagrams from one or more of the many instructional beadwork books popular in the 1970s and 1980s, such as Weber and Duncan (1971), for Ho "knowingly included 'fiction and conjectures'" in his publications (Cheah 2010:xi).

5. My identification of peyote stitch as a closed-diamond net is at odds with descriptions common in the popular beadwork literature, where the bead patterns formed by peyote stitch are likened to bricks in a wall, not to closed diamonds. For scholarly purposes, however, I believe peyote stitch, a net (*see* Figure 1), is best

understood as the closed-mesh counterpart of the open-diamond net in Figure 2.

6. I have personally studied the pieces shown in Figures 15-16, 21, 27, 30, and 38. My analyses of the pieces in Figures 14, 18-20, 24, 26, 28, 31, 33, 36-37, 40, and 42 are based solely upon photos and must be considered provisional.

7. "Transparency," a synonym for "diaphaneity," is a term already used by bead and beadwork analysts to describe the light-transmitting qualities of glass beads; for that reason, I use "diaphaneity." "Mesh" and "diaphaneity" are closely related terms, involving the ratio of beads to negative spaces. While the "mesh" of a bead net or plait connotes its degree of openness, "diaphaneity" connotes its transparency, meaning to what extent one can look through the net or plait to vistas beyond.

8. As far as I know, this observation has not been made before; little or no research has been done on this topic. I base my comments upon several decades of studying beadwork from around the world, in person and in publications, and producing numerous pieces of beadwork myself in a wide variety of techniques. As a practitioner and researcher, I am able to ground my discussion in a "context of practical activity" (Ingold 2013:9), the better to try and "close the gap between practice and… theory" (Ingold 2013:14), much as Barber (1991, 1995) has tried to do. It is probably no accident that the bead-netting and plaiting techniques that seem to be the oldest are also among the simplest and the most widespread. Both diffusion and independent invention probably help explain the global or near-global distributions of these techniques.

9. In mainland Southeast Asia, on the other hand, diamond-patterned bead nets and plaits are far less common, occasionally turning up among the Naga peoples of northeast India or Assam (Jacobs 1990:307, left top and bottom); the Leytu Chin peoples of Burma (James Barker 2015: pers. comm.); the Co Ho (Chil) people of central Vietnam (Richter 2000: Figure 131); and a few others.

10. I include in this tally only examples with diamond patterns that are clearly visible. My count may be skewed slightly by the small number of redundancies between the three volumes cited. Further research is needed to rule out the admittedly unlikely possibility that scholarly bias favored open-diamond-patterned pieces of beadwork.

11. It is impossible to say whether the *ba xian* headdress in the 1724 engraving was made by Peranakan or other Chinese in island Southeast Asia or imported from China, where such headdresses were common (Garrett 2007: Figures 233, 236). Another Peranakan *ba xian* headdress made ca. 1900 closely maintains the form of its 18th-century predecessor, but includes tassels made of a single-thread plait that aligns beads at 180° angles (Chin 1991:151), a technique rarely used by Peranakan Chinese beaders.

12. Peter Lee (2014:150, 2015: pers. comm.) identifies the cloth used to make the *baju panjang* garments as "European cotton printed organdie, which in Baba Malay parlance, was referred to as 'kasa gelair'." How European textile designers came to use such pearl-lattice designs remains to be determined.

13. To estimate diaphaneities, high-resolution digital images were first edited using Adobe Photoshop's selection tool to separate out the background from the beadwork details. The images were then converted to black and white to distinguish the background from the subject matter. The percentage of background was determined with the histogram tool: first the background was selected and the number of pixels noted, then the entire image was selected and the number of pixels noted. The number of background pixels was then divided by the total number of pixels to determine the percentage of open to closed spaces (Carrie Iverson 2016: pers. comm.). When image resolution was poor, beads highly reflective or backgrounds too close in color to foregrounds, I estimated diaphaneity without the aid of computer analysis.

14. To be fair, Khoo (1996:199) also associates the "threaded" (in our terms, "netted" or "plaited") beadwork made in Penang with the threaded beading techniques used in "ancient Southeast Asian cultures," though she does not go into detail.

15. Simple-hexagonal bead plaits can be seen as variations of simple-diamond bead plaits, with elongated east and west sides. The same cannot be said of hexagonal and diamond nets, which are typically formed using very different techniques.

16. One wonders how many European beaded purses were circulating in island Southeast Asia in the late 19th-early 20th centuries. It is important to remember, however, that many European beaded purses were made with closed-mesh techniques rarely used by Peranakan Chinese beaders, especially knitting and crochet.

REFERENCES CITED

Adovasio, Jame, Olga Soffer, and Jake Page
2007 *The Invisible Sex: Uncovering the True Roles of Women in Prehistory*. Left Coast Press, Walnut Creek, CA.

Barber, Elizabeth J. Wayland
1991 *Prehistoric Textiles: The Development of Cloth in the Neolithic and Bronze Ages with Special Reference to the Aegean*. Princeton University Press, Princeton.
1995 *Women's Work: The First 20,000 Years – Women, Cloth and Society in Early Times*. W.W. Norton, New York.

Barnes, Ruth and Mary Hunt Kahlenberg (eds.)
2010 *Five Centuries of Indonesian Textiles: The Mary Hunt Kahlenberg Collection*. Prestel, Munich.

Brinkgreve, Francine and Retno Sulistianingsih (eds.)
2009 *Sumatra: Crossroads of Cultures*. KITLV Press, Leiden.

Cheah, Hwei-F'en
2004 Beads in Time: Towards a Chronology of Nonya Beadwork. *Arts of Asia* 34 (July-August):65-77.
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.
2016 *Nyonya Needlework*. Asian Civilisations Museum, Singapore. In press.

Chen, Lydia, Linda Wu, and Yao Meng-Chia
1997 *Chinese Knotting*. Echo Publishing Company, Taipei.

Chin, Edmond
1991 *Gilding the Phoenix: The Straits Chinese and Their Jewellery*. The National Museum, Singapore.

Crabtree, Caroline and Pamela Stallebrass
2002 *Beadwork: A World Guide*. Rizzoli International Publications, New York.

Emery, Irene
1966 *The Primary Structures of Fabrics: An Illustrated Classification*. The Textile Museum, Washington.

Eng-Lee Seok Chee
1987 The Straits Chinese Bridal Chamber. *Arts of Asia* 17(3):108-114.
1989 *Festive Expressions: Nonya Beadwork and Embroidery*. The National Museum, Singapore.

Fisher, Gwen L. and Robert Mellor
2010 Using Tiling Theory to Generate Angle Weaves for Beadwork. *Journal of Mathematics and the Arts* 6:141-158.

Francis, Peter, Jr.
1986 Chinese Glass Beads: A Review of the Evidence. *Occasional Papers for 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.

Gao Chunming
2001 *Zhongguo fu shi ming wu kao* (Research in Ancient Chinese Costume and Adornment). Shanghai Wenhua Chubanshe (Shanghai Cultural Publishing Co.), Shanghai.

Garrett, Valery M.
1994 *Chinese Clothing: An Illustrated Guide*. Oxford University Press, Hong Kong.
2007 *Chinese Dress from the Qing Dynasty to the Present*. Tuttle Publishing, Rutledge, VT.

Gittinger, Mattiebelle
1979 *Splendid Symbols: Textiles and Tradition in Indonesia*. The Textile Museum, Washington.

Hector, Valerie
1995 Prosperity, Reverence and Protection: An Introduction to Asian Beadwork. *Beads: Journal of the Society of Bead Researchers* 7:3-36.
2005 *The Art of Beadwork: Historic Inspiration, Contemporary Design*. Watson-Guptill, New York.
2013 Chinese Bead Curtains, Past and Present. *Beads: Journal of the Society of Bead Researchers* 25:40-71.

Heidhues, Mary Somers
2003 *Golddiggers, Farmers, and Traders in the "Chinese Districts" of West Kalimantan, Indonesia*. Cornell Southeast Asia Program Publications, Ithaca, NY.

Ho Wing Meng
1987 *Straits Chinese Beadwork and Embroidery: A Collector's Guide*. Times Books International, Singapore.

Holm, Edith
1984 *Glasperlen: Mythos, Schmuck and Spielereien aus fünf Jahrtuasenden*. Callwey, Munich.

Ingold, Tim
2010 The Textility of Making. *Cambridge Journal of Economics* 34:91-102.

2011 On Weaving a Basket. In *The Perception of the Environment: Studies on Livelihood, Dwelling and Skill*, edited by Tim Ingold, pp. 337-348. Routledge, London.

2013 *Making: Anthropology, Archaeology, Art and Architecture*. Routledge, London.

Jacobs, Julian

1990 *The Nagas: Hill Peoples of Northeast India: Society, Culture and the Colonial Encounter*. Thames and Hudson, New York.

Kahlenberg, Mary Hunt, Valérie Bérinstain, Claudine Delecourt, and Frieda Sorber

2001 *Asian Costumes and Textiles from the Bosphorus to Fujiyama: The Zaira and Marcel Mis Collection*. Skira Editore, Milan.

Kesner, Lasilav

2008 Creative Personality and the Creative Act in the Anonymous Art of China. *Cahier d'Extrême-Asie* 17:17-49.

Khoo Joo Ee

1996 *The Straits Chinese, A Cultural History*. Pepin Press, Amsterdam.

Kwa, David

2012 A Variety of Peranakan Clothing. In *Indonesian Chinese Peranakan: A Cultural Journey*, edited by Lily Wibisono et al., pp. 286-313. Indonesian Cross-Cultural Society and PT Intisari Mediatama, Kebon Jeruk, Jakarta.

Ledderose, Lothar

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

Lee, Peter

2014 *Sarong Kebaya: Peranakan Fashion in an Interconnected World 1500-1950*. Asian Civilizations Museum, Singapore.

Lemaire, M.L.J.

1960 Techniken bei der Herstellung von Perlenarbeiten. *Baessler-Archiv*, Neue Folge 8(1):215-233.

Li Yuhua, Chu Chia-chin, Chao Yu-Liang et al.

1992 *Jewelry and Accessories of the Royal Consorts of Ch'ing Dynasty Collected by the Palace Museum*. Forbidden City Publishing House, Beijing.

Lin Mingti (ed.)

1988 *Guangdong gongyi meishu shiliao* (History of Arts and Crafts in Guangdong Province). Guangdong Arts and Crafts Association, Guangzhou.

Loebèr, J.A., Jr.

1913 Het Schelpen- en Kralenwerk in Nederlandsch-Indië. *Bulletin van het Koloniaal Museum te Haarlem* 51. Amsterdam. Unpublished English translation by Dacia Christensen, 1996.

Lombard, Denys and Claudine Salmon

1993 Islam and Chineseness. *Archipel* 57:115-131.

Lü Zhangshen and Zhang Rungping

2007 *Zhongguo guo jia bo wu guan guan cang wen wu yan jiu cong shu. Yu qi juan* (Chinese Museum Collection Cultural Relic Studies Series. Jade Volume). Shanghai Guji Chubanshe (Antique Book Publishing House), Shanghai.

Maxwell, Robyn

1990 *Textiles of Southeast Asia: Tradition, Trade, Transformation*. Oxford University Press and the Australian National Gallery, Melbourne.

Munan, Heidi

2005 *Beads of Borneo*. Editions Didier Millet, Kuala Lumpur.

Nabholz-Kartaschoff, Mary-Louise

2010 Clothes for the Ancestors: On the Relationship Between Technique and Meaning of Balinese Ritual Textiles. In *Five Centuries of Indonesian Textiles*, edited by Ruth Barnes and Mary Hunt Kahlenberg, pp. 186-197. Prestel Publishing, New York.

National Palace Museum

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

Newman, Thelma R.

1977 *Contemporary Southeast Asian Arts and Crafts: Ethnic Craftsmen at Work, With How-to Instructions for Adapting Their Crafts*. Crown Publishers, New York.

O'Neill, John (ed.)

1999 *Egyptian Art in the Age of the Pyramids*. Metropolitan Museum of Art, New York.

Orchard, William C.

1975 *Beads and Beadwork of the American Indians*. 2nd edition. Museum of the American Indian, Heye Foundation, New York.

Pazaurek, Gustav E.

1911 *Glasperlen und Perlen-Arbeiten in Alter und Neuer Zeit*. Alexander Koch, Darmstadt.

Reid, Anthony
1996 Flows and Seepages in the Long-Term Chinese Interaction with Southeast Asia. In *Sojourners and Settlers: Histories of Southeast Asia and the Chinese*, edited by Anthony Reid and Kristine Alilunas Rodgers, pp. 15-49. University of Hawai'i Press, Honolulu.

Richter, Anne
2000 *The Jewelry of Southeast Asia*. Harry N. Abrams, New York.

Rowe, Anne Pollard
1984 After Emery: Further Considerations of Fabric Classification and Terminology. *Textile Museum Journal* 23:53-71.

Scarpari, Maurizio
2000 *Ancient China: Chinese Civilization from its Origins to the Tang Dynasty*. Barnes & Noble, New York.

Scott, Joyce J., George Ciscle, and Leslie King-Hammond
2000 *Joyce J. Scott Kickin' It with the Old Masters*. The Baltimore Museum of Art and Maryland Institute, College of Art, Baltimore.

Seiler-Baldinger, Annemarie
1994 *Textiles: A Classification of Techniques*. Smithsonian Institution Press, Washington.

Skinner, William G.
1996 Creolized Chinese Societies in Southeast Asia. In *Sojourners and Settlers: Histories of Southeast Asia and the Chinese*, edited by Anthony Reid and Kristine Alilunas Rodgers, pp. 51-93. University of Hawai'i Press, Honolulu.

Szeto, Naomi Yin-yin
1992 *Dress in Hong Kong: A Century of Change and Customs*. Hong Kong Museum of History, Hong Kong.

Tan Chee-Beng
1999 Socio-Cultural Diversities and Identities. In *The Chinese in Malaysia*, edited by Kam Hing Lee and Tan Chee-Beng, pp. 37-70. Oxford University Press, New York.

Tillema, H.F.
1989 *A Journey Among the Peoples of Central Borneo in Word and Picture*. Edited and with an introduction by Victor T. King. Oxford University Press, New York.

Wang, Eugene
2005 *Shaping the Lotus Sutra: Buddhist Visual Culture in Medieval China*. University of Washington Press, Seattle.

Wassing-Visser, Rita
1982 *Weefsels en Adatkostuumes uit Indonesië*. Volkenkundig Museum Nusantara, Delft.

Weber, Betty J. and Anne Duncan
1971 *Simply Beads: An Introduction to the Art of Beading from North and Central America, Africa, and the Middle East*. Western Trimming Corporation, Culver City, CA.

Wentholt, Arnold
2013 Toraja Bead *Kandaure*. In *Living with Indonesian Art: The Frits Liefkes Collection*, edited by Francine Brinkgreve and David J. Stuart-Fox, pp. 259-260. KIT Press, Amsterdam.

Westerkamp, Pim
2002 Beadwork in Central Kalimantan: An Introduction to the Colors and Motifs Used by the Dayak. In *Ethnic Jewellery from Africa, Asia and the Pacific Islands: The René van der Star Collection*, edited by Michiel Elsevier Stokman, René van der Star, et al., pp. 215-244. Pepin Press, Amsterdam.

Yang Boda and Mayching Kao
1987 *Tributes from Guangdong to the Qing Court*. The Chinese University of Hong Kong Art Gallery, Hong Kong.

Xu Qixian (ed.)
2004 *Treasures of Imperial Court. Complete Collection of Treasures of the Palace Museum* 57. Palace Museum, Hong Kong.

Zhou Diren, Zhou Yang, and Yang Ming
1992 *Jiangxi De'An Nansong Zhoushi mu qingli jianbao* (Brief Report on the Excavation of the Zhou Tomb of Southern Song Dynasty in De'An County). Jiangxi renmin chubanshe (Jiangxi People's Publishing House), Nanchang.

Valerie Hector
Independent Researcher
Wilmette, IL
valeriehector@sbcglobal.net

BOOK REVIEWS

Contact in the 16th Century: Networks Among Fishers, Foragers and Farmers.

> **Brad Loewen and Claude Chapdelaine (eds.).** Mercury Series Archaeology Paper 176. University of Ottawa Press, Ottawa, Ontario, Canada. 2016. 296 pp., 98 figs., index. Paper ISBN: 978-0-7766-2360-3; PDF ISBN: 978-0-7766-2361-0. CAN $69.95 (paper); CAN $54.99 (PDF eBook).

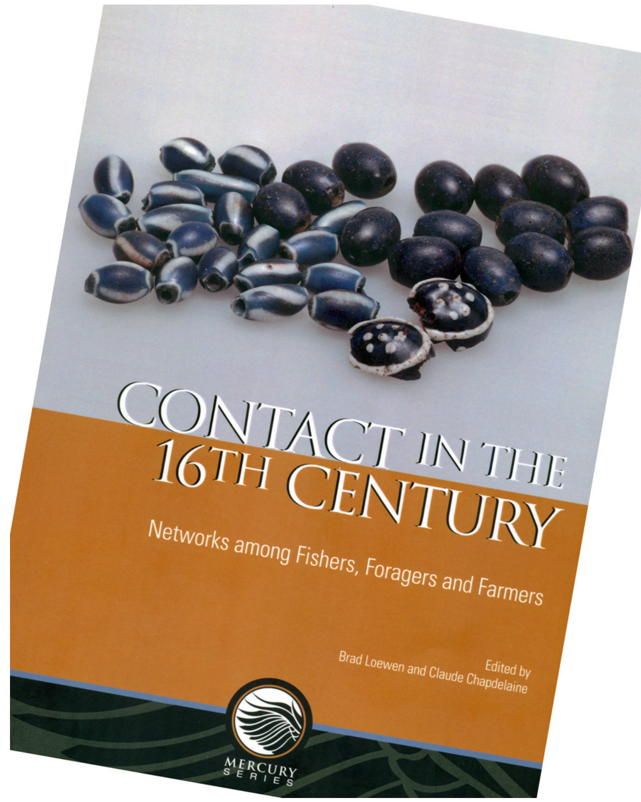
The editors have assembled a superb collection of 12 papers detailing what is known of 16th-century European-Native American/First Nations contact. The book is divided into three geographic regions: The Gulf of Saint Lawrence, The Fluvial Networks, and The Lower Great Lakes. The goal is to see how interaction played out between Europeans and native fishers, foragers, and farmers in these regions. The title is a little misleading as many of the authors also consider contact in the 17th and even early 18th centuries, but these inclusions only enhance the value of the volume.

Readers of *Beads* will not be surprised to find that much of the evidence for contact is in the form of glass beads. While other categories of European artifacts are also covered (especially iron tools and copper and brass objects), this review will focus on the beads.

Seven of the 12 papers deal specifically with glass beads, which are illustrated in 22 high-quality color plates. Other chapters focus on history instead of archaeological remains, European ceramics, and native artifacts.

The first chapter, by Lisa Rankin and Amanda Crompton, covers contact between Inuit and Europeans in Southern Labrador. Sixteenth-century sites contain primarily iron goods (often nails). It is not until the early 17th century that glass beads are documented at Inuit sites in the area (2 beads from the Huntingdon Island 5 site, House 2). One bead is a faceted charlotte, a type known from Spanish contact sites in the Southeast (e.g., St. Catherines Island, Georgia) and other areas, while the other is a common turquoise blue bead. House 5 contained 18th-century trade goods. House 1 at the Pigeon Cove site dates to the early to mid-18th century and includes a raspberry bead (not a "melon" as identified by the authors).

Vincent Delmas focuses on tracing 16th-century beads around the Gulf and into the Saint Lawrence Valley. He



presents the bead data for the important Red Bay site. Red Bay clearly has some 16th-century beads, but I believe that Delmas goes to great lengths to force some later beads into the 16th century. In his discussion of the Petit Mecatina site, he specifies 45 beads that may date to the 16th century. The most diagnostic of these, several gooseberry beads, are not illustrated. The other potential 16th-century beads are primarily monochrome beads. Delmas relies on a bead chronology developed by Keith Little. Dr. Little believed that a series of archaeological sites in Alabama could be connected with the Tristan de Luna expedition of 1559-1561. Subsequent and ongoing excavations by John Worth at the Luna landing site in Pensacola, Florida, show that Luna was not trading the heat-rounded beads thought by Little to date to the 1560s. It is now apparent that the Little chronology needs revision. I would have no trouble assigning all of the beads illustrated in Delmas' figure 4.5 to the 18th century. I believe it would help several of the authors of this volume to consult more 18th-century monographs, beginning with Jeffrey Brain's *Tunica Treasure*. On the other hand, the sections on Beads from Native Burial Sites in Acadia and Sixteenth-Century Beads from the Saint Lawrence Valley are very valuable contributions. But perhaps the most important contribution of this chapter is the analysis of beads from the 1583 Venetian shipwreck at Gnalic, Croatia (a detailed table and one color plate). This sample of beads will be an important touchstone for constructing bead chronologies.

Michel Plourde looks at archaeological sites in the Saint Lawrence Estuary between 1500 and 1650. In this chapter, he analyzes and illustrates beads from the important Tadoussac site, dating them to the late 16th and early 17th centuries. He also includes small collections from other sites in the region. Plourde finds it difficult to find many 16th-century beads in the region. He concludes that the small number of 16th-century beads indicates that contacts between Basques and seal hunters were "casual."

Claude Chapdelaine reviews evidence of contact in the Middle and Upper Saint Lawrence Valley. He notes that archaeological data from this region are extremely limited, but does illustrate and analyze eight beads from the Royarnois site. Working with Loewen, and again relying on the outdated Little chronology for Spanish beads in the southeastern United States, they assign the beads to the 16th century. I would suggest that they consult 18th-century site reports. Aside from this site, other 16th-century sites in the region produce few, if any, trade goods. The author concludes, "Of the seven villages assigned to the sixteenth century in our study area, not a single one has convincing evidence of trade with Europeans or of receiving gifts from other tribes" (p. 163).

Using both historical and archaeological evidence, Moreau, Guindon, and Langevin provide a convincing argument for a northern route between the Saguenay and Georgian Bay. The beads assigned to the 16th century from the Chicoutimi and Berube sites provide convincing assemblages, including blue beads with white stripes, faceted chevrons, oval gooseberries, and faceted garnet beads.

Martin Cooper looks at 16th-century Neutral exchange. The Neutral were a confederacy made up of several tribes, and Cooper suggests that trade should be studied at least on the tribal level, not the confederacy level. Cooper further notes that trade routes were often controlled by families or even individuals. Although some iron and European copper show up in the first half of the 16th century, it is not until the late16th century that European goods show up in quantity. Nueva Cadiz and chevron beads occur on multiple sites in the area, and Cooper explores the idea presented by David Pendergast that early European materials arrived via a southerly route from the Susquehannocks along with mid-Atlantic marine shell instead of up the St. Lawrence Valley. Late 16th-century sites produce the distinctive frit-cored beads and Basque kettles suggesting trade up the St. Lawrence at this time. European objects are rare in villages, but much more common in graves. Cooper concludes that European objects were obtained through Native middlemen.

The final chapter in the volume, Sixteenth Century Beads: New Data, New Directions, by Brad Loewen, combines the bead data from the other chapters. The author notes that the present volume greatly increases our knowledge of 16th-century beads, yielding a sample of 742 "probable or possible" examples. Again, I would suggest caution on many of the "possible" beads. Loewen identifies two supply networks: "one based in northern France and aimed at Acadia and the Tadoussac region beginning in 1559, the other based in the Basque Country of France and aimed at Tadoussac only between 1581 and 1599." Loewen tackles the difficult problem of "Spanish" beads in the northeast, providing an updated list of sites producing such types as Nueva Cadiz beads. His analysis suggests that there may have been two or more avenues of introduction of these types.

Several authors describe faceted chevron beads with four layers. I would note that such beads are not found on Spanish contact sites in the southeastern United States. Perhaps these are French products?

It is exciting to see some of the authors increasingly relying on the chemical analysis of beads. Some of the authors (Delmas and Plourde, for example) look at the ratio of blue to white beads in collections as a possible chronological indicator. While this is an interesting approach, I am sure that all of the authors are aware of the potential problems with small sample sizes, tribal color preferences, etc. I would advocate the use of more chronologically diagnostic "index fossil" bead types when possible, but unfortunately such beads are often lacking on these very early contact sites. As archaeologists, we are forced to use whatever data and types of analysis we can.

This is a beautifully produced volume with excellent color plates of the artifacts, color maps, and no production problems that I found. It is highly recommended for the specialist, but its technical nature and high price might make it less appealing to people with a more general interest in glass beads.

Marvin T. Smith
Professor of Anthropology (retired)
Valdosta State University
Valdosta, GA
mtsmith@valdosta.edu

Flower Forever: Bead Craft from France and Venice.

Ragnar Levi. Bokförlaget Langenskiöld, Köpmangatan 9, SE-111 31, Stockholm, Sweden. 2015. 180 pp., 152 color figs., 10 B&W figs. ISBN 978-9-187-00788-0. $40.00 (hard cover).

References on flower beading tend to come in waves, from *Godey's Lady's Book* in the mid-1800s, through the lady hobbyist era of the late 1960s and 70s, to the Japanese hobbyists and publications catering to them in the mid-1990s. The common thread through the majority of these was a plethora of how-to instructions for making beaded flowers and bouquets. What was barely touched upon, however, was the history, both of the flowers and the materials used to make them, which Ragnar Levi addresses in his new book, *Flower Forever: Bead Craft from France and Venice*.

Lavishly illustrated with photographs of current work and frequently charming historic images, Levi takes us through the history of beaded flowers in Europe, noting the making of them as a source of income for poor vineyard workers and others during the normally unproductive winter season. And while the earlier examples were largely pieces used in ecclesiastical settings, with less than perfect beads made up into both flowers and bouquets and carried into churches by altar and choir boys during processionals at Easter and Christmas, other forms included "funeral crowns," known as *Totenkronen* in German, and employed in central Europe upon the death of a young or unmarried person in a tradition many hundreds of years old and widely practiced, regardless of Christian sect. Other forms included the funeral wreath, colorful and exuberant in France, generally more somber in *Mitteleuropa*. Over time, the beaded funeral wreath fell out of favor, as the tattiness of old, rusted ones created a messy appearance ill suited to a place of serene peace and as the creators of replacement pieces died off. Levi cites a pair of more recent memorial expressions commemorating two significant historical events of the early 21st century: the attacks of 9-11 and Japan's earthquake/tsunami in 2011. Japanese bead artist Minako Shimonagase gathered a hundred Japanese students to help create a traditional cherry tree in full blossom to commemorate the latter; the former was memorialized with the creation of funeral wreaths of handmade beaded flowers from around the world.

Flower Forever is a feast of discovery, both that of the writer and others who have collected these colorful expressions, but also a feast of details in looking deeper at what makes them what they are. The book begins with beaded flowers and their historical roots, covering both the aforementioned memorial and ecclesiastical pieces, and in England, christening baskets and wedding paraphernalia. In regard to the manufacture of beads themselves, Levi winds his way through Venice, France, Bohemia (later Czechoslovakia), and further in the book, references seed bead making in India, Egypt, and Asia in general. He acknowledges in detail the role that wars and depressions play in when and where beads were made, and cites the exportation of a Venetian factory setting to Rouen, France, in order to take fuller advantage of France's great demand for seed beads. In fact, enough mention is made of seed bead making in France that once again, I hunger to see in print *the* definitive work on beadmaking in France through the centuries, rather than just the scattershot of information we've had to date, interesting and informative though much of it is.

Some of his historical information, however, seems suspect. For instance, he credits Marco Polo with having brought glass beads to the attention of the Italians in the 13th century, a tale that Peter Francis, Jr., discounted in his 1979 book, *The Story of Venetian Beads*, noting the tale can be traced no farther back than 1811 to a Carlo Neijmann Rizzo, a "pseudo-historian who never allowed the lack of evidence to get in his way when constructing the history of Venetian glass."

On the plus side, extensive descriptions are given regarding both the process of beadmaking, with many Italian terms, and the environment in which they are made, as well as much discussion of how many workers there were, of what sexes, and what work they performed, giving a fuller picture of glass bead manufacturing than we ordinarily are privy to. There's much discussion about the nature of bead sizes and the colors and surface treatments used, sometimes in quite some detail. In terms of how the glass itself is made for use in beadmaking, one charming story relates the acquisition of the sand that forms such a large part of the glass body, from an interview with Bruna Costantini, who grew up literally surrounded by her family's seed bead factory: "When the wet sand came to the factory to be used in the glass production, it was full of fresh clams and other molluscs that were picked out and put aside to be eaten. 'The whole room smelled of the sea!' exclaims Costantini, with a sweep of her hand from her nose, in a gesture encompassing the room" (p. 145).

Much is told about the cottage industry work associated with beads and wreath production, with wreaths and associated parts being made in people's homes, and extensive coverage is given to *l'impiraressa*, the women in Venice who gathered in sunny alleyways to gossip and string the huge quantities of beaded hanks sold around the world. Making funeral wreaths became such a popular way to make money in France that well into the 20th century, women could be seen in working-class neighborhoods in the town of Chauny sitting outside their front doors threading beaded flowers for delivery to the factory. Those imprisoned were also significant practitioners of this art. The First World War created a tremendous demand for memorial wreaths and the need for workers was so great that over 40,000 people, including prisoners, were employed at this.

In the center of the book, a few pages describe technique, but they are really more oriented toward the *theory* of technique and what is most critical to know about how choices are made. Close ups illustrate various finishing details and discuss how the flower elements are made and why.

The book wraps up with a series of short interviews with people of interest to the author and to the reader of the book as well, including Evelyn Ulzen (Berlin, Germany) who, along with her husband, Jürgen, collected over 13,000 pieces of beadwork and made of their home a museum, including around 200 objects associated with funeral wreaths; the aforementioned Bruna Costantini (Venice, Italy); and several beaded flower creators. Tudy Sammartini spoke of her aunt Nella Sammartini Lopez y Royo (Venice, Italy), who revived the practice of beaded flower making in Venice in the 1980s and about whom she wrote a book.

I very much recommend *Flower Forever* both to lovers of beadwork and bead history and to those who find beaded flowers appealing. The pictures are pretty and detailed and the information is clear and understandable. The book is available from flowerforeverbook@gmail.com.

Alice Scherer, Founder
Center for the Study of Beadwork
Portland, OR
alice@europa.com

Beads from Germany: Idar-Oberstein, Lauscha, Neugablonz.

Floor Kaspers. Marblings Publishing, Amsterdam. 2016. 134 pp., 165 figs. ISBN: 9789491311031. $37.79 (soft cover); $51.79 (hard cover). Also available as a free download at http://beadmuseum.com/files/BeadsfromGermany.pdf.

In this book, Kaspers documents three German "bead towns:" Idar-Oberstein, Lauscha, and Neugablonz, exploring how each town became so focused on the production and/or distribution of beads made of agate or glass, and "what happens when the demand… slows down" (p. 7). The book is divided into six sections entitled "Introduction," "Idar-Obarstein," "Lauscha," "Neugablonz," "Conclusion," "Notes" and "Literature." Not content merely to quote previous publications, many of them in German or English, Kaspers travels to each of the three towns to explore museums and other sites and interview people formerly or currently involved in the bead trade. In the process, she elicits information that is unavailable to armchair bead historians.

For example, following in the footsteps of German bead researcher Jürgen Busch, she visits the ruins in Lauscha of the glassworking furnace constructed in 1897 by Günter Kühnert & Co., which was abandoned in 1990 after German reunification, following decades of making marbles, marble beads, and other glass products. Inside the remains of one building she finds old bags of soda, lime, and quartz as well as old molds. Nearby, she finds pieces of cane and malformed marbles, though no marble beads (pp. 86-91).

Striking images accompany the text, including archival photos of beadmakers or bead sellers at work. Other photos were apparently taken by Kaspers herself, including close-ups of beads, bead sample cards, and beadmakers in action, in addition to colorful glass rods leaning against the wall of a factory (front cover), a concrete sculpture of a glassblower

bending over his rod (p. 58), photos of street signs such as Perlengasse or "Bead Street" (p. 101), murals on the walls of an apartment building depicting beadmakers in action (p. 120), and details of factory interiors showing bead molds, bead cabinets, and various machines.

Save for the formatting issues that plague many self-published books, *Beads from Germany* would be an unqualified success. Had Kaspers hired an editor to proof her text, there would be no grammatically incorrect sentences, no misspelled words ("it's" instead of "its," again and again; "underminded" for "undermined;" "amethist" for "amethyst; and so on), no missing punctuations marks, and no missing captions for some of the photos.

The absence of a map showing the locations of Idar-Obarstein, Lauscha, and Neugablonz (not to mention the related location of Gablonz in the contemporary Czech Republic) is also unfortunate. I looked them up on the internet, discovering that Idar-Oberstein is in southwest Germany, Lauscha in east-central Germany, and Neugablonz in southern Germany.

Finally, Kaspers' formatting of the "Notes" and "Literature" sections at the end of the book is amateurish. The latter, divided into two unnecessary categories, "Magazines" and "Books," is sometimes difficult to decode. For example, under the subheading "Beads" in the "Magazines" category, she lists five articles, providing titles, years, and volume numbers without mentioning authors or page numbers. I finally concluded that Kaspers was referring to articles in *Beads: Journal of the Society of Bead Researchers*. Also under "Books," she includes an article published on a website, without mentioning the date on which she accessed the article.

Despite these drawbacks, Kaspers' blend of history and ethnography is engaging and informative. Given that beadmaking is in decline in many parts of Europe, eyewitness accounts are especially precious. *Beads from Germany* is the fourth in Kaspers' series of small, self-published books devoted to bead manufacture and trade. No doubt the other three are worth reading as well: *Beads from Briare: The Story of a Bead Revolution from France* (2011); *Beads from Tucson: Where the World Meets for Beads, Stones and Jewelry* (2012); and *Beads from Jablonec: A History in Beads* (2014). Kaspers generously offers free digital downloads of all the books, in addition to selling print and digital versions. May she publish many more such books in the future.

Valerie Hector
Independent Researcher
Chicago, IL
valeriehector@sbcglobal.net