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Guide to the Description and Classification of Glass Beads Found in the Americas

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GUIDE TO THE DESCRIPTION AND CLASSIFICATION OF GLASS BEADS FOUND IN THE AMERICAS[1]

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This guide provides information relevant to the description and classification of glass beads recovered from archaeological sites in North and South America and the Caribbean. It is partly based on and intended to be used with "A Classification System for Glass Beads for the Use of Field Archaeologists," by Kenneth and Martha Kidd. Material presented includes a critical evaluation of several bead classification schemes, an overview of bead manufacturing techniques, a descriptive listing of the various classes and types of beads that have been recorded to date, and an explication of the physical attributes of a bead, as well as interpretative material concerning dating and likely origins.

INTRODUCTION

Several systems have been proposed for the classification of glass beads over the years. Although the majority are elementary in nature and have limited application, four are noteworthy.

The first classificatory scheme for beads was published in 1928 by Horace C. Beck. Comprehensive though it was, his "Classification and Nomenclature of Beads and Pendants" was aimed primarily at Old World researchers and never achieved popularity in North America. Nevertheless, Beck's work remains a valuable research tool especially as concerns bead shape and is a classic in its own right.

Little progress was made during the next two decades. Then, in the 1950s, Kenneth E. Kidd formulated a scheme which, with modifications and the collaboration of his wife Martha, was published in 1970 as "A Classification System for Glass Beads for the Use of Field Archaeologists." Utilizing primarily the process of manufacture to sort beads and secondarily the physical attributes, the system is most notable for its extensive color plates illustrating each recorded bead variety. Also noteworthy is the extremely well-developed typological flow chart for drawn beads (Kidd and Kidd 1970:51). Unfortunately, the wound-bead chart (Kidd and Kidd 1970:52) is woefully inadequate, and wound-on-drawn, mold-pressed, blown, and Prosser-molded beads are not dealt with at all. Furthermore, many of the bead classes and some of the terms are not adequately defined, making the system difficult to use at times. Another drawback centers on the fact that the system, developed using beads derived from early historical period sites in the Northeast, has been found to be of little utility by several researchers in the Pacific Northwest who dealt with beads of a later period (Ross 1976:671-673; Sprague 1971:128-129). In its favor is the fact that it is an open-ended system so that new categories, classes, types, and varieties can be added as required.

In the same year that the previous report was published, Lyle M. Stone completed his treatise on Fort Michilimackinac. Published four years later, it contains a substantial section on beads wherein the primary sorting is based on function as revealed by relative size (Stone 1974). The two pertinent functional categories (necklace beads and seed beads) are each further subdivided into Class (method of manufacture), Series (structure or form), Type (shape), and Variety (color and diaphaneity). All of the varieties are illustrated in color photographs.

A drawback to Stone's approach is that relative size and function do not always equate; "large" beads were not used just for necklaces while "seed" beads sometimes were. There is also the problematic "medium" size group which overlaps both categories. Furthermore, having the method of manufacturing as a secondary trait is awkward as it is considered the primary classification trait for glass beads (Sprague 1985:87). Like the Kidd system, this one only deals with drawn and wound beads and has not found broad acceptance.

The final classification system to be dealt with herein appeared in 1976. In that year, Lester A. Ross completed his monograph "Fort Vancouver, 1829-1860: A Historical Archeological Investigation of the Goods Imported and Manufactured by the Hudson's Bay Company" which contains a lengthy and well-illustrated section on glass beads. The system he used was refined and published in 1990 (Ross 1990). The specimens are classified using a typological scheme reminiscent of and apparently lightly influenced by that of Kenneth and Martha Kidd (1970). The Fort Vancouver typology, however, is much more comprehensive, covering all the major manufacturing types. While it is well thought out, the use of relatively complicated variety codes makes it difficult to work with and typographical errors could be a significant problem. Notwithstanding, Ross' scheme is a milestone for a part of the continent where the typical classification "system" had for so long consisted of a loosely ordered list of inadequately described bead types.

Although each of the foregoing systems has its drawbacks, the one that seems to offer the most potential and appears to have found the most universal acceptance is the one devised by Kenneth and Martha Kidd. Consequently, it has been chosen to form the basis for this guide. As it has long been out of print and not readily available to researchers, it has been published as a companion article.

The typology for drawn and wound beads that follows is a corrected and expanded version of that proposed by the Kidds. The other manufacturing types are classified using a similar coding system and attribute hierarchy, with the classes and types being defined on the basis of archaeological specimens and several 19th-century bead sample cards and books. Although every attempt has been made to make the typology as comprehensive as possible, it is inevitable that some categories will have been overlooked and new ones will be encountered as more bead assemblages are analyzed. Should you record a new class or type, please inform the author so that it can be added to the inventory. Although instructions for defining varieties are presented for each manufacturing type, no varieties are listed because they are far too numerous. Furthermore, the practicability of recording varieties in a comprehensive classification system becomes doubtful when one considers that well over 100,000 varieties of glass beads have been produced in the world to date (Liu 1975b:31).

If a new variety is encountered and thus lacks a Kidd variety number, it can be designated with an asterisk (*). To facilitate the discussion of such varieties in a report, a sequential letter may be appended to the appropriate Kidd type designation; e.g., Ia*(a).

GLASS BEAD CLASSIFICATION

The primary criterion for sorting glass beads into typological categories is the technique of manufacture. Six major types are pertinent to researchers in the Americas: drawn, wound, wound on drawn, mold pressed, blown, and Prosser molded.

Drawn Beads

Also called tube, cane, and hollow-cane beads, the appellation "drawn" is preferred because it refers to the production process rather than the form of the finished product. In the manufacture of drawn beads, a tube possibly up to 150 ft. in length was drawn out from a hollow globe of molten glass by two men (Carroll 1917:7, 2004:30). Depending on what stylistic variation was required, the gather may have been 1) composed of several differently colored layers; 2) supplied with rods or lumps of colored glass to create stripes; 3) marvered or thrust into a mold to create a specific shape; and/or 4) twisted during the drawing process to impart a spiral effect. Starting in 1917, monochrome tubes were also produced using an automated process developed by Edward Danner of the Libbey Glass Company wherein molten glass flowing over a metal mandrel was mechanically drawn out into a continuous tube (Douglas and Frank 1972:46-51; Ross 2005:43). Compressed air pumped from the end of the mandrel created the perforation. If the mandrel (which formed the perforation) was polyhedral, the perforation of the resultant tube was the same shape. This is the only characteristic that distinguishes "mandrel-drawn" beads from those produced using the older method.

When the tubes created by either process were sufficiently cool, they were broken into manageable lengths which were then sorted according to their diameter. If desired, enamel paint was sucked up into the tubes to color them internally. The tubes were subsequently chopped into bead lengths. In the early days this was accomplished by placing them on a sharp broad chisel set in a bench or block of wood and striking them with another similar blade. About 1822, a mechanical tube-cutting machine was developed which greatly increased the speed and efficiency of this task (Karklins and Adams 1990:72).

The resultant tube segments were either left unaltered, except for the possible grinding of facets, or their broken ends were heat rounded. Prior to 1817, this was accomplished by placing the segments (those generally under about 6 mm in diameter) in a copper pan with sand or ground charcoal (Karklins and Adams 1990:73) or a mixture of sand and ash (Karklins and Jordan 1990:6) and then heating the pan. The contents were continually stirred with a hoe-like tool until the tube segments became sufficiently rounded. A contemporary method for rounding larger beads involved the use of a spear-like tool (*a speo*) (Gasparetto 1958:186) or a large fork-like instrument with sturdy prongs protruding from a metal handle (Karklins 1993). The tube segments were slipped onto the prongs so that they did not touch and the tool was revolved in a furnace, rounding the segments.

A much more efficient process for rounding beads came into use in 1817. It involved mixing the rough beads with lime and charcoal to plug the holes and then placing them in a metal drum containing sand occasionally mixed with charcoal dust (Karklins and Adams 1990:72). The drum was then placed in a furnace at an angle and rotated at a slow speed, a technique commonly referred to as "tumbling." In this and the pan method, the heat and agitation rounded the broken ends while the various packing mixtures kept the beads from sticking together and prevented their perforations from collapsing as the glass became viscid. Depending on the temperature and the amount of time that the tube segments were heat treated, they might range from practically unaltered tube segments to practically globular.

After cooling, the beads were cleaned and then sized by passing them through a series of graduated screens. They were generally then polished and strung in bunches or packaged loose for the world market. During the 17th century, however, certain beads were subsequently turned over to lampworkers who reheated each of the beads and applied insets ("flush-eye" beads) or trailed decoration (e.g., "Roman" beads). Others were heated until soft and pressed with a tool to flatten them.

Drawn beads exhibit certain characteristics. They may consist of unaltered tube segments (generally known as "bugles") with uneven broken ends. Bubbles in the glass and striations on the surface, if present, are oriented parallel to the axis of the perforation. The perforation is usually parallel sided and has a smooth surface. Beads rounded using the *a speo* method sometimes exhibit a slight projection at one end or a scar where two beads had fused but were later broken apart. Two drawn beads fused end to end with their perforations perfectly aligned may also indicate spit rounding (Note: these features should not be confused with similar ones found on some wound beads; for a thorough discussion, *see* Karklins 1993).

For additional details regarding the manufacture of drawn beads, consult the following creditable accounts: Anonymous (1835), Carroll (1917, 2004), J.P.B. (1856), Karklins and Adams (1990), Karklins and Jordan (1990), and *The Pottery Gazette* (1987, 2009).

In the Kidds' system, drawn beads are divided into four classes according to their structure (simple or compound) and manufacturing sub-type (tubular or non-tubular). Each class is segregated into types on the basis of the general form of the beads and their decorative elements. Varieties are based on bead shape and the number, color, and diaphaneity of the structural elements.

Beads made by the hand-drawn method were often cased in clear glass to increase their brilliance. This was frequently done for translucent grayish white and opaque Indian-red beads but apparently never for transparent blue, opaque black, or opaque white beads. The presence of this layer, often microscopic, should be noted but does not qualify an otherwise Class I or II bead for inclusion in one of the multilayered classes (III and IV).

The various classes and types recorded to date are listed below and illustrated in Figures 1-4. Drawn and wound types marked with an asterisk (*) were encountered after the Kidds' classification system was published. The varieties are too diversified to be listed; *see* Kidd and Kidd (1970: 67-83) for the ones they classified.

Three of the bead types included here (Io, IIg, and IIj) need a bit of explanation. All three consist of drawn beads that were subsequently modified at the lamp to impart an "alternating twist" pattern to type Io, and to apply insets and wavy lines to IIg and IIj, respectively. Although they might best be assigned to a "lamp-worked" category, they have been retained in the drawn-bead section to prevent confusion as these types have been referred to in a number of research reports.

Class I. Tubular beads with simple (monochrome) bodies which may exhibit adventitious surface decoration. Cross-sections are round unless otherwise noted.

Ia	Undecorated
Ib	Decorated with straight simple stripes
Ib'	Decorated with spiral simple stripes
Ibb	Decorated with straight compound stripes
Ibb'	Decorated with spiral compound stripes
Ic	Beads with straight polyhedral bodies
Ic'	Beads with twisted polyhedral bodies
Id	Beads with straight polyhedral bodies decorated with straight simple stripes
Id'	Beads with twisted polyhedral bodies decorated with spiral simple stripes
*Idd	Beads with straight polyhedral bodies decorated with straight compound stripes
Ie	Beads with straight ribbed (rounded crests) or ridged (angular crests) bodies

Ie' Beads with twisted ribbed (rounded crests) or ridged (angular crests) bodies

If Polyhedral beads whose surfaces have been modified by grinding

*Irr Beads with straight ribbed (rounded crests) or ridged (angular crests) bodies decorated with straight compound stripes

Class II. Non-tubular (heat-rounded) beads with simple (monochrome) bodies which may exhibit adventitious surface decoration.

IIa Undecorated

IIb Decorated with straight simple stripes

IIb' Decorated with spiral simple stripes

IIbb Decorated with straight compound stripes

IIbb' Decorated with spiral compound stripes

IIe Melon (lobed bodies)

*IIf Beads whose surfaces have been modified by the application of ground facets

IIg "Flush eye" beads (decorated with insets; lamp-worked)

IIh "Flush eye" beads with insets and straight simple stripes (lamp-worked)

*IIhh "Flush eye" beads with insets and straight compound stripes (lamp-worked)

IIj "Roman" beads encircled by two or more wavy lines (lamp-worked)

Class III. Tubular beads with compound (multi-layered) bodies which may exhibit adventitious surface decoration. Cross-sections are round unless otherwise noted.

IIIa Undecorated

IIIb Decorated with straight simple stripes

*IIIb' Decorated with spiral simple stripes

IIIbb Decorated with straight compound stripes

*IIIbb' Decorated with spiral compound stripes

IIIc Beads with straight polyhedral bodies

IIIc' Beads with twisted polyhedral bodies

*IIId Beads with straight polyhedral bodies decorated with simple stripes

*IIId' Beads with twisted polyhedral bodies decorated with simple stripes

IIIe Beads with straight ribbed (rounded crests) or ridged (angular crests) bodies

IIIe' Beads with twisted ribbed (rounded crests) or ridged (angular crests) bodies

IIIf Polyhedral beads whose surfaces have been modified by grinding

IIIk Chevron beads with straight bodies and plain outer layers (any of the chevron and semi-chevron beads except type IIIm may have facets ground on the ends and these should be noted)

*IIIkk Semi-chevron beads (all layers except the core are "starry") with plain outer layers

*IIIl' Chevron beads with twisted polyhedral bodies and plain outer layers

IIIm Chevron beads made by grinding large, multi-layered tubes into round or oval forms to show the ridges of the second layer and the end design of the various layers

IIIn Chevron beads decorated with straight simple stripes on the outer layer

*IIInn Chevron beads decorated with straight simple stripes on the outer layer; these resemble porcelain imitations of type IIIn beads and are the tubular counterparts of type IVnn beads

*IIInn-a Chevron beads decorated with straight compound stripes on the outer layer (properly, this should be type IIInn but the Kidds assigned that designation to the former type)

*IIIp Chevron beads decorated with straight simple stripes on the surface of the second layer

*IIIpp Semi-chevron beads (all layers except the core are "starry") decorated with straight simple stripes on the surface of the second layer

*IIIq Semi-chevron beads (all layers except the core are "starry") decorated with straight simple stripes on the outer layer

*IIIr Beads with straight ribbed (rounded crests) or ridged (angular crests) bodies decorated with straight simple stripes

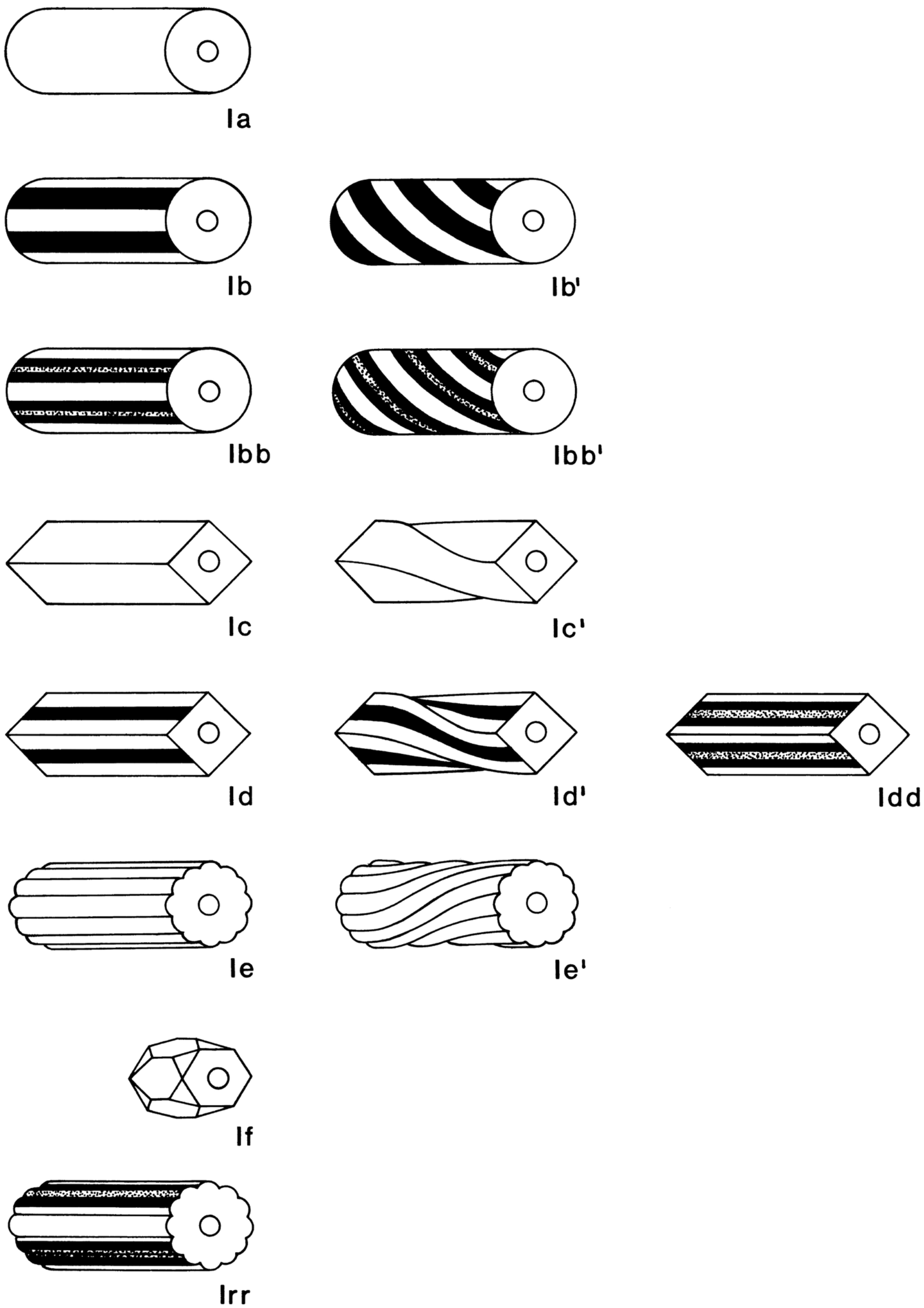

Figure 1. Recorded types of Class I drawn beads (all drawings by Dorothea Larsen).

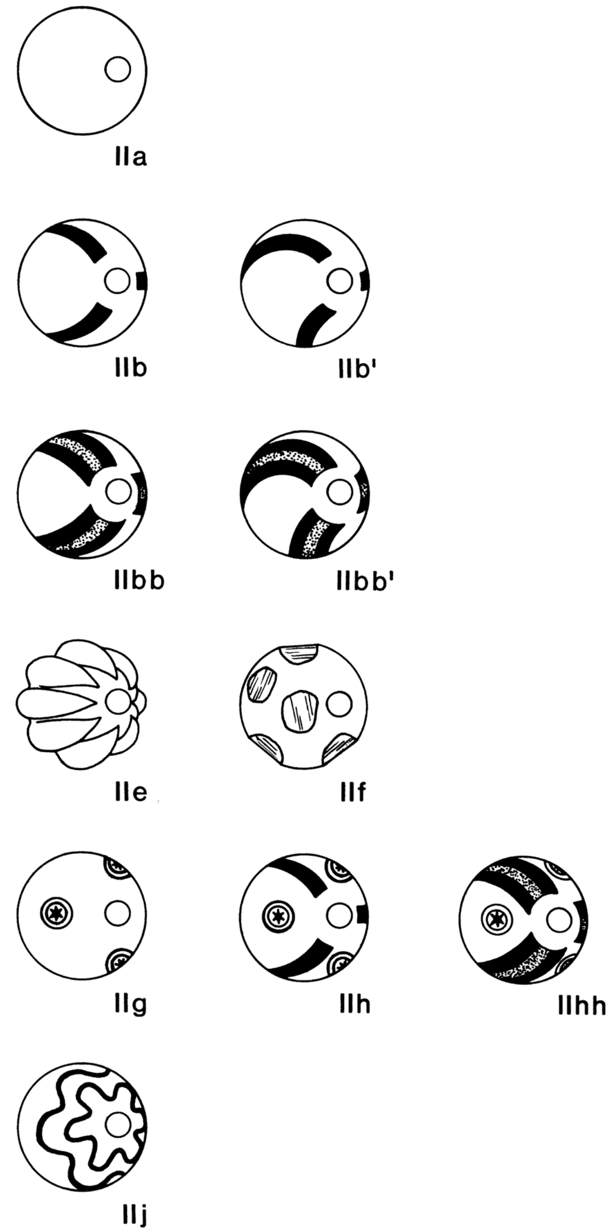

Figure 2. Recorded types of Class II drawn beads.

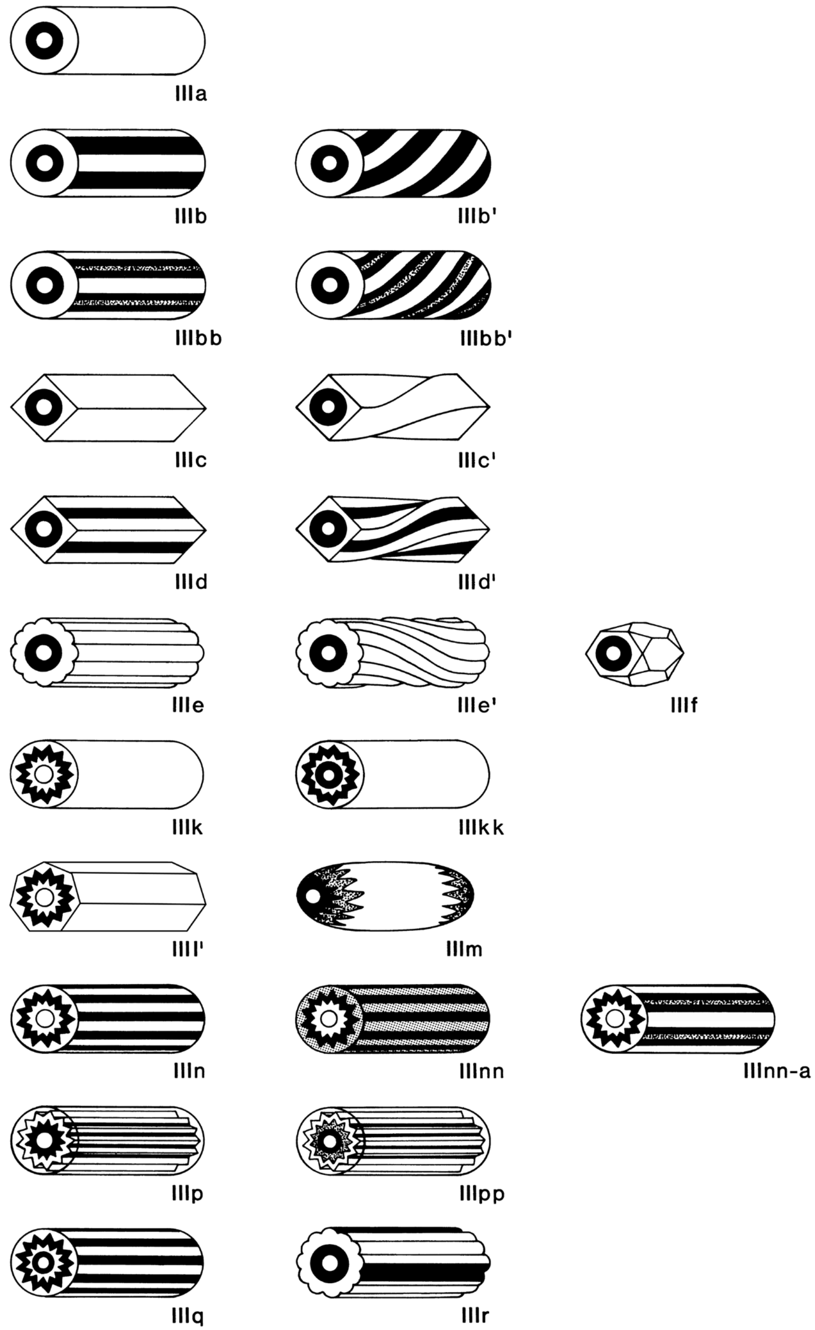

Figure 3. Recorded types of Class III drawn beads.

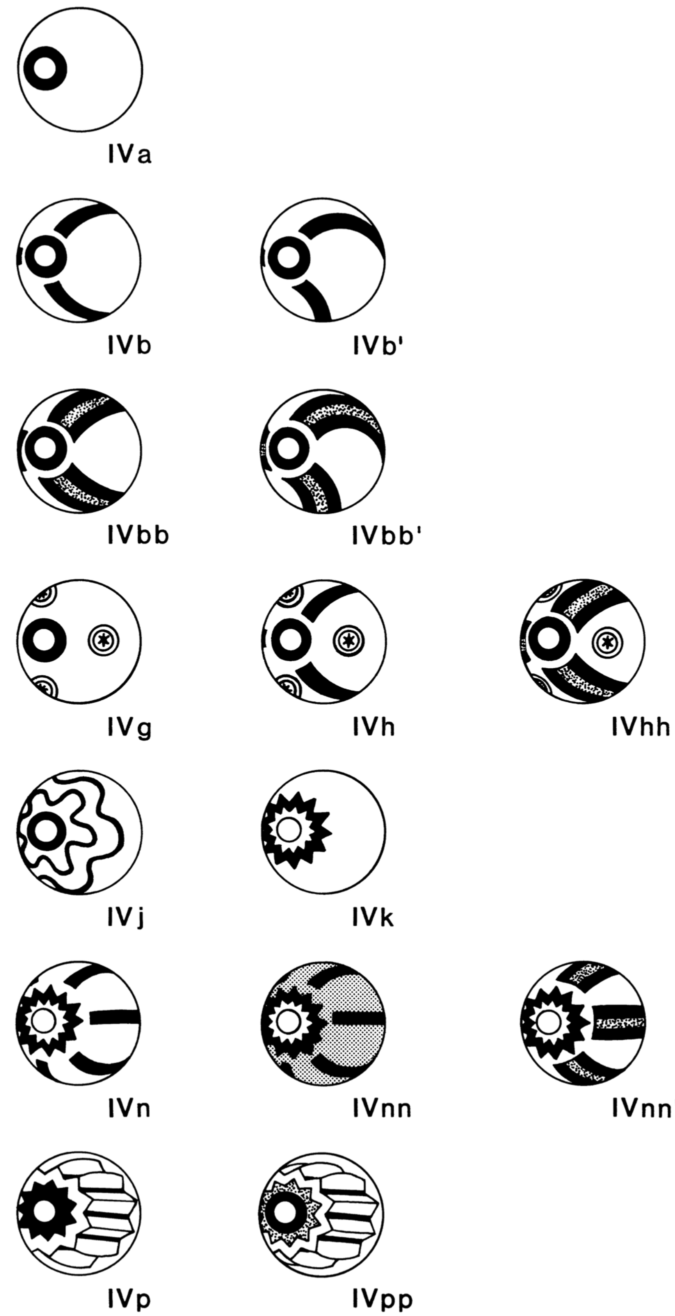

Figure 4. Recorded types of Class IV drawn beads.

Class IV. Non-tubular (heat-rounded) beads with compound (multi-layered) bodies which may exhibit adventitious surface decoration.

IVa Undecorated

IVb Decorated with straight simple stripes

IVb' Decorated with spiral simple stripes

IVbb Decorated with straight compound stripes

IVbb' Decorated with spiral compound stripes

IVg "Flush eye" beads (decorated with insets; lamp-worked)

*IVh "Flush eye" beads with insets and straight simple stripes (lamp-worked)

*IVhh "Flush eye" beads with insets and straight compound stripes (lamp-worked)

*IVj "Roman" beads encircled by two or more wavy lines (lamp-worked)

IVk Chevron beads with plain outer layers (any of the chevron and semi-chevron beads may have facets ground on the ends and these should be noted)

IVn Chevron beads decorated with straight simple stripes on the outer layer

IVnn Chevron beads decorated with straight simple stripes on the outer layer; these resemble porcelain imitations of type IVn beads

*IVnn' Chevron beads decorated with straight compound stripes on the outer layer

*IVp Chevron beads decorated with straight simple stripes on the surface of the second layer

*IVpp Semi-chevron beads (all layers except the core are "starry") decorated with straight simple stripes on the surface of the second layer

Wound Beads

Wound beads, also termed wire wound and mandrel wound, were produced by winding a viscid rod or a strand drawn therefrom around a rotating metal mandrel one or more times until the desired size and shape were achieved. While still soft, the beads might be decorated with any of a myriad of inlays or appliques. They might also be pressed with small paddles to impart soft facets or rolled in a trough mold to produce a symmetrical form. The beads could also be clamped in tong-like molds to impart a design or a uniform shape (this should not be confused with the "mold-pressed" process (cf.) where production begins with a glob of molten glass and not an already formed wound bead). When cool, the beads were stripped from the mandrel which was sometimes tapered and covered with chalk, graphite, or clay to facilitate this step (Kidd and Kidd 1970:49; Sprague 1979:8).

A variation of this technique that was not common in Europe and appears to have only been used in the Fichtelgebirge region of Germany is called furnace winding. In this process, a worker gathered a glob of glass onto the point of an iron rod directly from a pot of molten glass and formed it into the desired shape with a tool that may have been an open-faced mold. Once the bead had cooled, it was removed from the iron rod and put into a clay annealing box next to the furnace (Kenyon et al. 1996, 2009).

The surfaces of wound beads usually exhibit swirl marks that encircle the axis. Bubbles are either round, or elongate and oriented like the swirl marks. The perforation may taper slightly and have an uneven surface.

The Kidds segregate wound beads into three classes according to their structure (simple or compound) and the relative complexity of their shape (Figure 5). Types are determined according to the shape and general configuration of the decoration, if any, whereas varieties are based on the color and diaphaneity of the structural elements.

A listing of the various classes and types recorded to date follows. Types marked with an asterisk (*) were encountered after the Kidds' classification system was printed. The diversity of the varieties precludes their being listed; *see* Kidd and Kidd (1970:84-86) for the few they recorded. Forms not listed below will certainly be encountered and should be identified using the terminology and codes in Beck (1928, 2006).

Class WI. Single-layered, monochrome and polychrome beads with simple shapes.

WIa Cylinder

WIb Round (includes globular, oblate, and barrel shaped; specify which)

WIc Oval

WId Doughnut-shaped

*WIe Conical

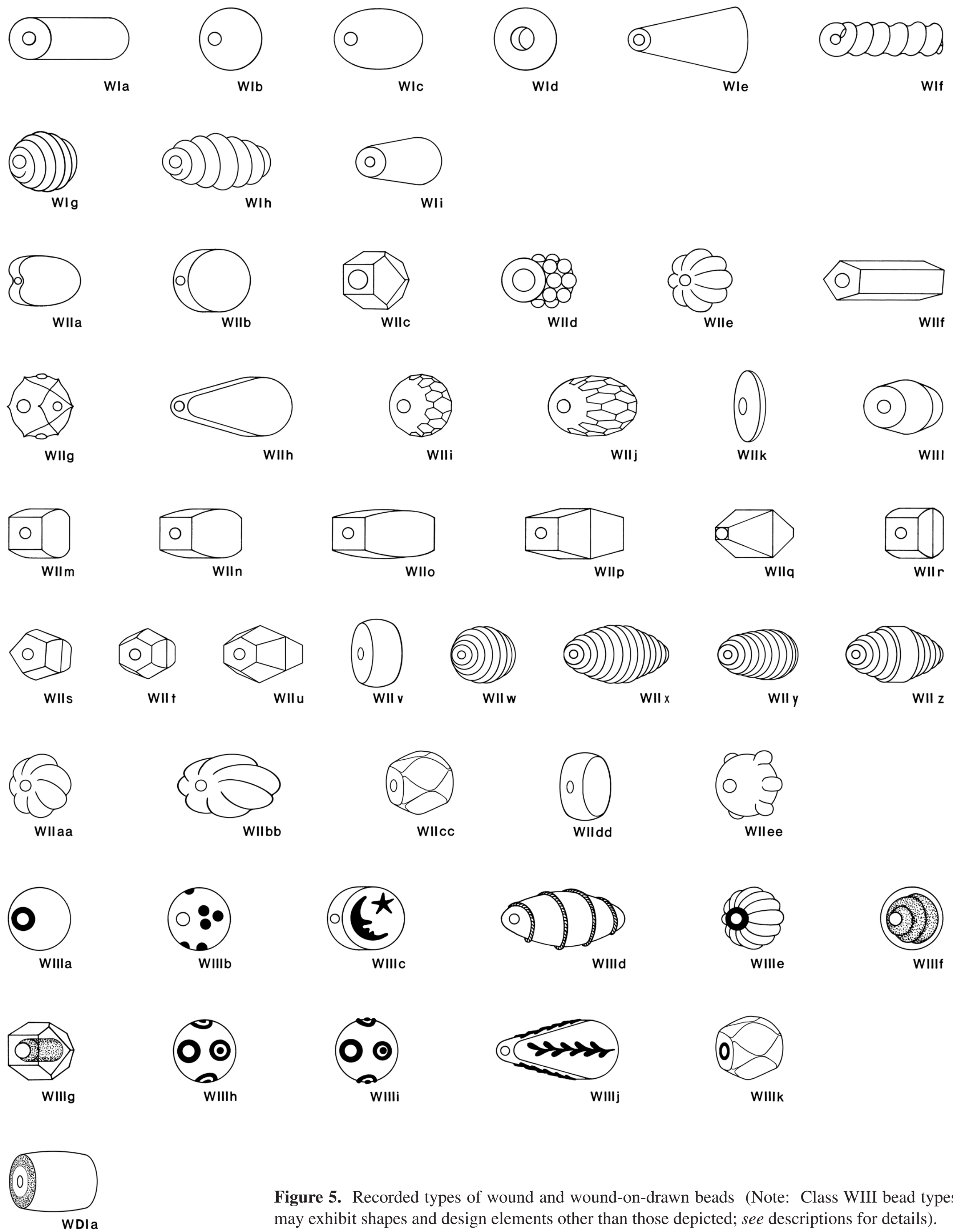

Figure 5. Recorded types of wound and wound-on-drawn beads (Note: Class WIII bead types may exhibit shapes and design elements other than those depicted; *see* descriptions for details).

*WIf Spiral cylinder (shaped like a compressed cylindrical spring, this type consists of a glass rod wound in a spiral fashion)

*WIg Round raised spiral (formed by winding a glass rod into a round form; there is no core, the interior is hollow)

*WIh Oval raised spiral (formed as above)

*WIi Truncated teardrop

Class WII. Single-layered, monochrome and polychrome beads with relatively elaborate shapes formed by pressing, pinching, molding, grinding, or some other form of manipulation.

WIIa Corn (tabular beads in the shape of corn kernels)

WIIb Flat disc (tabular beads with circular outlines)

WIIc Faceted "five-sided" or pentagonal (each has eight or ten pentagonal pressed facets)

WIId Raspberry (these exhibit several rows of prominent nodes)

WIIe Melon (lobed beads resembling melons)

WIIf Ridged tube (tubular beads with rectangular pressed facets that extend their entire length)

WIIg Beads with complex pressed designs (specify the exact configuration)

*WIIh Flattened teardrop (teardrop-shaped beads pressed flat)

*WIIi Round-faceted (round beads whose surfaces have been modified into facets by grinding)

*WIIj Oval-faceted (oval beads whose surfaces have been modified into facets by grinding)

*WIIk Circular convex bicone (Beck [1928] type I.A.1.e - I.B.1.e.)

*WIIl Standard circular truncated convex bicone (type I.C.1.f.)

*WIIm Short square barrel (type IX.B.1.b.)

*WIIn Standard square barrel (type IX.C.1.b.)

*WIIo Long square barrel (type IX.D.l.b.)

*WIIp Long square truncated bicone (type IX.D.2.f.)

*WIIq Standard square bicone (type IX.C.2.e.)

*WIIr Truncated square convex bicone (type IX.B.1.f.)

*WIIs Truncated pentagonal convex bicone (type XII.C.1.f.)

*WIIt Truncated hexagonal convex bicone (type XIII.C.1.f.)

*WIIu Truncated hexagonal bicone (type XIII.D.2.f.)

*WIIv Short barrel (type I.B.1.b.)

*WIIw Round ribbed (apparently rolled in a linear ribbed mold to impart a contiguous series of ribs or rings that encircle the bead perpendicular to the perforation)

*WIIx Oval ribbed (formed like type WIIw)

*WIIy Ribbed truncated teardrop (formed like type WIIx)

*WIIz Oval ribbed with medial band (formed like type WIIy but with a plain broad band around the middle)

*WIIaa Round spiral lobed (twisted melon)

*WIIbb Oval spiral lobed

*WIIcc Round/irregular with irregular pressed facets

*WIIdd Flattened oblate (beads pressed flat parallel to the perforation)

*WIIee Round knobbed (similar to the WIId "raspberry" form but with only a single row of knobs about the equator)

Class WIII. Single-layered, monochrome and polychrome beads with adventitious decoration, and multi-layered beads with or without adventitious decoration or faceting.

WIIIa Class WI beads with a surface coating of a different color or material

WIIIb Class WI beads with inlaid decoration (incorrectly described in Kidd and Kidd [1970:86] as "overlaid in a design")

WIIIc Class WII beads with inlaid decoration

WIIId Class WI beads with overlaid decoration

WIIIe Class WII beads with a surface coating of a different color or material (incorrectly described in Kidd and Kidd [1970:86] as "overlay of material other than glass")

*WIIIf Class WI beads with internal decorative elements

*WIIIg Class WII beads with internal decorative elements

*WIIIh Type WIIIa (multi-layered) beads with inlaid decoration

*WIIIi Type WIIIa (multi-layered) beads with overlaid decoration

*WIIIj Class WII beads with overlaid decoration

*WIIIk Class WIIIe beads with pressed facets

Wound-on-Drawn Beads

This is a rare manufacturing type recorded at only a few sites in the Pacific Northwest (e.g., Burgess and Dussubieux 2007:64; Sprague 1979:9). It consists of a short section of drawn tubing about which has been wound a layer of contrastingly colored glass. Having a red exterior and white core, the only variety observed to date is practically indistinguishable from its more common, all-wound counterpart. The only difference is that the cores of the former contain linear bubbles that parallel the perforation. Preliminary chemical analysis suggests that these beads may be the products of the Bohemian beadmaking industry (Burgess and Dussubieux 2007:70).

As only one variety has been observed to date, it is impossible to do more than make a few suggestions concerning a classificatory scheme for wound-on-drawn beads (Figure 5). Using the wound bead system as a basis, the wound-on-drawn category (designated WD) may be classified as follows:

Class WDI. Multi-layered, undecorated.

*WDIa Barrel shaped

Additional types would be designated according to the shape of the beads. Varieties would be based on the color and diaphaneity of the structural components.

Mold-Pressed Beads

Variously cited in the literature as molded, pressed, and mold pressed, the latter designation is adopted here as it seems to best describe the process of manufacture. Two basic methods were employed to produce the mold-pressed beads found on North American sites. In the first, the end of a glass rod was heated over an oil flame or in a furnace until it melted. A piece was then pinched from it and pressed in a tong-like two-piece mold. As the glass was compressed, any excess was forced out at the seam while a moveable pin (or pins, depending on how many holes were desired) pierced the glass and formed the perforation.

In a variation of this, termed "mandrel-pressing" by Ross (2003), a tapered pin attached to the interior of one half of the mold formed the perforation. As the pin did not extend all the way to the other side of the mold when it was closed, the narrow end of the perforation was sealed and had to be ground down and/or broken through once the bead had hardened.

In the second method, two pieces of viscid glass, one in either half of a two-piece mold, were pressed together to fuse them. This permitted the production of beads with complex colored patterns that would have been distorted or destroyed in the previous processes. The movable pin that formed the perforation usually extended from one half of the mold to the other in the case of round and oblate beads and across the open face of the mold for flattened and elongated specimens. Consequently, the beads in the former group have seams about their equators, whereas those in the latter group have seams along their edges. Some faceted beads have mold seams that zig zag around the middle, following the edges of the central facets. The nature of the mold seam, if visible, should be noted (Ross 2003:46).

After the beads were removed from their respective molds, any flash along the mold seam was removed by tumbling and facets imparted by the mold were frequently ground smooth. If the perforation remained sealed off at one end as in the case of the mandrel-pressed beads, the closed end of the bead was ground down and, if need be, punched through.

Mold-pressed beads are usually symmetrical though they may display tiny flattened areas. They may also have uneven "orange peel" surfaces, or exhibit mold marks in the form of slight to bold ridges and linear bulges, seams in colored patterns, or slightly differently colored linear zones caused by differential light refraction. The perforations (and there may be several) sometimes taper distinctly, especially in the case of the mandrel-pressed beads, and frequently have crackled surfaces. It is sometimes difficult to distinguish mold-pressed beads from Prosser-molded beads (cf.) having a high silica content.

Mold-pressed beads were produced in a wide variety of forms, styles, and colors (Neuwirth 1994, 1995, 2011). While relatively few of these appear in archaeological collections, a basic classificatory framework may be created on the basis of recovered specimens and those illustrated in various publications

The mold-pressed category (designated MP) is divided into two major classes based on the presence or absence of faceting or molded designs[2] (Figure 6). Shape determines the type, whereas varieties are defined according to the color and diaphaneity of the structural elements, the configuration

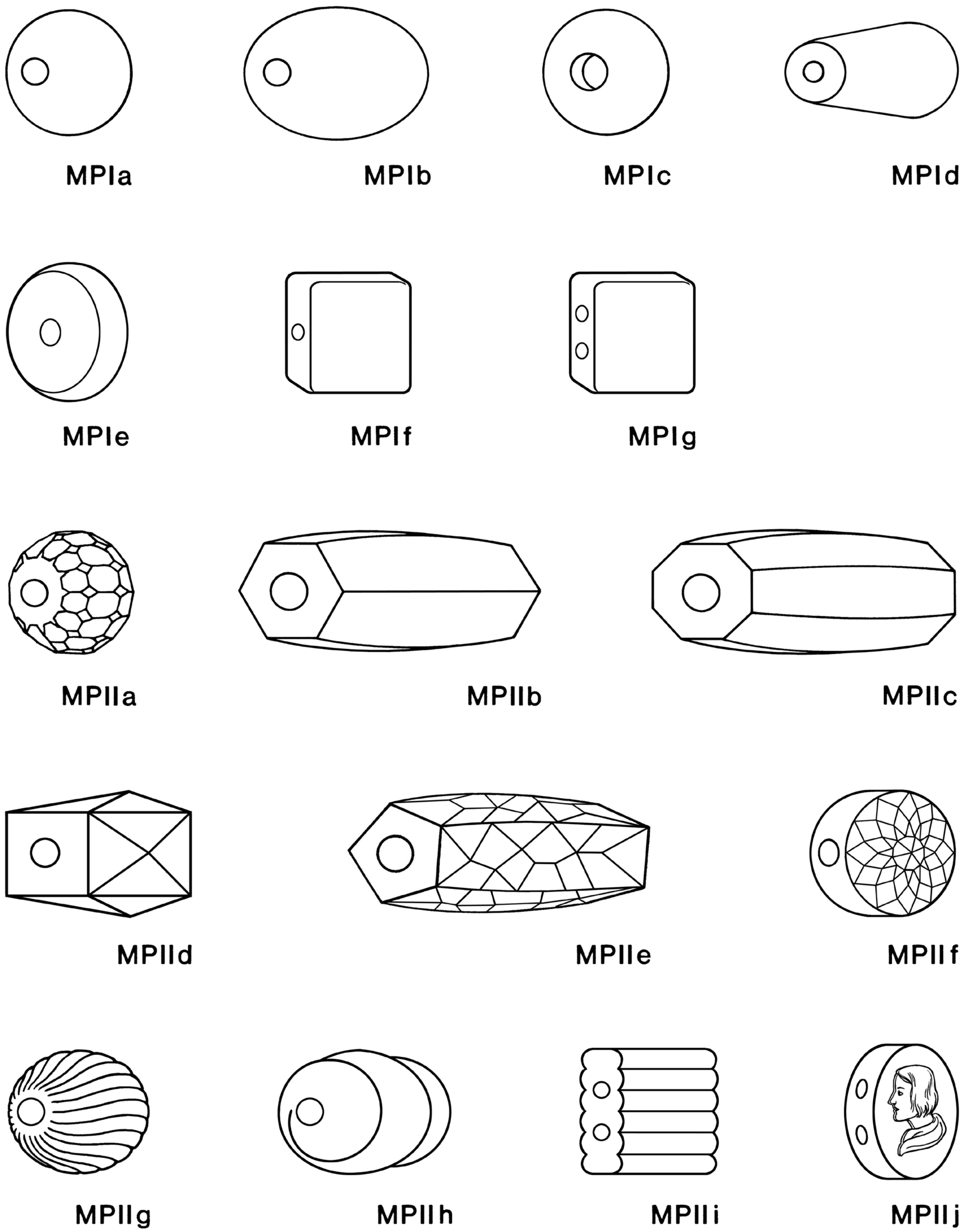

Figure 6. Recorded types of mold-pressed beads (Note: Class MPII bead types may exhibit shapes and design elements other than those depicted; *see* descriptions for details).

of the decoration, the shape, number, and configuration of the perforation(s), the number, shape, and type (mold imparted or cut) of facets, and the nature of the mold seam, if visible. In all cases where the manufacturing sub-type can be determined, it should be appended to the description; e.g., MPIIa. Round-faceted (mandrel pressed). For a detailed study of 19th-century faceted mold-pressed beads, *see* Ross (2003).

Class MPI. Undecorated monochrome and polychrome beads.

MPIa Round

MPIb Oval

MPIc Doughnut-shaped

MPId Truncated teardrop

MPIe Barrel disk

MPIf Rectangular tabular

MPIg Rectangular multi-hole spacer beads (describe exact configuration)

Class MPII. Monochrome and polychrome beads exhibiting various forms of surface decoration such as facets or molded designs (specify which and describe).

MPIIa Round faceted (describe exact configuration)

MPIIb Long hexagonal barrel (Beck type XIII.D.1.b.)

MPIIc Long octagonal barrel (type XIV.D.1.b.)

MPIId Square-faceted

MPIIe Faceted pentagonal barrel (pentagonal cross-section)

MPIIf Plano-convex faceted (circular outline, plano-convex cross-section)

MPIIg Round beads with molded designs

MPIIh Oval beads with molded designs

MPIIi Rectangular multi-hole spacer beads with facets or molded designs (describe exact configuration)

MPIIj Oval multi-hole spacer beads with facets or molded designs (as for above)

Blown Beads

Beads in this category were either free blown or mold blown. In the former case, one method entailed blowing a bubble of molten glass at the end of a blowpipe. This was a slow process; a more common technique was to individually blow one or more bubbles in a glass tube heated at the lamp. If desired, a design could be trailed onto the surface while the glass was hot.

There were two basic methods in mold blowing as well. A simple technique was to blow a small bubble at the end of a glass tube which was quickly inserted into a two-piece mold. Additional air was then blown in so that the bubble filled the cavity. A more complicated (and more productive) process involved placing a glass tube in a two-piece mold with up to 24 connected cavities. The mold and tube were heated until the glass became viscid and air was blown into the tube either by mouth or mechanically using compressed air to expand the tube and make it conform to the shape of the mold. Mold blowing could produce beads with very complicated designs. If a row of beads was produced, it was either used as such or the individual segments could be broken apart to form individual beads. In either case, the protruding ends were usually fire polished to round the broken edges.

"Constricted-tube" beads (Figure 7, BIk-l) are a related form that was made at the lamp but apparently did not involve increasing the diameter of the tube by blowing. Consisting of thin, unaltered tube sections with constricted ends, the beads were apparently produced by heating a small section of a tube over a flame and then pulling the tube in opposite directions to form a narrow waist. After a series had been produced, the segments were broken apart and the constricted ends fire polished. These beads retain the same diameter as the original tube and are usually in the form of long cylinders or standard barrels.

The beads created using any of the aforementioned methods could subsequently be decorated or otherwise enhanced by painting designs on their surfaces or introducing paint, colored wax, powdered fish scales, or metal dust into their interiors (Pazaurek 1911:2). They were often filled with white wax to render them less fragile (Lardner 1972:236). Blown beads are easy to identify as they are all hollow.

Blown beads were produced in a myriad of forms and styles (Neuwirth 1994, 1995, 2011) but are rarely encountered at archaeological sites because of their fragility. Consequently no attempt has been made to list all the possible types as most will probably never be encountered by researchers. An examination of recorded specimens and those illustrated by Neuwirth (1994, 1995, 2011) does, however, allow the creation of a basic classificatory framework.

Beads in the blown category (designated B) are divided into two major classes based on the presence or absence of surface decoration, whether faceting, painting, or applied components. Types are distinguished according to shape and form (Figure 7). Varieties are defined by the color and diaphaneity of the components; the nature of the coloration (external, internal, or in the glass itself); and where applicable, the number, shape, and type (mold imparted or cut) of facets; the nature and configuration of the decoration; and the number of segments.

Class BI. Undecorated monochrome and polychrome beads including those with gilded, silvered, or otherwise coated exteriors or interiors.

BIa	Round
BIb	Barrel
BIc	Oval
BId	Segmented
BIe	Teardrop
BIf	Melon (lobed)
BIg	Round ribbed
BIh	Oval ribbed
BIi	Round spiral ribbed
BIj	Oval spiral ribbed
BIk	Barrel shaped (constricted tube)
BIl	Long ribbed cylinder (constricted tube)
BIm	Ribbed double-bulge oblong
BIn	Hexagonal alternating twist (lamp-worked bead apparently produced by twisting a heated hexagonal tube one way and then the other until a series of undulations were formed in the body facets; formerly drawn type Io)

Class BII. Monochrome and polychrome beads exhibiting various forms of surface decoration including facets (specify which and describe).

BIIa	Round with painted or gilded decoration
BIIb	Oval with painted or gilded decoration
BIIc	Round with trailed glass decoration and/or facets
BIId	Oval with trailed glass decoration and/or facets
BIIe	Faceted teardrop
BIIf	Complex molded (describe exact configuration)

Prosser-Molded Beads

This manufacturing type was defined by Sprague (1973, 1983) and Ross (1974:18) who termed it "Prosser molded" because of its similarity to the molding technique for ceramic buttons that was patented by Richard Prosser (1840). Although the beads are technically ceramic, depending on the amount of silica in the composition, they sometimes have the appearance of grainy glass so are included here. Unlike the beads discussed previously, Prosser-molded or "tile" beads, as they are generically called in the manufacturer's parlance, are not produced from viscid glass but from a powdered mixture consisting of feldspar, calcium fluoride, silica sand, and a colorant. Milk is used as a binding medium and the paste is then pressed in a gang mold to impart the desired shape (Opper and Opper 1991:49). The mold is then inverted and the beads are expelled onto a metal sheet which is then placed in a furnace until the material fuses. Some varieties had colored stripes or other decoration of colored glaze applied to them prior to firing. The bead could also be rolled in glaze and/or the ends could be dipped in it to impart the appearance of a cored or multi-layered body. The beads may be glazed or have the appearance of unglazed porcelain. Beads with a high silica content have a glassy appearance and a granular structure is visible if the material is sufficiently transparent.

Prosser-molded beads often exhibit a broad, slightly raised equatorial band. Generally, one end is rounded and smooth, while the other is somewhat flattened and rough or pebbled. The perforation tapers toward the rounded end.

Neuwirth (1994, 2011) illustrates a wide range of Prosser-molded beads (designated PM). Using her illustrations, coupled with an examination of archaeological specimens and beads on 20th-century sample cards, it is possible to group the beads into two major classes based on the presence or absence of surface decoration, including stripes, dots, or elaborate faceting (Figure 8). Types are determined based on shape and the nature of the decoration, if any, while varieties are determined by the color and diaphaneity (most beads are opaque but those with a high silica content are translucent) of the structural components and the color and configuration of the decoration. As there are so many different forms of Prosser-molded beads and relatively few have been found in American archaeological assemblages, no attempt has been made to list them all. The most common ones are listed below. New types may be added as they are encountered.

Class PMI. Undecorated monochrome and polychrome beads.

PMIa	Round
PMIb	Oblate
PMIc	Oval

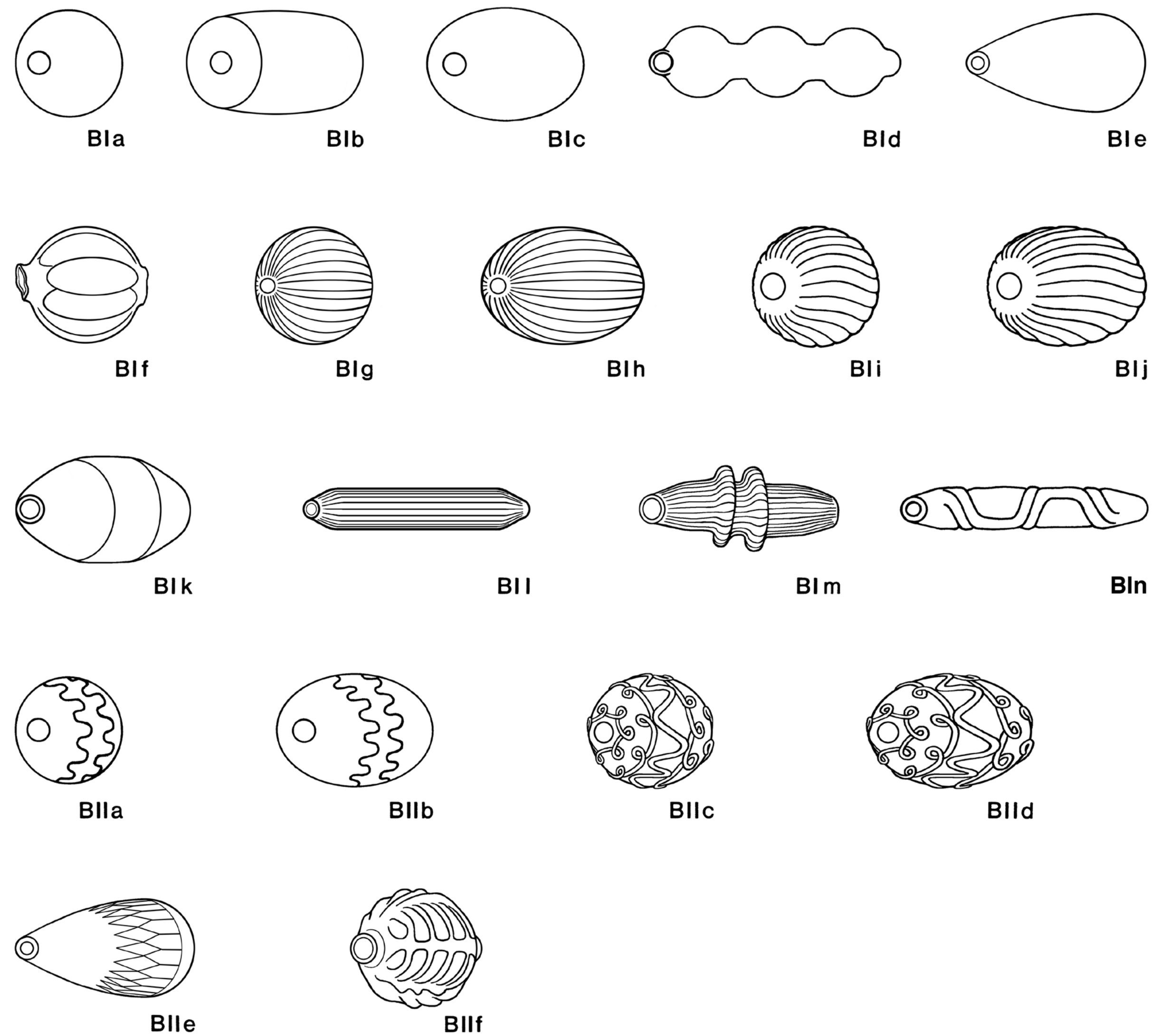

Figure 7. Recorded types of blown beads (Note: Class BII bead types may exhibit shapes and design elements other than those depicted; *see* descriptions for details).

PMId Barrel shaped

PMIe Demi-oval (an oval cut in half perpendicular to the perforation)

PMIf Cylinder (indicate whether long, standard, or short)

PMIg Barrel disk

PMIh Ring

PMIi Interlocking (beads with crenelated ends that allow the beads to interlock; specify exact form)

PMIj Elaborate forms (describe exact configuration)

Class PMII. Monochrome and polychrome beads exhibiting surface decoration such as stripes, facets, or nodes or other protrusions (specify which and describe).

PMIIa Oval with straight stripes

PMIIb Oval with spiral stripes

PMIIc Oval with dots or eyes

PMIId Cylinder with straight stripes

PMIIe Cylinder with colored nodes

PMIIf Round faceted

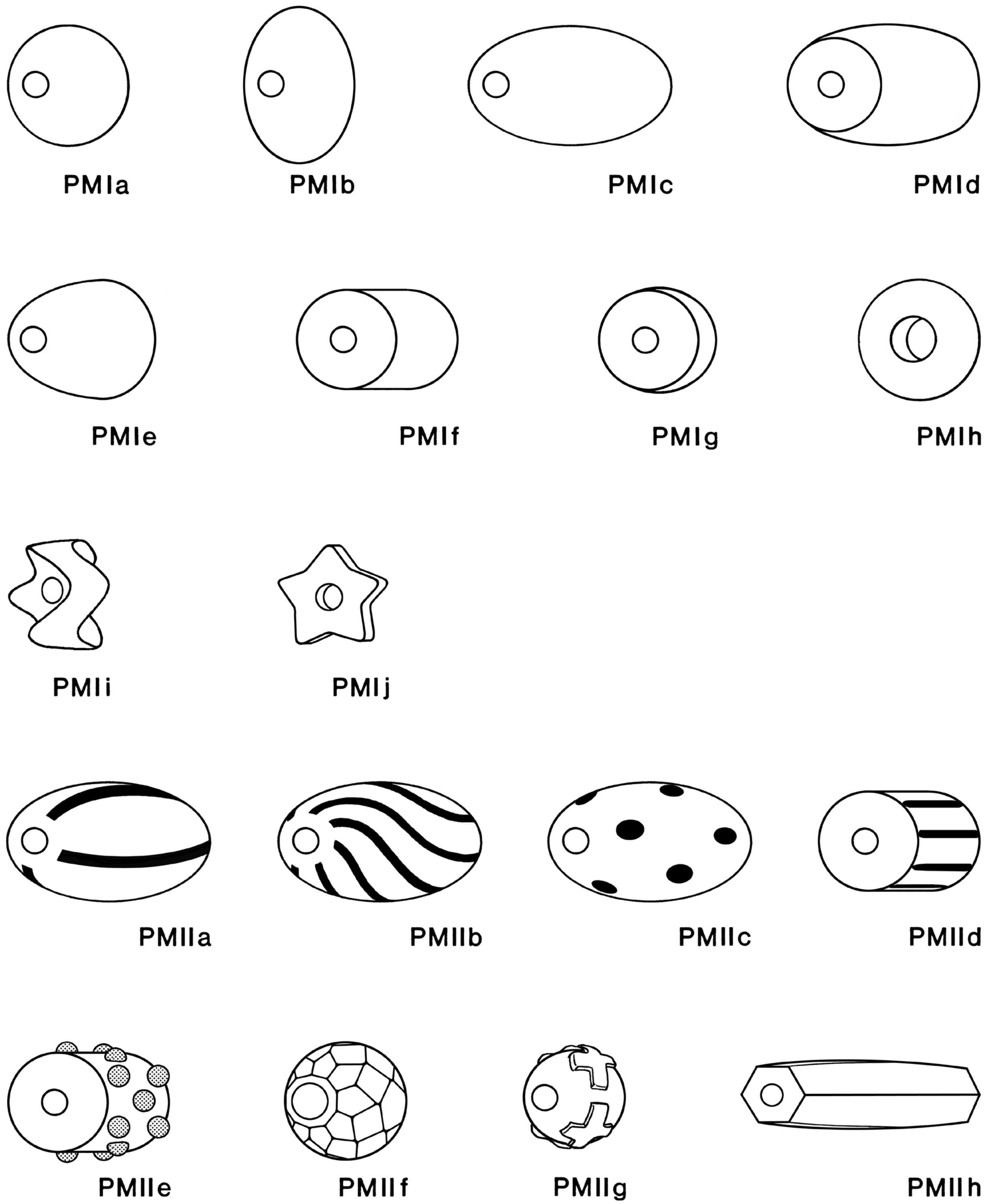

Figure 8. Recorded types of Prosser-Molded beads (Note: Some MP bead types may exhibit shapes and design elements other than those depicted; *see* descriptions for details).

PMIIg Round with complex molded surface decoration (describe exact configuration)

PMIIh Long hexagonal barrel

GLASS BEAD ATTRIBUTES

The following attributes are listed in descending order of their relative importance in the classification of glass beads.

Structure

The physical composition of a bead defines its structure. There are four structural categories (Stone 1974:88-89):

Simple – beads composed of a single undecorated layer of glass (includes flashed specimens).

Compound – beads composed of two or more undecorated layers of glass.

Complex – simple specimens with adventitious decoration.

Composite – compound specimens with adventitious decoration.

Shape

Although the shape nomenclature utilized by the Kidds is basically self-explanatory, a few comments will help elucidate some of the terms.

All **tubular** beads are assumed to have round cross-sections unless otherwise noted. If not, the specific cross-section shape should be appended (e.g., tubular-hexagonal). As they often grade imperceptibly into the circular group, tubular specimens may be segregated using the following criteria. A bead of any length is classified as tubular if it has broken or cut ends that have not been altered by heat rounding. If the ends have been rounded, a bead is tubular if its length exceeds twice its diameter. Tubular beads of types If and IIIf that have hexagonal-, heptagonal-, and octagonal-sectioned bodies whose corners have been removed by grinding are termed tubular, cornerless hexagonal/heptagonal/octagonal (whichever pertains). In certain cases, it is useful to note if the walls of a tubular bead are thin or thick in regard to the size of the perforation.

Circular specimens, shaped like little rings or tori, have lengths that are less than twice their diameter. As there is so much variability in the shape of heat-rounded drawn beads as well as some wound beads, the **round** category incorporates beads that are not only globular or spheroidal, but also oblate and barrel-shaped. The specific shape should be indicated. If there is shape overlap within a sample, the description should reflect this (e.g., round to barrel shaped). Some **oval** beads are somewhat barrel-shaped while others are shaped like olive pits. These forms should be identified; e.g., oval (olive-pit shaped).

The Kidds use the term **flat** to define those drawn beads that have been pressed flat parallel to the perforation while the glass was still viscid. As this does not reveal anything about the bead's pre-flattened shape, the term should be modified to include this information. For example, a flattened round bead would be recorded as "flat-round." **Doughnut-shaped** refers to those beads in the wound category that have extremely oblate bodies and large perforations, much like a typical lifesaver.

Other shapes are defined and illustrated in the Glass Bead Classification section of this guide. Should new forms be encountered, the use of Beck's (1928, 2001) system and terminology to designate them is recommended. Unfortunately, as multi-faceted specimens are not adequately covered in the latter, a few comments are appropriate. For beads with more than 21 facets, if the exact shape cannot be determined using Beck, it is suggested that the general form of the bead be given followed by the qualifier "faceted" (for example, round-faceted or elongate-faceted). To this should be appended a description of the type (cut or mold imparted), shape, number, and location of the various facets.

Decoration

Applied adornment encountered on beads found in the Americas falls into three major categories. **Overlaid:** appliques of glass or another material that either rest on or protrude noticeably from the surface of the bead (this includes painted decoration). **Inlaid:** embedded elements whose surfaces are either flush with or only slightly above the surface of the bead. **Internal:** decorative elements, such as colored cylinders, spiral bands, and metal foil, located within the body of the bead.

Beads may be decorated using multifarious techniques and decorative elements, the most common of which include the following. Aligned with the perforation, **stripes** may be simple (monochrome) or compound (polychrome), and straight (Figure 9, a) or spiral (Figure 9, b). In some cases straight lines intersect to form a **lattice** (Figure 9, c). **Rings** are lines that encircle a bead perpendicular to the perforation (Figure 9, d). **Wavy lines**, either simple or compound, are those that undulate around a bead (Figure 9, e). Also called "double wave," **interwoven lines** consist of

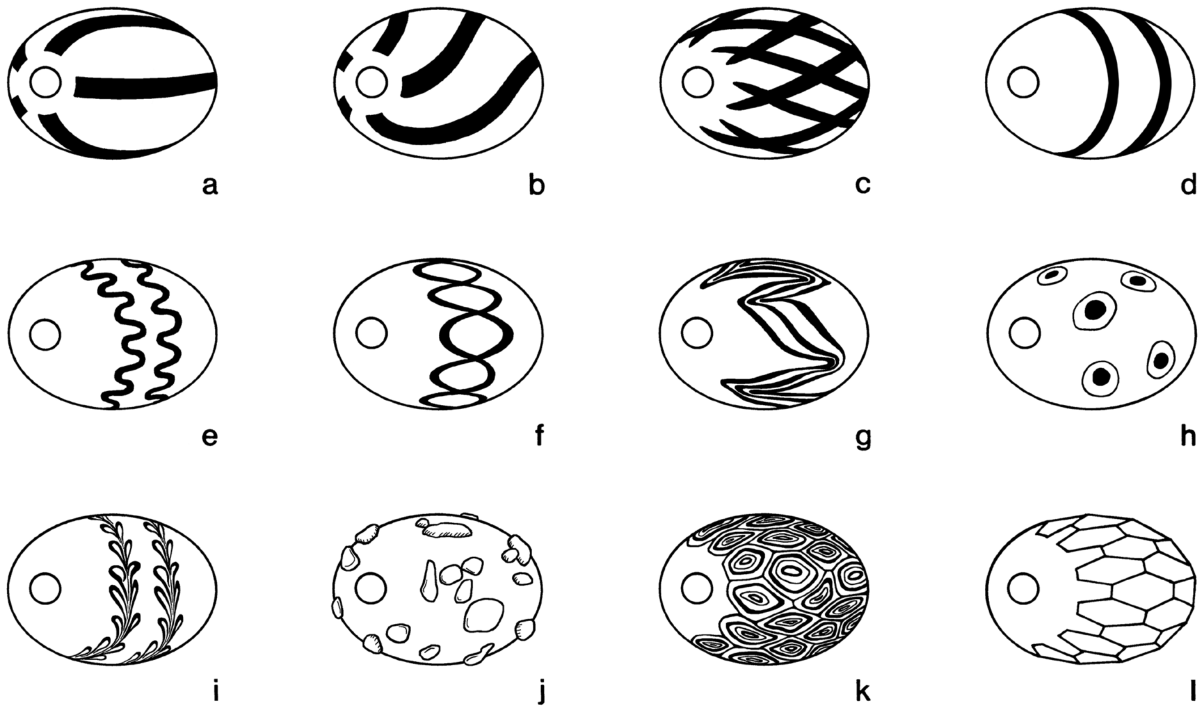

Figure 9. Some common forms of bead decoration: a, straight stripes; b, spiral stripes; c, lattice; d, rings; e, wavy lines; f, interwoven lines; g, combed designs; h, eyes; i, floral designs; j, crumb; k, mosaic; l, facets.

two intersecting wavy lines that encircle a bead (Figure 9, f). In the case of **combed designs**, a wire is drawn through freshly applied viscid rings or spiral stripes to produce a series of scallops, ogees, zigzags, or feather-like patterns (Figure 9, g). Specimens adorned with simple or compound dots are called **"eye beads"** (Figure 9, h). **Floral designs** include various designs in the form of simple or compound wreaths, flowers, blossoms, and plants whose appearance ranges from highly stylized to realistic (Figure 9, i). **Crumb** beads are made by embedding contrastingly colored crushed glass into the body of a bead while the glass is viscid and then fire polishing it to fuse the components; the crumbs may protrude from the surface or be flush with it (Figure 9, j). Wound **mosaic** beads consist of fused sections of fancy cane generally embedded in a glass core to create elaborate designs (Figure 9, k). **Facets** may be applied with the use of paddles or molds while the glass is soft or they may be ground after the glass has hardened (Figure 9, l). Other forms of decoration that may be encountered are described and illustrated in Beck (1928) and van der Sleen (1967).

Color

In the Kidds' system, colors are designated using the names and codes proposed in the *Color Harmony Manual* (Container Corporation of America 1958). As the latter is obscure and no longer produced, the equivalent codes in the better-known Munsell color notation system should be used instead. (The codes for the colors recorded by the Kidds are provided in Table 1 of the reprint of the Kidds' taxonomic system that accompanies this report; *see* p. 44).

Although some researchers have used the colored plates in Kidd and Kidd (1970) to identify the colors of their specimens, this practice is not endorsed. For one thing, the color rendition in the plates, especially that in the French edition and a subsequent reprint (Kidd and Kidd 1983:219-257), is not true enough to permit proper identification. For another, the list of recorded colors has dramatically increased since 1970 so that the plates provide far from adequate coverage.

The correct procedure is to compare the beads to the glossy finish chips in the *Munsell Book of Color* (Munsell Color 2010) or the smaller and less-expensive *Munsell Bead Color Book* (Munsell Color 2012) which lists all the colors encountered in archaeological and ethnographic materials in North America to date.

To properly determine the color of a bead, it must first be cleaned of all dirt. If the surface is eroded, dull, or lightly patinated, the specimen should be wet with water, preferably deionized, or clean saliva to bring out the true color. Those covered with a thick patina need to be cleaned in a small area before being moistened if this will not harm the specimen. The bead should then be mounted on the tip of a teasing needle and compared to the Munsell chips against a white background in natural daylight or daylight-approximating fluorescent light. Incandescent and regular fluorescent lighting should be avoided as they impart an orange or a greenish hue to the glass, respectively. Also keep in mind that early morning and late afternoon sunlight may also affect color determination.

The color of opaque beads must obviously be ascertained using reflected light. In the case of translucent and transparent beads, transmitted light should be used with the reflected color being noted if it varies significantly (e.g., transparent reddish purple or green beads which appear black unless held up to a strong light). If the glass is dichroic (i.e., it has a distinctive golden or opalescent cast), this should also be noted. For multi-layered beads, record colors from the outside inward.

As there is a great deal of variation in the color of beads produced before about 1850, the range should be noted for a group of beads that comprise a variety with the modal hue being used to determine the specific variety.

To facilitate an ordered inventory, beads in each type category should be listed on the basis of their body color and decorative elements as arranged in the Munsell system. The neutral values (white, gray, black) come first, followed by red, yellowish red, yellow, greenish yellow, green, bluish green, blue, purplish blue, purple, and reddish purple.

Diaphaneity

The diaphaneity of beads is described using the terms opaque (op.), translucent (tsl.), and transparent (tsp.). Although the Kidds use "clear" in lieu of "transparent," the latter term is preferred as it is more descriptive and clear is generally taken as meaning "colorless." Simply defined, beads that are **opaque** are impenetrable to light except on the thinnest edges. **Translucent** specimens transmit light, yet diffuse it so that a pin inserted in the perforation appears only as a shadow when viewed through the body of the bead. **Transparent** beads are such that a pin in the perforation is clearly visible. Sometimes diaphaneity will vary slightly in an otherwise like batch of beads. In such an instance, list the range (e.g., tsl./op.). As the presence of numerous tiny bubbles will affect the diaphaneity of a bead, their presence should be noted.

Patination and Luster

Beads are often patinated and this feature may sometimes be the only clue to its relative age. The color and degree of the patination should be noted. Researchers should keep in mind that the patina on beads may be thin yet have an almost imperceptible yellowish (or other) tint that can change the color of, say, a bright blue bead to turquoise blue. Removing the patina from one or two specimens will usually reveal the true color.

Unpatinated beads will generally exhibit one the following types of luster. The two most common types are **shiny** (smooth and bright) and **dull** (not shiny). Others that may be encountered, especially on 19th- and 20th-century specimens, are **metallic** (having a metallic sheen), **iridized** (having an iridescent surface), **greasy** (having an oily appearance), **matte** (etched with acid), and **satin** (characterized by a fibrous structure).

Size

Although the five arbitrary size categories (very small, under 2 mm; small, 2-4 mm; medium, 4-6 mm; large, 6-10 mm; and very large, over 10 mm) proffered by the Kidds are useful in relating relative size, research conducted by Ross (1976:684-766, 1990) and Karklins (1983b:188) has revealed that they are too broad to be of any use in establishing historical size groups where the inter-size interval can be as little as 0.2 mm. Minimally, the range of each variety's least diameter and length should be recorded to the nearest tenth of a millimeter using vernier calipers. Least diameter is indicated as this dimension is the one that determines a bead's size as it passes through a series of screens during the sizing process at the factory. The pertinent dimensions for most beads are length (parallel to the perforation) and diameter (perpendicular to the perforation). In the case of flattened specimens, however, they are length (parallel to the perforation), width (perpendicular to the perforation), and thickness (perpendicular to the width). Where there is more than one specimen per variety, the size range should be recorded. When a large sample is present (say 100 or more specimens), means and modes should be computed as well as they may provide information about historic bead sizes.

While measuring the perforations of common "seed" beads has generally not been found to be useful, in some cases drawn tubular beads will be encountered where all the physical attributes are identical (i.e., shape, color, diaphaneity) but in one the walls are thin and the perforation very large whereas in the other, the opposite holds true. These are clearly not the same variety and should be described as variants of a variety (e.g., Ia2 variant). Perforation size may also help segregate wound from mold-pressed beads; e.g. the holes of the latter may have very small diameters while those of wound beads are sometimes quite large.

Post-Production Modification

Beads were occasionally modified after they left the factory or workshop, generally on this side of the Atlantic. This includes grinding a bead to remove its exterior layer(s) or to modify its form, as well as intentional heating or accidental burning, processes that frequently alter a bead's diaphaneity, color, and shape. These characteristics should always be noted. In the case of grinding, an attempt should be made to determine the original form and color sequence of the bead (based on intact accompanying specimens or those in similar collections) and it should then be recorded as that variety with a note stating what alterations have been made.

HISTORICAL ARCHAEOLOGICAL INTERPRETATIONS

Chronology

Despite decades of research, no one has as yet worked out a comprehensive chronology for glass beads found on North or South American sites. Fortunately, there are several regional chronologies as well as a number of detailed reports which describe significant archaeological collections that will help researchers date their assemblages. For the New England area and the adjacent Atlantic provinces, James W. Bradley's (1983) summary of the beads of 16th-17th-century New England may be of use. Ontario lacks a comprehensive chronology, but for those working on 17th-century sites in the southeastern part of the province, the chronology prepared by Ian and Thomas Kenyon (1983) is a must. Walter Kenyon's (1982) report on Neutral beads is also recommended. Researchers in New York state have a large body of information to consult, including Bennett (1983), Pratt (1961), Rumrill (1991), and Wray (1973, 1983). Especially useful for Seneca beads of the late 16th and early 17th centuries are Sempowski and Saunders (2003) and Wray et al. (1987, 1991). Kent (1983, 1984) is a good source for Pennsylvania and several of the volumes in Fenstermaker's *Archaeological Research Booklet* series may also be of use (Fenstermaker 1974a, 1974b, 1977). Researchers in the Mid-Atlantic states will need to rely on Miller et al. (1983). For the Southeast and central Gulf Coast, there is the St. Catherines Island, Georgia, report by Blair, Pendleton, and Francis (2009), Pluckhan's (1996-1997) report on early historic Creek beads (Georgia), Deagan's (1987) study of the beads of Spanish Florida and the Caribbean, Smith's (1983) synopsis of Spanish-period beads, and Brain's (1979) study of the beads from the Tunica Treasure (Louisiana).

Quimby (1966) remains a solid source for the Great Lakes region and Stone (1974) and Mason (1986) should also be consulted. One of the best sources for the Midwest is Good (1972). An overview of Northern Plains and Upper Missouri beads is provided by Davis (1972), an abbreviated version of which appears in Davis (1973). The studies of the beads recovered from Fort Union, North Dakota, are especially useful (DeVore 1992; Ross 2000), and the Leavenworth site (South Dakota) report by Bass, Evans, and Jantz (1971) is also recommended. For the Southern Plains, see Good (1983), Harris and Harris (1967), and Sudbury (1976). They cover the period from 1700 to 1885.

Miller (1994) discusses Alaskan trade beads. As for the Northwest Coast, Quimby (1978) presents an overview of the state of the knowledge of beads in the Northwest, and Woodward (1965, 1970) provides generalized dates for some of the more common bead types. For comparative purposes, Ross' (1976, 1990) studies of the beads from Fort Vancouver (1829-1860), Washington, are essential. As for California, the typology compiled by Clement Meighan (n.d.) must be mentioned as it has been used widely by local researchers. Unfortunately, it is so far only in manuscript form and not readily available. Other reports that should prove helpful to researchers in California are Dietz (1976), Karklins (2009), Motz and Schulz (1980), and Van Bueren (1983).

More comparative information on beads from North American sites may be found by checking the indices in the two annotated bibliographies by Karklins and Sprague (1980, 1987). These are available online at <http://beadresearch.org/Pages/Bead_Bibliography.html>.

Researchers in Mexico should find DiPeso (1974, Vols. 3, 8) and Kelly (1992) of interest. For adjacent Belize, see Smith, Graham, and Pendergast (1994). Spanish Colonial beads from Peru are discussed in Donnan and Silton (2010), Liu and Harris (1982), and Smith and Good (1982).

In the Caribbean region, Deagan (1987) deals with Spanish material in general, Karklins and Barka (1989) cover St. Eustatius, Karklins (1998) discusses beads from Jamaica, and Handler and Lange (1978:274-281) record the beads found on a plantation site on Barbados.

A number of distinctive bead types are also good horizon markers. These include man-in-the-moon beads (Lorenzini and Karklins 2000-2001), faceted mold-pressed beads (Ross 2003), drawn beads with polyhedral perforations (Ross 2005), drawn white-cored cornaline d'Aleppo beads (Billeck 2008), early eye beads (Smith 1982), Nueva Cadiz beads (Liu and Harris 1982), and wound pigeon egg beads (Engages 1984).

Origins

Although Venice/Murano and Bohemia produced the bulk of the glass beads that were exported to the New World, Holland, Germany, France, England, Spain, Russia, China, and likely some other nations also contributed their share (Kidd 1979; Liu 1975a). Unfortunately, there is no routine method for determining the country of origin for any given bead type. Although van der Sleen (1967:108) proposed that Dutch beads can be distinguished from those of Venetian origin on the basis of chemical composition (Dutch beads supposedly having a high potassium content compared with a high sodium content in Venetian specimens), this supposition was based on limited evidence and is not supported by more recent findings (Karklins 1983a:116). It also totally ignores the chemical make-up of beads manufactured in other countries which could also be high in either potassium or sodium, these being the two standard fluxes utilized in the production of glass.

Much has been done since van der Sleen's pioneering work to determine bead origins on the basis of chemical composition. Most notable are the long-term neutron activation studies conducted by Ron Hancock (Karklins et al. 2001, 2002) and summarized in Hancock (2005) and, more recently, the work undertaken by Burgess and Dussubieux (2007) employing Laser Ablation-Inductively Coupled Plasma-Mass Spectrometry (LA-ICP-MS). They have brought us closer to understanding bead chemistries over time and determining bead origins, but much more work is required before we have the full story. A major factor is the scarcity of comparative material from tightly dated European manufacturing sites. Aside from the beads recovered from 17th-century factory sites and factory wasters in Amsterdam (Gawronski et al. 2010; Karklins 1974, 1985a) and Middelburg (pers. observation) in The Netherlands and the mid-17th-century Hammersmith Embankment site (Egan 2007:5) outside London, England, there are no recorded assemblages of beads of like date from actual manufacturing sites in Europe that I know of and thus far it has been impossible to obtain samples of the Hammersmith beads for analysis. Excavations have also been conducted on manufacturing sites in Germany but the results have yet to be published. Similarly, excavations in and around Paris have produced beads (Dussubieux and Gratuze 2012; Turgeon 2001) that may be local products but this is by no means certain. Factory sample cards from the 19th and 20th centuries are plentiful and chemical analysis of the beads they hold could yield much useful data but such a project has yet to be undertaken. Clearly much more research is required before chemical analysis can resolve the question of bead origins.

It is, nevertheless, possible to determine the probable source of many bead types and varieties on the basis of historic sample cards, museum collections, and archaeological specimens from European manufacturing sites. While it is beyond the scope of this report to attempt a detailed account of what each country produced, the following summary will provide the reader with a basic understanding of each country's principal products and identify additional sources of information.

Venice/Murano

Venice and its factory island Murano were the main suppliers of glass beads to traders and explorers heading to the New World. It had no real competition until the rise of the Bohemian bead industry beginning in the 1860s (Francis 2008). The Venetians produced the bulk of the drawn embroidery beads that flowed into the Americas over the centuries but they are best known for the colorful array of fancy wound beads, including a vast array of mosaic or millefiori beads, that delighted people around the world and brought the Venetians great wealth (Karklins and Adams 1990). Examples of Venetian products may be seen in many museums and publications. Four well documented sources are the Giacomuzzi bead sample book and folders (Karklins 2002), the Frost trade bead collection (Illinois State Museum 2006), the sample book of 19th-century Venetian beads (Karklins 1982b, 1985c), and the J.F. Sick & Co. sample card collection (van Brakel 2006). A vast array of beautifully photographed Venetian beads may also be seen in the *Beads from the West African Trade Series* (Picard and Picard 1986a, b, 1987, 1988, 1991, 1993) and Panini (2008).

Bohemia

Centered on Jablonec nad Nisou (Gablonz in German) in the Czech Republic, the Bohemian bead industry is not as old as that of Venice/Murano but starting in the mid-19th century, it became a serious competitor for the world bead market. While there were major factories, much of the production work was done in small workshops in the surrounding mountains. Like the Venetians, the Bohemians churned out tons of embroidery beads, but are best known for their faceted and polyhedral drawn, mold-pressed, blown, and Prosser-molded beads which were produced in an amazing range of forms and colors. The blown beads were especially suited for Christmas tree ornaments (Neuwirth 1995). Wound beads were also produced but only in limited quantities. The most comprehensive work on the industry is Neuwirth (1994, 2011) which not only discusses its history and technology, but provides a wealth of illustrative material. Other examples are illustrated in Picard and Picard (1989). To see actual examples, a visit to the Muzeum skla a bižuterie in Jablonec is a must. Some bead sample cards that exhibit blown beads that appear typically Bohemian bear the wording Made in Austria (Neuwirth 2011: Plates 48B-C, 50). These are actually Bohemian products, created when Bohemia was part of the Austro-Hungarian Empire between 1867 and 1918.

Holland

During the 17th century, several glasshouses in Holland undertook the manufacture of drawn glass beads. These were located in Amsterdam, Middelburg, Haarlem, and Rotterdam (Karklins 1983a; Francis 2009a). Although the products were well made and closely resembled Venetian beads, the Dutch seemingly could not compete with Venice and drawn bead production in Holland does not seem to have extended past 1698 (Karklins 1983a:113). Some of the products are discussed and illustrated in Karklins (1983a, 1985a), Gawronski (2010), and van der Made (1978). A chemical profile has been determined for them (Gawronski 2010:148; Hancock 2005; Karklins et al. 2001, 2002).

A distinctive assemblage of wound beads has been recovered from non-factory sites in Amsterdam (Karklins 1985d) as well as at Dutch sites around the world that date to the late 17th and 18th centuries; e.g., Karklins (1991), Karklins and Barka (1989), and Karklins and Schrire (1991). These include the distinctive, large to very large, pentagonal-faceted (WIIc), raspberry (WIId), melon (WIIe), and ridged-tube (WIIf) beads, as well as some very large round, oval, and doughnut-shaped varieties. In North America, many of these types are present in the 18th-century Tunica Treasure from Louisiana (Brain 1979). While it is tempting to conclude that they were made in Amsterdam, there is no archaeological evidence in the form of production debris or malformed beads there to support this and it is quite possible that these beads were obtained from Venice, Germany, or another source and were simply traded by the Dutch. It should also be kept in mind that some of these types were also produced during the 19th century and are definitely not Dutch. Chemical analysis may help solve this conundrum.

Germany

Nestled among the forested hills of Thuringia in east-central Germany, the town of Lauscha was already producing glassware at the end of the 16th century. The production of beads, however, did not begin until around 1750. The early beads appear to have been free-blown followed in the early 1800s by those blown (utilizing locally produced glass tubes) in two-piece molds composed of brass, porcelain, or slate. Gang molds were introduced around 1850, greatly increasing output. The beadmaking process was industrialized in 1862, when the beads created in individual workshops began to be finished in a factory setting. This greatly reduced costs and dramatically increased production (Busch 2000). Nevertheless, competition from the Bohemians who made much the same products, only better, hurt their business and it went into decline. To compensate, the Lauscha glassworkers turned to making technical glass, elegant tableware, and other such items, essentially leaving beadmaking to the Bohemians (Jargstorf 1995:83).

The principal products of the Lauscha beadmakers were silvered components for Christmas tree ornaments, faux pearls, and a myriad of colorful blown beads of sundry forms to be turned into necklaces and other adornments. A sample of the latter dating from the period 1850-1880 may be seen in Busch (2000:30). Many of the items made in Lauscha are very similar in appearance to those produced in Bohemia. Perhaps chemical analysis will provide a means of differentiating the two.

The mountainous Fichtelgebirge region of northern Bavaria was also a bead producer and production was apparently already underway there in the 15th century (Kenyon et al. 1996, 2009). What was made during the early period remains unknown but seems to have involved lampworking. In the 19th century, a principal product was a large bead (round, oval, or ring shaped) made using a technique not usually associated with European glass beadmaking: furnace winding, a process in which a worker removed a small gather of glass directly from a pot of molten glass with a pointed iron rod and formed it into the desired shape (Kenyon et al. 1996, 2009). Some mold-pressed beads were also produced during the latter part of the 19th century, and possibly drawn beads as well.

Following World War II, the Sudetenen Germans were expelled from Bohemia and this group included about 2,000 beadmakers. Many of them renewed their businesses at the edge of the city of Kaufbeuren in Bavaria and named the new community Neugablonz (New Gablonz). They continued to make what they had produced in Bohemia – principally mold-pressed beads, but also wound varieties. While beadmaking has declined in Kaufbeuren-Neugablonz, it still continues (Wild Things Beads 2011).

The products of Germany were distributed worldwide. Some 19th-century examples are illustrated in Busch (2000) while several 20th-century varieties are illustrated in the J.F. Sick and Company catalog (1921: page 44).

France

Beadmakers in Paris and elsewhere in France were already involved in the production of draw, mold-pressed, and, to a lesser degree, wound beads in the 16th century. The former appear to have been shipped to North America in fairly large quantities (Turgeon 2001:68, 70). Faux pearls, blown at the lamp and then made to look like the real thing using a number of ingenious methods, became a French specialty starting in the 17th century (Opper and Opper 1996-1997). Unfortunately, aside from the few 16th-18th-century beads illustrated by Dussubieux and Gratuze (2012) and Turgeon (2001:59), some of which may be imports, very little is known about what bead varieties were manufactured in France during the two centuries that followed.

A significant product that began to be made around 1860 in Briare was the "tile" or Prosser-molded bead (Kaspers 2011; Opper and Opper 1991). Having greatly improved upon the process patented by the Prosser brothers in 1840, Jean Felix Bapterosses was able to dramatically increase production of this product. In 1870, some workers moved to Gablonz and thus began the Bohemian tile-bead industry. The Bapterosses factory continued to produce beads until 1962. A selection of its more recent products may be seen in Kaspers (2011).

During the 20th century, the Salvadori company in Vaulx-en-Velin produced drawn seed beads, many of which were used domestically to make ornate funerary wreaths (Opper and Opper 1991). It is visually near impossible to segregate them from the products of Venice and Bohemia.

England

Little is known about glass beadmaking in England and even what is known is a bit enigmatic. While several encyclopedias printed between 1860 and 1906 state that there was a major bead industry in Birmingham (Karklins 1987, 2009), there is no supportive evidence either in the form of documentation or actual beads. A thorough examination of the Birmingham city directories reveals that there was a "glass pincher" (lampworker) there as early as 1767 who is identified as a "necklace maker." By 1829, four glass beadmakers are listed in the directories, but it is uncertain if they actually produced beads or were just dealers selling imported goods. Glass beads cease to be mentioned after 1895 (Karklins 1987).

A small group of lampworkers also worked in the Bethnal Green and Shoreditch area of London up to about 1857. They made simple wound beads but, being "so careless and unpunctual," their business came to an end (Hartshorne 1897:106n). Such work also took place in Bedfordshire during the latter half of the 19th and early part of the 20th centuries (Springett and Springett 1987:14). It is likely that, due to the relatively crude nature of many of the beads mentioned above, most were used locally, many finding their way onto the spangles that were attached to lace bobbins by lacemakers in the East Midlands. Examples may be seen in Springett and Springett (1987).

The only evidence for the manufacture of drawn beads in England was that found at the mid-17th-century Hammersmith Embankment site (Egan 2007:5) outside London. The recovered wasters and finished beads (some are illustrated in the cited article) are very similar to both contemporary Venetian and Dutch beads. Whether any of these made it to North America remains unknown.

Spain

Researchers have for some time speculated that Spain may have produced beads but no concrete evidence to that effect has as yet been encountered. Based on an examination of a large collection of beads recovered from the 16th-17th-century site of Mission Santa Catalina de Gaule, Georgia, Francis (2009b) has postulated that a number of distinctive beads are likely to have been produced in Spain. These include small wound annular beads, several types of gilded wound beads (with and without incised decoration), and lampworked segmented beads, including gold-glass varieties. It is hoped that chemical analyses will corroborate these identifications and add additional types to the list of Spanish-made beads.

Russia

There are few details about glass beadmaking in Russia during the historic period. Farris (1992:2-3, 2009:24) reveals that there was a factory in St. Petersburg established by the renowned scientist M.V. Lomonosov which produced "fine glass beads" during at least the latter part of the 18th century. Another factory was established in Irkutsk, Siberia, in 1782 by a student of Lomanosov's and operated until the

1820s (Farris 1992:2-3, 2009:24). Among other items, the glassworks manufactured seed beads, likely specimens of which have been excavated in the area. They are primarily light blue in color and were fashioned from a low-quality glass using a local carbonate salt as the flux. Thus they have a milky appearance and exhibit leached surfaces (Farris 1992:2-3, 2009:24). Some of these beads may well have made it to Alaska and beyond.

There was also a thriving beadmaking and beadworking enterprise in the vicinity of Moscow during at least the last quarter of the 19th century but the indication is that the products were intended solely for the local market (*Pottery and Glassware Reporter* 1885).

China

Information on the types of glass beads imported from China is limited but the indication is that most, if not all, of them were wound, either at the lamp or at the furnace (Francis 2002:83). Examples that date to the 1850-1940 period may be seen in Burgess and Dussubieux (2007), Fenstermaker and Williams (1979), and Liu (1975). Francis (2002:83) typifies these late beads as being made of leadless, very bubbly glass of distinctive colors and with large perforations. Burgess and Dussubieux (2007) provide a chemical profile for the beads. An overview of the modern Chinese bead industry appears in Sprague and An (1990).

Function

Unless a bead is found in an archaeologically diagnostic context (e.g., sewn to clothing, situated at the neck of a burial, or strung on a rosary), it is extremely difficult to assign it a specific function. Although "little" beads (those under about 6 mm in diameter) were commonly used in embroidery and loom work, they were frequently also employed in the formation of necklaces, earrings, and nose and hair ornaments, as well as decorative inlays in aboriginal pottery and other items. Similarly, "big" beads (those over about 6 mm in diameter) are commonly thought of as necklace components but also served to adorn fringes, baskets, mats, vases, and other items. Thus to arrive at the real function of a bead, not only must its size be considered but also the cultural, historical, and archaeological contexts.

Insight into how the Native peoples of the Americas utilized beads may be found in Orchard (1929) and Karklins (1992). There are numerous publications that deal specifically with the beadwork of various cultural groups and a listing of some of the classic ones may be found by checking the two Karklins and Sprague (1980, 1987) bibliographies.

CONCLUSION

This guide was prepared to allow archaeologists and others to adequately and correctly classify and interpret their beads. Doing this will greatly facilitate inter-site comparison of bead assemblages and facilitate the preparation of regional chronologies that will help to date archaeological contexts. It will also facilitate the development of distributional charts for beads that may be characteristic of a certain period or cultural group. While far from perfect, the taxonomic system created by Kenneth and Martha Kidd and expanded herein remains the best one for the logical ordering of glass bead types, especially those in the drawn category. Those who do not wish to utilize the Kidds' variety numbers can still use the Kidd types to organize their bead inventory. Even if one uses an arbitrary Type or Variety system (i.e., Variety 1, Variety 2, etc.), it should be ordered using the Kidd system as this will make comparative studies much easier. Appending the Kidd type code to the arbitrary type number would be very beneficial; e.g., Variety 1 (Kidd Ia1). In any event, the important thing is to describe beads in a way that will convey as much information as possible to others. Sharp color images of the beads are a must and will generally make up for any deficiencies in their description.

ENDNOTES

1. This guide is a greatly expanded and updated version of the one first published in 1982 by Parks Canada and reprinted in 1985 (Karklins 1982a, 1985b). New types have been added to each manufacturing category with a corresponding schematic drawing being incorporated into the appropriate figure. The interpretive section relating to origins has been fleshed out and the chronology section has not only had numerous references added but the scope has been increased to cover all the Americas and the Caribbean.

2. The mold-pressed classification system has been simplified from that presented in the previous guides with the result that the codes for some types have changed (cf., Karklins 1982a, 1985b)

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