The World of Beads Monograph Series 8

THE GLASS TRADE BEADS OF EUROPE

Their Manufacture, Their History, and Their Identification

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SOME KEY DATES IN EUROPEAN GLASS BEADMAKING HISTORY

1110-40 Theophilus' On Divers Arts
1291 Glassmaking moved to Murano
1308 Margarteri guild organized
1359 Glasshouse at Vimpark, Bohemia
1376 Queysser factory at Sklenařice
1477 La Pasternostrière in France
1480-1490 Tube drawing in Venice
1486 Paternosteri guild organized
Furnace-wound beads started in Royal Forest with Venetian help
1492 Columbus finds America
1497 Vasco da Gama reaches India
1510 Beadmakers supported by the Capitolo dell' Arte
1528 Supialume organized
1530 The Shürer's open first factory
1540 Biringuccio's Pirotechnia
1550 Agricola's De Re Metallica
1551 Mutio makes beads in France
1579 Beadmaking at Beckley, England
1593 French Patenôteier guild
1597 First Dutch bead factory (1580?)
Beadmaking at Lauscha, Germany
1603 Soop smuggles beadmakers to Holland from Murano
1605 Z.A. Miotti owns Dutch factory
1612 Neri's L'arte Vetraria
1615 Munsell making beads in England
Spain may be making beads
1635 Crisp obtains beadmaking patent
1647 Supialume achieve full status
1656 Jaquin invents Roman pearls
1662 Merrett translates Neri
1676 Kunckel making beads in Potsdam
1677 V. Miotti invents aventurine
1685 Cassius makes gold ruby glass
1697 Last known Dutch bead factory
1706 Turnov send the Fišers to Venice
1715 "Composition" glass at Turnov
1718 Peace of Passarowitz
1725 French making "French jet"
1730-50 Bertolinis improve lamp work
1751 Bohemians show beads in Lisbon
1753 Lomonosov making beads in Russia
1766 Riedl's factory at Nová Louka
1767 Beadmaking at Birmingham
1767 Vistosi helps spread Venetian beadmakers throughout Europe
1781 Reidls record first beads
1787 Unger opens first Jablonec bead factory
1790 Death of Václav Rybář, inventor of the tong mold
1790s Aventurine being made by others
1791 Miotti family closes business
1797 Peace of Campoformino
1810 Blown beads in Bohemia
1814 Peace of Vienna
Reidls move to Zenkner works
1817 Pusinich invents tumbling machine
1822 Longo invents cutting machine
1826 G. Franchini makes coral glass
1835 First description of manually opening gather for tube drawing
1837 Zenkner works making millefiori
1838 Bassano invents polishing machine
1839 Kamenický Šenov glass school
1840 Richard Prosser's patent
1841 Thomas Prosser's patent
1843 Bussolin patents gas lamp
1845 J. Franchini makes first mosaics
1860 Graziati makes macca beads
1861 Zanetti opens Glass Museum
1864 Frigio expands tumbler capacity
1866 Bapterosses making Prosser beads
Jablonec incorporates, and the railroad reaches it
1867 Venice: Miotti improves cutting machine; Zecchin and Ceresa invent sorting machine; Radi, Giacomuzzi, and Salviati making lamp beads
1869 Barsetta first used
1880 School of Applied Arts, Jablonec
1894 Arbib invents tamburo
1895 No more Birmingham beadmaking
1898 The Conterie is formed
1900 Conterie regroups French firms
1914-17 War disruptions
1917 Czechoslovakia is formed
Danner's tube-drawing machine
1920 The Conterie buys Sachse & Co.
1920-30 Venice buys Danner machines
1920 Glass number two Czech export
1921 Lalique making necklaces
1922 Rousselet making glass beads
1929 Czechs make "by far the largest proportion of the world's beads."
1930-45 Depression and War
1940 The Hendricks go to India
1945 Large Czech glass factories nationalized; many workers go to Austria and Germany
1948 All glassworks nationalized
1955 Revival of Czech industry
1975 Rousselet stops beadmaking
1987 Czech beadmaking in China

COLOR PLATE

Beads of Venice

A. 1-10 Early drawn beads; 4 Paternoster bead. 11-18 Chevron beads.
B. 1-6 Cornaline d'Allepos. 7-14 Beads matching those in the Levin catalogue and early cards in the Murano Museum (early 19th century).
C. Millefiori. 1 is a "Flush Eye" bead. 2 and 3 have similar patterns, but 2 is molded, while 3 was made by bundling canes. 4 is a combination of molding and cane bundling. 5 has a rooster, the mascot of Murano, in the center of each cane; 6 has a spade pip. 7 is an unusual red cored millefiori. 9 is an unusual bundled cane bead. 10 is current production (late 20th century). 11-14 are mosaic cane chips (murani).
D. Beads matching those in the Giacomuzzi book and later cards in the Murano Museum (late 19th century).
E. Beads matching those on the Frost cards and the Allen catalogue (early 20th century)
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H. Beads imitating other people's beads. 13 Novelty bead.
I. 1-4 Beads for the Muslim market. 5-7 Beads imitating natural objects. 8 Spacer. 9 Impressed square bead. 10 Blotched bead. 11 Inside of a bead similar to G 12. 12-13 Pendants.
J. 1-2 Novelty beads. 6-9 Art Nouveau/Deco. 10-11 "Tut" beads.
K. Current (late 20th century) production.

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8-15 Royal Forest, post World War II.
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CENTRAL EUROPE, SHOWING SOME BEADMAKING CENTERS

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Peter Francis, Jr.

PREFACE

The Story of Venetian Beads and The Czech Bead Story, the first volumes in the World of Beads Monograph Series, were the earliest detailed histories of the world's two most important glass beadmakers of the last 500 years. They are now out of print, but the information in them remains valuable to many people, both those who appreciate the beauty of beads, and those involved in historical and archaeological studies.

Much more information has been obtained about both industries, as well as minor beadmakers of Europe. There is still a great deal to be learned about European glass beads, but progress has been made. Rather than reprinting these books, an entirely new and expanded work is being offered.

This volume is more than a revised edition of the former two books. It is completely rewritten and the plate redone. The information incorporates new research now possible because of access to older but often obscure works.

Although this is a history of beadmaking and beadmakers, it is also a guide to the beads themselves. European glass beads of the last 500 years or so are found throughout the world: in America, Africa, Europe, Asia, and Oceania. The term "trade bead" is used here in its widest sense. While any bead of commerce is a trade bead, the ones discussed here are principally those used by European explorers, settlers, and merchants as they penetrated and came to dominate the rest of the world. Many of the older beads remain important to the people who received them and are now heirlooms among them. We have also included information about newer European glass beads, though they did not necessarily participate in older trade transactions.

This work is divided into five sections. The first is an introduction to glass beads and beadmaking processes. The second is a brief discussion of the Medieval background to European beadmaking, which formed the basis for subsequent developments. The other three sections discuss the beadmaking of Venice (Italy), Bohemia (now part of Czechoslovakia), and other beadmaking regions in Europe. Each contains a history of beadmaking in the area involved, followed by a discussion of the beads made in those areas, with an attempt at ordering them chronologically. The sources used and the problems involved in this approach are discussed at the end of Section One.

Bead research is an interdisciplinary subject, and the sources we consult come from many fields: history, archaeology, ethnography, and others. We are now in a position to evaluate some of the historical record in light of the archaeological record, especially as found in North America.

The text employs three sets of brackets. Square brackets [] are used for references. Pointed brackets <> designate a bead by row and number on the color plate and are used sparingly for details which might otherwise be put in a footnote. Parenthases () are used in the ordinary way, and to identify classification numbers in the sections on Venetian and Bohemian beads.

SECTION ONE:

INTRODUCTION

Beginning with Glass

Glass is one of the most familiar products of our age, yet its exact nature is often not well understood. Rather than a material, glass may be defined as a state of matter, formed by heating metals and cooling them below their point of crystallization without allowing them to crystallize. Glass is amorphous and has no precise composition.

As used here, glass is always an artificial, man-made product. The most common metal used to make glass is silica, one of the most abundant elements on Earth, a component of many rocks, and the principal ingredient of sand. Glass is highly versatile and can be opaque or translucent, formed into a great many shapes, and colored virtually any hue. It is easily recognized by being cool to the touch, will scratch a piece of copper but not a steel file or a piece of agate, and nearly always has bubbles of entrapped gasses.

The origins of glass are not precisely known. The data for its beginnings have recently been reviewed [Francis 1986a:3]. To summarize, stone beads were glazed with a thin coat of glass in Egypt before 3800 B.C., but the earliest known actual glass is from Mesopotamia about 2445 to 2414 B.C. Glass beads appeared in Egypt 2387 to 2365 B.C., and beads and fragments of glass have been found in the Caucasus from about the same period. Locally made glass was first produced in China and in India around 1000 B.C.

From the beginning, beads were an important glass product. Glassmaking is more an art than a science, but the raw materials are fairly common, and the scarcer ingredients, such as colorants, were articles of commerce. Glass is ideal for beads because it is versatile, durable, and relatively abundant. Because glass beads are not made everywhere they enjoy a ready market among people who do not make them, and have been trade items for millennia.

Trade Beads and the Bead Trade

Trade beads imply a bead trade, and beadmaking and trading are two of the world's earliest industries. As trade goods, beads were secondary to cloth, foodstuff, and metal tools, but they survive longer than textile, wine, oil, or grain, and were not usually melted down and reused. They also survive because of the value put upon them, and in time acquired increased status as they evolved into heirlooms.

It would be a mistake to underestimate the role beads played in exploring and colonizing the world. The moment Columbus landed in America he gave away glass beads to people who had never seen glass, but knew enough to put them around their necks. English, French, Dutch, German, Spanish, Russian, American, and Portuguese explorers, missionaries, traders, and settlers all took glass beads to every part of the world [see Francis 1986b]. Although there is no proof that beads bought Manhattan Island [Francis 1986c], they paid for much else -- friendship and food, and, sadly, slaves.

Europeans placed little value on these beads. They were called "trifles," "toys," and even "trash," and when possible, the least expensive and usually least attractive ones were foisted onto the Natives [Francis 1986b:30]. Today trade beads are regarded as valuable. Their use in archaeological and historical studies is well attested, and there is a growing appreciation of their importance to the people who wore them [Hamell 1983].

The bead trade began with the beadmakers, on whom this study concentrates. From them, beads traveled many routes, were sold to firms large and small, and resold to individuals. Virtually every explorer had them to barter or as gifts, whether Columbus, Cortez, or Cook. They were purchased in bulk by large quasi-official enterprises such as the British East India and Hudson's Bay Companies, the United (Dutch) East India or West India Companies, or the Russian-American Company, and were available to small independent traders, who were satisfied with a meager profit. They were redistributed by the Natives, and internal bead trade networks in the Americas and Africa are documented. Today's bead trade is not only in new beads but in old ones as well, often reversing the original direction of their travel.

Making Glass Beads

Until recently it was assumed that there were only a few ways to make glass beads. Along with an appreciation of the variety of beadmakers, we have learned that there are many beadmaking methods [Francis 1982a; 1983; Sprague 1985]. It is critical to understand how a bead was made, as it may suggest its date or origin, and reflects the level of the beadmaker's technology. Fortunately, it is usually possible to recognize how a bead was produced, but we must first understand the processes involved.

The Sources of Glass

Beadmakers may acquire glass by one of three ways: 1.) Make it themselves, 2.) Melt down old glass, or 3.) Use specially prepared glass products. The earliest European beadmakers made their own glass or reused old sherds. The reuse of old glass was not practical for large producers due to the volume needed. The size of these industries caused them to specialize, with the factories making raw glass as semi-finished products to be formed into beads in small shops or in private homes.

For ordinary glass there are three necessary ingredients: SILICA, which constitutes 60 to 70 % of most glasses, an ALKALI to help lower the melting point of the silica, and LIME to stabilize the silica-alkali composition. Various metals are used for the colors. Most glass also contains many other elements because ancient glassmakers could not prepare pure batches.

The Venetians used sand for their silica. In the last century most of it came from Pola, on the Adriatic coast [Zanetti 1869:36], while fifty years later it was mostly brought from Fontainebleau, France [Carroll 1917:3]. The Bohemians favored quartz crystal from the nearby mountains.

Most alkali came from plant ashes. Venice imported prepared ashes of the saltwort ("barilla" in Spanish) plant (*Salsola kali*) from Spain and Syria [Zanetti 1869:36; Gasparetto 1975:54], from which our word alkali ("the ash" in Arabic) comes. Venice also used some natron, or impure soda carbonates from Lake Natron in Egypt [Zanetti 1869:36]. The major Venetian alkali was therefore SODA. The Bohemians burned beech wood to yield POTASH, a source of POTASSIUM. Since the wood was used for fuel, this was a great advantage for them. The Dutch often used potash, too. During the Revolution, France was cut off from the soda sources, and in 1794 Le Blanc perfected SALTCAKE, a cheap soda from brine [Angus-Butterworth 1948:27]. <The English patent for this process gives his name as Antoine Blanc.> However, glassmakers often mixed their alkalis and used different ones at different times.

Ash alkalies did not come cheap. In Bohemia for every ton (1000 kgs) of beech wood, only 3.2 pounds (1.5 kg) or even 2.2 pounds (1 kg) [Hettes 1958: 6; Barta 1930:A456] of potash was produced. Early beadmakers spent half the year making beads and the other half cutting wood [Jackson 1927:A113]! Of course, when trees are cut the supply does not last forever. In the early 19th century when Joseph Lobmeyer set up a glasshouse in Slovakia local peasants objected, at least in part because of his need for so many trees [Despot 1962:106].

Glassmakers strove for improvement. The **CRISTALLO**, on which the fame of Venice rested, invented by Angelo (Anzolo) Barovier (1405-1460), was nearly clear, decolored with manganese and made with purified alkali and special care [Mariacher 1966:79; Mentaste 1980:XLVI]. It was still slightly grey and bubbly [Haynes 1959:68]. Michael Müller, master of the glasshouse of St. Anton, in south Bohemia, developed **CHALK-GLASS**, or **BOHEMIAN CRYSTAL**, in 1683, which was soon widely made in Bohemia, although its brilliancy was hard to maintain [Turner 1956:46T; Weiss 1971:334]. Better glasses came later with the use of lead and the purification of ingredients.

Glassmakers had to build their own furnaces and pots. An excellent view of this in the mid-18th century is in Denis Diderot's **Encyclopedia** of 1761 [Gillispie 1959:II pl 209-234]. Clay mixed with fragments of bricks and old pots was used to line the brick furnaces and to make new pots. Several furnaces were needed: a **CALCINATING** furnace, the **MAIN** furnace, sometimes **SUBSIDIARY** furnaces, and a **LEHR**. Pots lasted only a few months and furnaces a year or two, largely because of corrosion from the glass. In Venice the furnaces of clay and sand needed frequent repair if they were to last two years. At first they were worked for only nine months, but later were used 44 weeks of the year; the rest of the time was devoted to maintenance and accounts [Zanetti 1869:34; Dillon 1907:182].

Raw materials were first refined: quartz and limestone broken up, sand and chalk washed, and ashes leached or **LIXIVIATED**. These were heated in the calcinating furnace until they melted into a hard mass called **FRIT**. Then the frit was broken up, mixed with crushed scrap glass called **CULLETT**, and the whole was put into the main furnace. In time it would liquify almost magically. At large houses, this molten glass was transferred to subsidiary furnaces, but in smaller ones it was worked at the main furnace. When glass cools and solidifies, strains are produced that may cause it to break. So it must be cooled slowly or **ANNEALED**. Vessels were annealed in a lehr. For beads made at the furnace, a small attached compartment served the same purpose. When glass is quickly pulled out into a tube or cane, it does not usually have to be annealed.

Glass Into Beads:

Beads Direct from the Furnace: Furnace-Wound Beads

Glass hot in the furnace can be used to make beads directly by dipping an iron rod or **MANDREL** into the crucible and twirling it until a bead is built up. While hot, the bead may be pressed or manipulated into shape, dipped into another color of glass, or decorated with glass from another crucible. When finished and still semi-molten, the bead can be knocked off the mandrel into an annealing chamber because glass cools and contracts slightly slower than iron.

These are **FURNACE-WOUND** beads, with their fabric and bubbles encircling the perforation. They are often large with large bores, and a thin black deposit in the perforations, a bit of iron oxide from the mandrel. They also tend to be less perfect than other types of wound beads and sometimes less elaborately decorated. Many earlier and some later European glass beads were furnace-wound, including the early products of Venice.

Semi-Industrial Beadmaking

The great European beadmakers found it more efficient to make beads by other methods. The glassmakers made intermediate products to be worked by others into beads. The product was either a solid rod or **CANE** ("canna massiccia" in Italian), or a **TUBE** ("canna farata" in Italian). Tubes were be cut into beads, while canes were reheated and wound into beads. Both canes and tubes were made by pulling out or **DRAWING** a gather of glass. Beads made from cut tubes are called **DRAWN BEADS.**

Beads from Tubes: Drawn Beads

To make a tube the master takes a **GATHER** of glass from the furnace and works it into a hollow cylinder by blowing air slowing into it, or, as at Venice for the last 150 years, by manipulating the gather into an open cone. The gather may be decorated by placing canes of different colored glass on it, or dipped into other colors of glass. More elaborately, colors were added successively and the gather molded to build up concentric waves. This was the method used to make the well known **CHEVRON** bead. The prepared cylinder is then drawn into a tube by having an assistant attach an iron rod to one end or join it to a similar open glass cone and walk or run away, producing a tube up to 300 meters (or yards) long. (Figure 2)

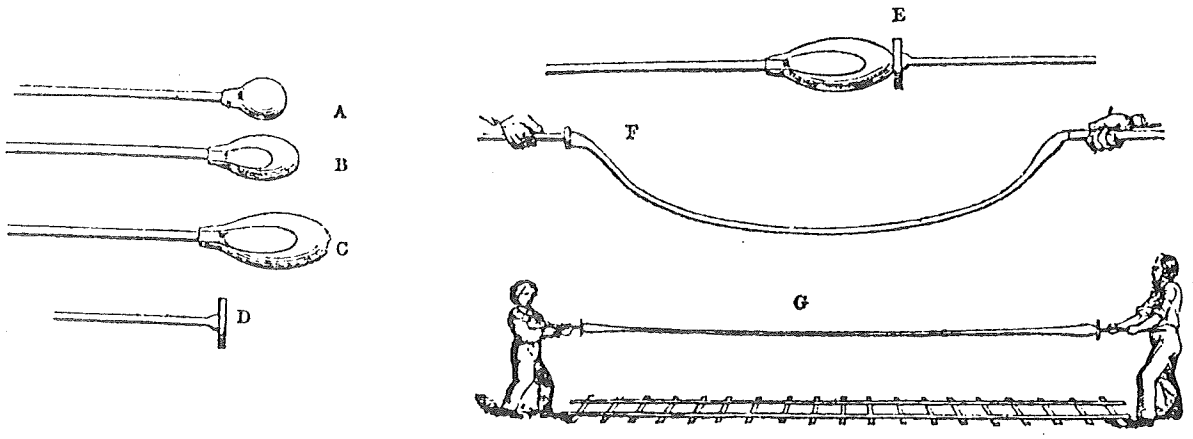


Fig. 2: A is the glass gather; B and C have been made hollow. D is the rod which is attached to the gather in E. F and G are the drawing of the tube.

The tube is cut into meter lengths and sent to other workers. They are sorted by diameter, cut into short segments, then packed in ash or a mixture of charcoal and lime to fill the holes. Then they are agitated with sand over heat to smooth off their sharp edges. The ash prevents the holes from

collapsing or the beads from breaking. At first the reheating was done on a flat plate. Later the Venetians invented a rotating drum suspended over a heat source. After reheating, the sand is removed and the beads sorted for size in a series of sieves, and prepared for selling. They may be sold loose, but are often strung by women who put many into a flat pan or basket and run 20 or more fine needles through the mass of beads, picking up beads with each operation. In Venice this process was the work of the Margariteri guild and called "a ferrazza," after the iron rod once used to stir the cut bead segments while reheating.

There are variations on this technique. One is to cut segments of large tubes and finish them by hand. This could be done hot, by placing them on a wire and holding them to a flame, in which case they could also be decorated by hand. In Venice this was the work of the Paternosteri, working "a speo," or with a spit. Finishing could also be done cold, by grinding beads against a wheel. The hot finishing of drawn beads passed away, but most chevrons continued to be cold finished; at least some of them may have been worked in Treviso, rather than Venice, where running water could drive the grinding stones [Dillon 1907:182]. Another variation was to pinch beads from a hot (apparently reheated) tube, as was done with some chevron and other beads.

No matter how they were finished, drawn beads can be recognized by their fabric and bubbles running parallel to the perforation. They tend to be fairly regular in size, and larger ones are usually tubular in shape. The decorations of most drawn beads are limited to longitudinal stripes or to concentric color layers. More details about these operations and changes in them over time are included in the section on Venice (pp. 19-20).

Beads From Canes

The production of solid canes is essentially the same as for tubes, except that the gather is not hollow. Monochrome solid canes were sent to homes to be worked into beads; the difference between how the Venetians and Bohemians made beads from canes is an important distinction between them.

Canes need not be of one color. They can be decorated in the same way as as drawn beads. Colored canes may be laid on the gather before it is drawn out, the gather can be coated with contrasting colors, molded, or worked in combinations of these. Decorated canes can also be made by building designs with semi-molten strips of glass or by bundling cold canes together and heating them until they fuse. Once a design is made and the cane drawn out, it will appear all the way through. Slices of these **FANCY CANES** ("murani") are then added to the surface of a bead. If they are only sparsely placed around a bead we have a **MOSAIC** bead; if they cover the whole surface with a floral pattern it is called **MILLEFIORI** (a thousand flowers) work.

As for monochrome canes, lengths sent to beadworkers' homes were reheated at a lamp and wound around a wire. The wires might be coated with kaolin or a similar material so the finished bead would slip off. Later the Venetians used copper wires, which were dissolved in acid. While still hot, the bead can be decorated with other canes, rolled along a small trough to shape it, pressed into shape with paddles or in a simple mold, or spun around quickly in a depression in a small metal cube (a **HALF-MOLD**) to shape it.

These **LAMP** (or **LAMP-WOUND**) beads are similar to furnace-wound beads in that their fabric and inclusions encircle the perforation. They are usually more even in shape, often more highly decorated, and generally have smaller perforations. If a coating was used on the wire, there may be traces of it

in the perforation. Those shaped with tongs or along a small trough (as in Venice) often show coiling around their apertures <plate L 4>; those shaped in a half-mold (as in Bohemia) are smoother around their apertures <L 5>.

Although the Bohemians made drawn and lamp beads, they are best known for molded beads. These were made by heating canes and then pinching a bit of glass into hand-held two part molds which were closed around the hot glass. The mold shaped the bead, and sometimes had a rod inside to perforate it; others had a hole at the side for pushing a rod in to perforate the bead. A later variant is a tabletop mold which makes a dozen or so beads at a time.

Many molded beads have some extra glass or FLASH squeezed out between the two parts of the mold. If the bead was simple and round this was removed by tumbling with a light abrasive. Beads of complex shape or intricate designs were ground by hand to remove the flash. Molded beads have seams (often appearing as a dark encircling line on an opaque bead) or encircling bands where the bead was ground. Faceting beads can remove the seams completely.

Other Processes

The beadmaking methods just described are those used by traditional European beadmakers. There are many other ways of making glass beads not discussed here because they were apparently not used for European trade beads. A few other more specialized processes call for some notes.

One has been widely used since its invention in 1840 by Richard Prosser (or his brother Thomas, who claimed in 1841 that he was the inventor). These beads are made by molding a mixture of feldspar or clay (which is largely feldspar) with quartz and other materials under pressure. The shiny opaque beads are often called "China" or "Porcelain" beads because of their ceramic quality. The two most common types are spheres with wide equatorial zones <plate L 6>, and short cylinders ("tile beads") <L 7, 8>. Both have pitted areas around one aperture. They were made in several countries, but not in Venice [Sprague 1983; Patents: R. Prosser 1840, T. Prosser 1841].

Glass tubes may be heated over a flame and blown into thin beads, which are sometimes manipulated into shape. These are not very common and not very durable. Germans and Bohemians made beads this way as did others for artificial pearls. Tubes may also be expanded in molds by blowing, which results in a series of beads that are then cut apart.

Today, most glass beads are made by machines. A tube drawing machine was invented by Edward Danner of the Libby Glass Co. in 1917 [see Patents]. The Vello and the updrawing machines were invented a bit later. Danner drawing machines have been used in Venice from perhaps the 1920s. Methods of molding beads in Bohemia were constantly improved, and are now largely mechanized. The Prosser technique was often improved upon [Patents: Bapterosses]. The Bonnet Bead Machine even mechanized the winding of beads [Cousen 1924].

Identifying European Glass Trade Beads

Following the histories of the beadmakers of Venice (Section Three), Bohemia (Section Four), and other European countries (Section Five) are discussions devoted to identifying beads from these areas. An attempt has been made to include most outstanding types, noting their roles in the bead trade, trying to date them, and coordinating them with the beads on the color plate. It is hoped this will prove useful to those interested in the history and trade of European glass beads. However, some words of caution are necessary and should always be kept in mind when reading these pages.

It is unfortunately not yet possible to pinpoint every glass bead in terms of origin and date. We simply do not know enough about manufacturing output nor have sufficient archaeological data at hand. This is the ultimate goal of bead research, but it is still elusive. There is a tendency that once a statement is published it is believed and quoted, even though the writer is well aware of its limitations. It is not necessary to belabor the point, if the reader keeps in mind that this information is preliminary.

With this warning in mind, we can still summarize the data to help build a chronology of beadmaking. This information comes in many different forms, and it is important to understand the nature of our sources and consider their limitations and advantages. The sources we shall use are:

1.) Historical references to beadmaking operations or the bead trade. In In some cases there are direct statements that a particular bead was first made by a certain beadmaker in some year, giving us the earliest date for such beads. To rely on this information we must consider its credibility. Some writers are more trustworthy than others, and some credit innovations which were really made elsewhere. When Abbot Zanetti talks about changes he witnessed in Venice, we can trust him. When travelers describe beads, they only give us dates they were being used, and they may or may not have been well informed as to their source.

2.) Bead sample cards. These have the advantage of presenting the beads themselves for study. However, they must be used with caution. Some sample cards were made for traders who bought beads from more than one source. Few cards are dated, though we can fix approximate dates for many of them. Such cards also show the beads that a company can make, not necessarily those they did make in quantity. They may include older beads to illustrate those once made which could be produced again if there is a demand. An excellent example of this is a Venetian card in the University of Florida with 19th century beads which was assembled sometime after 1948 [Francis 1985a:50-51].

3.) Archaeological evidence. This is becoming increasingly important, particularly from American sites, and to a lesser extent for Africa. A bead from a site dated 1620-1650 was probably, but not certainly made around that time; there are several pitfalls involved. One is that dating is not always precise or accurate. Another is that beads may be heirlooms and buried long after they were made. Beads can also fall down from upper levels into lower or earlier ones. Surface finds are notoriously inaccurate. One bead from one site is much less secure than many examples from many sites. Of course, archaeological evidence gives virtually no hint as to where a bead was made.

With all of these caveats, we might be tempted to abandon any attempt to coordinate known beads with their makers or to date them. Yet this would be a mistake, an easy road too often chosen in the past. While this exercise is preliminary, it is designed to encourage refinement of our information, so we may eventually build a more accurate picture of bead identification.

To aid the general reader, yet present information for specialists, most technical notes, including sources and comments, are given in an indented paragraph in these sections. In the Venetian section, parentheses are used for numbers in the Kidd Classification system [Kidd and Kidd 1970], and in the Bohemian section for registration numbers in the Muzea Skla a Bizuterie (Glass and Costume Jewelry Museum) in Jablonec, Czechoslovakia.

The beads on the color plate have been selected to represent as closely as possible those known from various manufactures at different dates. It was not possible to show all beads known from all places, but by coordinating the literature on this topic we hope that interested readers can be directed to other sources and larger collections.

S E C T I O N T W O:

THE MEDIEVAL BACKGROUND TO MODERN EUROPEAN TRADE BEADS

The glass beadmakers of the Roman Empire were the most advanced of the time. Not all beadmaking centers have been identified, but Rome, Aquilea, Sidon/Tyre, Alexandria, and Cologne were among the more important glass centers, and beads were likely made at many of them. Following the dismemberment of the Roman Empire, some of these areas may have continued their former craft, and some new places began making beads, but the pace of beadmaking certainly slackened.

Before the birth of modern chemistry and world-wide information retrieval, glassmaking was a well guarded secret because of the fear of rivals. Hence, we lack information about how glass was made. We know less about early Medieval European glassmakers than about Assyrian ones 1500 years earlier, because the latter craftsmen were documented [Oppenheim et al. 1970]. Pliny the Elder, a Roman whose authority was unchallenged in Medieval Europe, described glassmaking in Natural History [Eichholz 1962:149-55], which was accurate as far as it went, but no one can learn how to make glass from it.

An early European text to discuss glassmaking is Mappae Clavicula, first known in a 9th century edition. Many of its scattered references to glass concern coloring, including methods which are physically impossible [Smith and Hawthorne 1974:50, 67]. Nor could the two descriptions of glassmaking actually be used. One says to put sand in a crucible and light a coal fire, and, "glass will run from below your hand but a useless kind." The other says to wash sand, heat it in a furnace, grind up the product, and heat it again. So far so good, but to make the furnace, the entire instructions read, "build a glassworker's furnace." [Ibid:62] The magical roots of this work are evident in many passages. To cut glass we are advised to beat goat udders with stinging nettles, milk them by thumping them with the hands, and put glass and an iron tool into the milk overnight. The next day the tool will be hard and the glass soft. If nettles or a she-goat are not around, substitute the milk with some, "small red-headed girl's urine that has been collected before sunrise." [Ibid:67]

The most important Medieval work on glassmaking was compiled probably by a Benedictine monk, Roger of Helmarshausen, writing as Theophilus Presbyter, around 1110 to 1140. As a metallurgist, he detailed the making of furnaces and pots, the working of glass, some coloring operations, and some special products [Hawthorne and Smith 1963:49-74]. He does not discuss beadmaking, but his description of making rings shows how beads were made in his day.

Glass was picked up on the tip of a wooden spit covered with iron, and the spit driven against a wooden post, forcing the glass up the spit. While the glass was reheated, the spit was rotated over the fire and hit against the post to loosen and expand the glass. When the ring reached finger size it was thrown "off at once" into a small clay annealing pot [Ibid:73-4]. This is very similar to the way in which furnace-wound beads are made, except that an iron rod is used, and beadmakers do not jam it against a post. The operation recalls the way bangles are made by traditional bangle- and beadmakers, at least in India [Francis 1982b:21-2].

For centuries, few books on glass were as detailed as Theophilus, and many of them, such as by the Swede, Månnson around 1530 [Winbolt 1933:77-81], were heavily influenced by him. The Siennese, Vannoccio Biringuccio, based his **Pirotechnia** of 1540 on keen observation, but did not write from personal knowledge nor for practical application. He did mention Venetian beads: "The best glasswork that is made in our times and that which is of greater beauty, more varied coloring, and more admirable skill than that of any other place is made at Murano.... Look at the rosaries, the salt cellars, and the drinking vessels in which one actually sees twisted designs of thorn branches and other crisscross inlays which appear to be in relief but actually are plane." [Smith and Gnudi 1943:131-2] De Re Metallica (1550) by Georgius Agricola is based mostly on Biringuccio, but is better illustrated (Figure 1, title page) and describes furnaces better. Several lesser books and a few hand written recipe books for the exclusive use of the author's family, are also known from this period [Mentasti 1980:XLIX-LV].

However, with the increased emphasis on learning and craftsmanship during the Renaissance, a most important work on glass appeared. Indeed, it may well be the most important book in glass history: L'arte vetraria by Antonio Ludovico Neri (1576-1614). It was first published in 1612, but it did not assume its fame until sometime later.

Neri was a Florentine priest who loved all branches of chemistry. Little is known of his life beyond the book and 30 letters written to him by a Portuguese Knight living in Antwerp, Emanuel Ximenes. Ximenes and Neri corresponded about their experiments, and Ximenes persuaded Neri to come to Antwerp for several years to practice his art there. From his personal experience in Florence, Antwerp, and Pisa, Neri wrote his book soon after he returned to Florence, not long before he died [Mentasti 1980:XLI-XLIII].

The work languished in obscurity, being reprinted only once (1661) until 1662 when it was translated and expanded by Christopher Merrett (or Meritt; 1614-1695), an English physician and naturalist. The new edition was an instant success. It was translated into Latin, still the universal language of Europe, in Amsterdam in 1668, and went through three printings and three editions in the next 20 years. In 1679 Johann Kunckel, the director of the glassworks in Potsdam, added more and translated it into German, which went through four editions in the next 80 years. Meanwhile, the original text was reprinted in Venice, 1663 and 1678. Editions of Neri, Neri-Merrett and Neri-Merrett-Kunckel were published in English, Latin, Italian, German, French, and Spanish down to 1826, and the work influenced numerous other books, some of which gave no credit to Neri at all [Turner 1963; Mentasti 1980:LIX-LXV].

Neri was most concerned with making glass itself, and although he often mentioned beads (especially drawn ones) it was only to say that a certain glass was suitable; he did not discuss how beads were made. Nonetheless, what he did say was completely lost to virtually all readers because Merrett (not to be blamed too harshly) did not understand the word "conterie" (an Italian term meaning small drawn glass beads). So mystified was he by this technical term that he either omitted references to it or mistranslated it in highly original ways, such as "rails for counting-houses" [Dillon 1907: 183 n.; Zecchin 1964]

SECTION THREE:

VENICE: THE MOTHER OF MODERN BEADS

Venice is one of the most beautiful cities in the world. Consisting of 117 islands strung thorough the Lagoon of Venice, separated from the Adriatic by the Lido, a long sand spit, she has always looked to the sea for prosperity. Canals criss-cross the islands and mirror the incomparable facades of public and private buildings constructed in the days when Venice was an Empire of her own, and her sons were the finest mariners of Europe.

How Venice developed into a great glassmaking center is not really known. Jews from the Levant, Romans fleeing the Huns, and Byzantines from Greece and Constantinople have been evoked, all without proof. We do know that glassmakers, perhaps descendants of Roman craftsmen, built small furnaces on Torcello Island in the 6th century to make tableware and tiles for Torcello cathedral. Glassmaking continued there until the 8th century or a bit later [Gasparetto 1967; Tabaczyńska 1968].

In A.D. 811 residents of Malamocco on the Lido fleeing the invading Franks were led (by pigeons carrying crosses) to Rivo Alto, the High Bank, which came to be called Rialto, the cradle and still the heart of Venice. In 823 the bones of St. Mark, patron saint of Venice, were brought from Alexandria, and Rialto slowly eclipsed Torcello as the leading city of the lagoon. In 982, 1082, and 1090 documents refer to "phiolarii" or bottle makers attached to Benedictine monasteries. Along with tableware, they made enamel (smalto) for mosaics [Gasparetto 1960:37]. This was the great age of church mosaics, as exemplified in Ravenna and in St. Mark's Basilica in Venice itself. In 1072 there is a record of alum, to be used as an alkali for glass, being imported from Alexandria [Perrot 1958:11].

In time the glassmakers freed themselves from Church control. Hazlitt said the first glassmaker's guild was not formed until 1436 [1915:708], but recent scholarship suggests a much earlier date. In 1224, 29 glass guild members were fined for infractions of the guild's rules [Perrot 1958:10]. Guilds were the backbone of craftsmanship. In Venice each had its executive government and mariegola, regulations defining its relationship to the state and to other guilds, setting out the members' obligations and privileges [Hazlitt 1915:696].

In 1275 an edict forbade the export of potash, broken glass, or sand, and restricted German merchants from exporting more glass than they could carry on their backs (or ten Venetian Liras). This was the first of many laws designed to protect the industry. In 1286 the Grand Council drew up a code for the glassmakers, stating minimum working conditions and forbidding the furnaces to operate when it was excessively hot. In the next year the wood fuel supply was put under the direct management of the senior judges, to insure sufficient quantities of this vital commodity [Perrot 1958:10-11].

These laws prove the growing importance of the glass industry. They show an awareness of the danger from fire to a city of many wooden structures. They also reflect the fear that the secrets of the lucrative industry would escape Venice and her monopoly would be broken. A decision designed to solve both these problems was reached on 8 November 1291.

The Senate decreed that the industry had to move to the island of Murano, ancient Amurianas or Amurianum, about a mile north. Although the next year a few glassworkers were allowed to stay on Venice, the bulk of the industry

was transferred to the prosperous fishing and trading community [Perrot 1958:11; Zanetti 1869:9-11]. The move helped alleviate the danger of fire and made it easier to keep track of the glassworkers. Not everyone went; in 1297 and again in 1321 similar laws were passed; Fra Paolino still had a furnace in the Rialto until the late 14th century [Hazlitt 1915:705].

More laws showing the importance of the glass industry followed. In 1306 and 1330 it was forbidden to import alum, because it made an inferior glass [Perrot 1958:11]. In 1376 it was decreed that when a glassmaker's daughter married a nobleman they could pass his titles on to their children. In 1490 the glassmaker's guild was placed under the authority of the Council of Ten, the highest governing body of the state, which greatly improved its lobbying position [Ibid.:21]. Wealthy glassmakers could become nobles, as did the Morellis in 1686 upon paying 100,000 ducats [Gasparetto 1958:189].

The Growth of Beadmaking at Venice

The historian Molmenti claims that beadmaking began in the 13th century with the Cristalleri guild which worked rock crystal into rosary beads and lenses for spectacles [Thompson 1960:251]. The Cristalleri formed a guild in 1284, and one of its branches, the Arte Minuta, specialized in carving small rock crystal objects, such as beads [Alcouffe 1984:274].

Other beads were made at Venice as well. Christopher Columbus said that pearls were bored there [Morison 1963:273-4]. Bone, ivory, and wood were made into rosaries and sent to the Holy Land [Morazzoni 1953:9]. Given the industries of glassmaking, beadmaking, and tremendous export opportunities, glass beadmaking was almost inevitable.

Martino da Canale first mentioned glass beads when describing a procession on 23 June 1268 celebrating the election of Lorenzo Tiepolo as Doge (the chief magistrate). One of the parading glassmakers wore a necklace of beads [Gasparetto 1958:182]. Da Canale was not a beadmaker himself, as has been asserted [Kidd 1979:61], but the glassmaker probably wore his own handiwork. The first use of Venetian glass beads for embroidery was recorded in 1296, although these were not necessarily small beads [Morazzoni 1953:20]. A notice of 20 March 1327 says a ship flying the banner of St. Mark bound for the eastern Mediterranean was robbed by pirates from Reggio, including 1200 strands of glass rosary beads, no doubt for sale to Christian pilgrims [Cecchetti 1865:43; Gasparetto 1958:184].

The old story that when Marco Polo returned to Venice in 1295 he convinced Cristoforo Briani and Domenico Miotti to produce beads to sell to the Orient is embedded in much of the literature, but is fictitious. It was invented by Carlo Neijmann Rizzi in 1811. Zecchin demonstrated its falsehood and that of several other of Rizzi's stories [1955:5-17]. Antonio Miotti, the founder of the glassmaking family, is first heard of only in 1528 [Zecchin 1971:77]. Marco Polo's beads join his introduction of pasta to Italy (the Romans ate it) and playing cards to Europe (known before his return). This debunking was unfortunately too late to be incorporated by Morazzoni [1953].

The first official mention of beads was a decree of the State Inquisition in 1308, which organized the glass beadmakers into Arte de' Margariteri, a guild equal in status to those of the beadmakers working wood, ivory, and bone [Morazzoni 1953:8-9]. The term Margariteri is derived from the Greek and Latin words for pearl, and by extension, beads.

The Arte de' Margariteri threatened the stone beadmakers, the Cristalleri. In fact, the Cristalleri had been wary of glassmaking from the start. Their first mariegola (rules) in 1285 warned against imitating rock crystal with

glass, and they struggled to keep their monopoly on lensmaking, but by 1301 had to admit defeat [Perocco 1984:30]. Beadmaking constituted another threat to the Cristalleri. Beginning in 1326, their rules forbade making imitation stones [Gasparetto 1958:184]. In 1445 the Venetian Senate forbade the work, and imposed a heavy fine of a thousand (gold) ducats and two years in jail [Gasparetto 1958:184]. The Inquisition also prohibited making false gems in 1502 [Morazzoni 1953:22].

The stone beadmakers were fighting a loosing battle. On 17 February 1510 a convocation of the Capitolo dell' Arte, the central ruling body of all the guilds, announced their support of glass beadmakers and required that glass canes no longer be exported to Bohemia for further working, as all steps of beadmaking should become a Venetian monopoly. The support was so firm that the bickering over the industry was halted, and, as Gasparetto put it, "Rock crystal was dead and glass beads born." [1958:185-6]

The 1510 ordinance reads: "to keep what was newly discovered twenty years ago...an invention made by our glassmakers of Murano of pure canes of common cristallo and colors of diverse sorts...." A new invention was also noted a bit earlier in the rules of the glassmaker's guild listing their products: "paternosteri de rosette" (chevron beads), "oldoni," canes, and other "sorts of work newly discovered", all of which was done by the Paternosteri guild, which was organized in 1486 [Morazzoni 1953:21; Gasparetto 1958:184].

But, what was it that had been newly invented between 1480 and 1490 or so? Morazzoni believed that it was Bernardo De Pin's hydraulic machine to polish glass [1953:23], but De Pin and his wondrous machine were just another fabrication of Rizzi's fertile mind [Zecchin 1953; Gasparetto 1958:182-3], and polishing remained a problem for Venice long afterwards. Nor was it the clear cristallo nor colored glass; both were known well before this time.

Rather, it must have been the drawing of tubes that was the new invention. This idea seems not have to occurred to Italian historians because of the dominance of drawn beads in the Venetian industry for centuries. But early Venetian beads were apparently furnace-wound, a nearly universal craft and one taught by the Venetians to the Germans in 1486 [Jackson 1927:A113]. The Margariteri must have begun making plain wound beads. After the development of drawing, they continued to make plain beads, but now drawn ones. Fancier beads (notably chevrons) were produced by the newly organized Paternosteri. Drawn beads would have been a novelty and a labor-saver, and would have been more regular than the wound beads of other Europeans.

A third beadmaking method, the "supialume" or lamp-winding process, also evolved. The name, which indicates blowing at a lamp, has caused confusion with blown beads, or even drawn ones. The term derives from the small pipe once attached to a lamp which was blown into in order to increase the heat.

The early history of the Supialume is imperfectly known. Rizzi, who has already thrown much sand in our eyes, dreamed up the inventor of lamp beads, one Andrea Vidaore (or Viador or Vidor), who is supposed to have developed the technique in the early 16th century. The Supialume was made a guild (Arte de' Perleri e de' Supialume) by the Senate in 1528 [Morazzoni 1953: 24-5], but did not achieve quite the same status as the other two guilds until 1647 [Ibid; Gasparetto 1958:188]. At that point, the three shared the same school, which had been begun by the Paternosteri and the Margariteri in 1615, the same patron saint (Antony the Abbot) and the same mariegola or rules, but set up duplicate banks and governing councils.

The reason for the slow acknowledgment of the lamp-winders was the fierce opposition from the Paternosteri, who must have resented the competition in large or decorated lamp-wound beads. Nor were they were wrong, because the Supialume did eventually supplant the Paternosteri.

One other beadmaking method was practiced for a while in Venice, probably by yet another guild: making artificial pearls from hollow balls blown from tubes and coated inside usually with a mercury base. Although some say the work began in the 16th century, in 1537 Frances Massarius reported it had ceased, either because the pearls were too fraudulent or as a health measure [Beckimann 1846:264-5; Webster 1973:210].

Growth of the Industry

The growth of the Venetian glass bead industry did not follow a neat curve, as it reflected internal and external events that now promoted or now harmed it. One measure of the industry's relative strength can be gauged by the number of workers and firms involved. The data for the numbers of furnaces (roughly firms) and the number of Capi Maestri, or head masters, are most instructive. Some of the statistics available are listed in Table 1:

Table 1: The Size of the Venetian Glass Beadmaking Industry 1606-1898

Date	Masters	Furnaces	Source
1606	251 (14*)		Morazzoni 1953:29
1674	11*		Ibid.
1736		30	Ibid.
1744		19	Ibid.
1754		46	Ibid.
1755		52	Ibid.
1761	108	30	Morazzoni 1953:30
1762	200	15	Morazzoni 1953:29
1764		22	Nesbitt 1879:652
1766	100	26	Morazzoni 1953:33
1867		ca. 40	Zanetti 1869:32
1869		20	Ibid.
1898		22	Pasquato 1953:77 + Gasparetto 1958:201

These figures are not strictly comparable, some carrying more weight than others. The marked decline between 1736 and 1744 and resurgence in the next decade were reported in the same contemporary document. The decline from 1867 to 1869 is probably quite accurate. On the other hand, the numbers of masters for 1606 and 1674 with a star (*) are for top masters only, and the furnaces for 1766 correspond to furnace owners. The striking difference between 1761 and the following year are difficult to understand.

Nonetheless, the data is instructive. The number of furnaces ranged from a low of 15 to a high of 52, with a mean average of 29 and a median average of 26, while the number of masters, after the initial rush due to the quick early growth of the industry [Morazzoni 1953:29], fluctuated at just over 100. The figures do not justify the assertion that after the fall of the Venetian Republic (1797) beadmaking houses declined from 300 to 20 [Rogers and Beard 1948:40, and quoted by others].

Moreover, the early figures, at least, do not account for the Supialume. In addition to larger firms making tubes and canes, there were many smaller ones making lamp beads. The number of workers is harder to determine, with less data and more estimates. Those available are in Table 2:

Table 2: Workers in the Venetian Bead Industry 1790s-1955

Date	Total		Other Figures	Source
1790s			600-1000 lamp workers	Nesbitt 1879:652
1869	15,000			Zanetti 1869:32
1883	15,000			Scientific American 1883
1889			1000 tube drawers	Harper's 1889:262
1890	6000			Pottery Gazette 1890
1900	ca. 9000	=	3000 men	Scientific American 1900
1917	ca. 3000	=	1000 families	Carroll 1917:18
1955			500 lamp-workers/50 shops	Gasparetto 1958:202

Again, the numbers are not comparable, nor likely to be very accurate. We can conclude, however, that there was a steady decline in the population of workers between 1869 and 1917, both of which may be accurate figures.

There were great variations in the fortunes of the bead industry. The 1736 to 1755 period saw a steep decline followed by a steep rise. From 1787 to 1797 the census showed a noticeable drop in beadworkers [Gasparetto 1958: 194]. In the 1867-1869 period the industry suffered heavily again.

What caused this roller-coaster fortune of the industry? In some cases we can point to historic events. Venice had built herself an empire along the shores of the Adriatic Sea, but lost it after the 1718 Peace of Passarowitz, leading to a decline in shipping, and the loss of markets in Africa and the Middle East [Gasparetto 1958:188]; this in part accounted for the 1736-1744 decline. The 1787-1797 drop can be attributed to the final dismantling of the Venetian Empire by Napoleon with the Peace of Campoformino in 1797. The 1867-1869 period immediately followed the unification of Italy in 1866 with emphasis on other industries and the rise of Jablonec, Bohemia, which was incorporated as a city and linked to the world by a railroad that year. At the same time, heavy demand for beaded dresses, which had greatly boosted the industry, dropped off, severely curtailing production and employment [Scientific American 1883].

Another low point was recorded between 1890 to 1905 [Morazzoni 1953:64], during which 17 of the remaining firms united in order to form the Societa' Veneziana per l'Industria della Conterie, popularly known as "the Conterie" [Pasquato 1953:77-8; Gasparetto 1958:201].

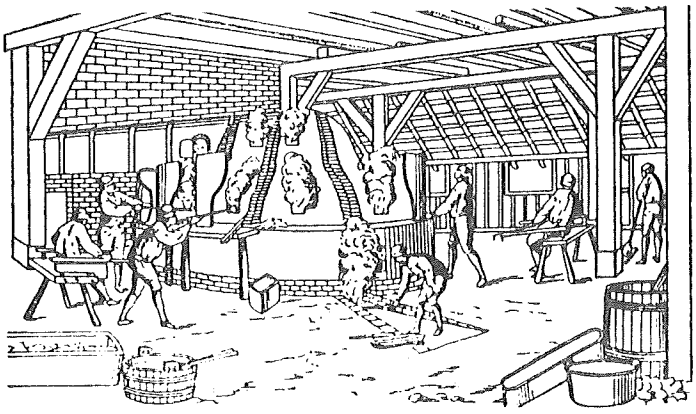


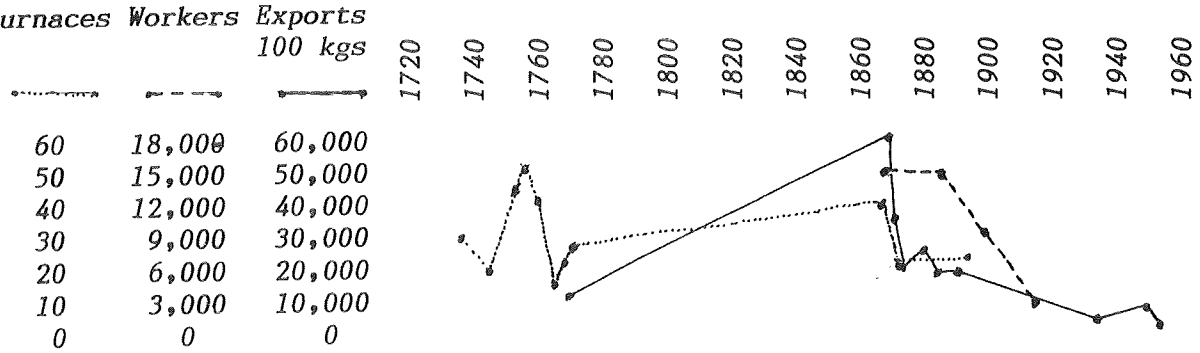
Figure 3: Mid 18th century glasshouse for making small glass objects.

Throughout all these varying fortunes, Venice continued to make beads and make money by exporting them. During the 1860s, which included one of the low periods, an average of 20,000 pounds of beads were exported every day! [Encyclopedia Britannica 1875:460]. But figures for selected years tell the story of decreasing export orders during the last century:

Table 3: Export (or Production) of Venetian Beads 1764-1954
In quintals (100 kilograms = 220 pounds)

Date	Quintals	Source
Annual averages:		
1860-1905	23,500	Morazzoni 1953:63
1861-1871	33,182	Encyclopedia Britannica 1875:460
1872-1905	20,811	By computation
1879-1883	25,000	Scientific American 1883
1938-1954	8,153	See Table 4; average for three years
1764	10,400	Computed from Kidd 1979:67 (52 weeks)
1867	60,152	Morazzoni 1953:63
1868	36,621	Ibid.
1870	less than 20,000	Ibid.
1880	27,273	Kidd 1979:68
1885	less than 20,000	Morazzoni 1953:63
1890	less than 20,000	Ibid.
1938	7,680	See Table 4
1949	9,159	See Table 4
1954	7,619	See Table 4

There was a considerable rise in production by the mid-19th century. The two most astounding drops are in the 1867-1868 period, discussed above, and at the end of the 19th century. This can be most easily seen in the chart, where data from Tables 1 through 3 have been combined:



The disruptions of World War I were a great blow to the industry. Prices, especially of raw materials, soared. The cost of soda and niter leaped more than 10 times, that of potassium 15 times, and coal some 18 times [Carroll 1917:2-3]. More precise trade figures from the 20th century showing how the industry learned to adapt to new situations are seen in Table 4:

Table 4: Export of Venetian beads 1938-1954, in Hundreds of Kilograms [Italian Institute for Foreign Trade n.d.:161]

Importer	1938	1949	1954	Rank: 1938	1954
India	2821	829	413	1	5
Pakistan	with India	127	4		16
[India/Pakistan total	2821	956	417	1	5]
South Africa	1186	2251	1648	2	2
Angola/Mozambique	1053	509	973	3	4
France	1005	550	253	4	7
Eritrea	638	39	12	5	15
British West Africa	301	1641	1137	6	3
Egypt	172	538	207	7	9
British East Africa	133	1277	312	8	6
Turkey	103	340	193	9	10
United States	93	197	1668	10	1
Somalia	52	6	1	11	17
United Kingdom	46	183	247	12	8
Libya	34	--	17	13	13
Belgium	25	32	135	14	12
Belgium Congo	11	548	155	15	11
Australia	6	83	122	16	13
Canada	1	9	122	17	13
Totals	7680	9159	7619		

The figures for 1938 and 1954 are remarkably close, and the bulge in 1949 exports might have been due to pent-up post-war demand. However, the export patterns are quite different. India, by far the largest importer in 1938, had shrunk to less than 15 % of the earlier market due to the growing glass bead industries in independent India and Pakistan [Francis 1979c:9-11;1982b: 6-8]. Eritrea, the sixth largest importer in 1938 despite its small size, imported less than 2 % of that figure in 1954; it was no longer an Italian colony. The loss of Libya and Somalia as colonies are reflected in similar patterns. On the other hand, imports to the United States increased 18 fold, making it the largest customer, and British West Africa increased imports almost four times. The United Kingdom and Belgium increased their imports five times or more, the Belgium Congo by 14 times, Australia 20 times, and Canada 122 times! During this period, South Africa and Portuguese South Africa (Angola and Mozambique) remained major importers with steady buying.

Beadmaking History: the Early Centuries

A hallmark of Venetian beadmaking has long been special glasses. Angelo Barovier (1405-1460), the leading glassmaker of his day, developed not only the clear cristallo, but a milk white (lattimo) glass and a chalcedony glass as well [Mentasti 1980:XLVI]. A Barovier may also have developed fancy cane for mosaic or millefiori work, technically similar to chevrons. The word "millefiori" itself was first used only in 1827 [Hollister 1983:202], but the earliest mention of it is the oft-quoted passage of M.C. Sabellico, the librarian at San Marco Basilica in Venice, in 1495, "But consider to whom it did first occur to include in a little ball all the sorts of flowers which clothe the meadows in spring" [Buckley 1939:19]. In 1496 the inventory of

Giovanni Barovier's factory listed objects decorated with "rosettes," which may have been fancy mosaic cane slices [Zecchin 1968]. Such work enjoyed an early popularity, but then was out of fashion until the 19th century [Perrot 1967:14; Hollister 1977:383]. It may have been used sparingly for beads all along, but most millefiori beads seem to be from the mid 19th century.

A spectacular invention was aventurine or goldstone. The name reflects a tradition that it was discovered by accident ("avventura"). Aventurine glass has small flakes of suspended copper which sparkle and shimmer like gold. It was invented by Vicenzo Miotti (1644-1729), to whom the Doge granted the exclusive right to manufacture it in 1677. He first revealed its secret to his son Daniele (1678-1763) in a Libro di Segreti (Book of Secrets) in 1669. Other glassmakers strove to copy it, and in the late 18th century Pietro and Giovanni Andrea Bertolini, important glassmakers from 1731 (Andrea died in the 1750s) [Charleston 1963:61], made an inferior grade. The Miotti family closed business in 1791. By 1807 Lorenzo Bigaglia had made aventurine, but the Miotti formula only reached rival hands in 1811 when a Miotti widow (of Domenego?; died 1803) revealed it to Beneditto Barbaria. Sometime before 1859 Giuseppe Zecchin, second in command to Pietro Bigalia, improved on it, allowing for larger copper crystals and less tendency to scale off. Antonio Salviati was making it soon thereafter [Morazzoni 1953:36-7, 56-8; Zecchin 1977:78, 82]. An aventurine formula was published by Tomlinson in 1854 [Hollister 1969:14], another by Hautefeuille in 1860, and another supposedly patented in the U.S. by H. Henkins in 1877 <this could not be confirmed.> Although it has been made elsewhere, the primary world supplier for over a century has been the Dalla Venezia family of Venice [Revi 1967:110-12].

Another important glass is ruby (translucent red) in color. Although ruby glass was made with copper in the High Middle Ages [Turner 1956:Table VII], this method was only rediscovered by George Bontemps in France around 1826 [Thorpe 1935:239]. However, gold gives glass a richer hue, was easier to use, and had mystical associations. It must be in a colloid suspension as a red tincture in stannic (tin) acid, a formula medieval pharmacists knew, but probably not the ancients, as has been claimed [Thompson 1936: xxxi ff.]. While Giovanni Darduin of Venice (1585-1654) may have been using it in glass [Mentasti 1980:LIX], the German, Andreas Cassius (1640?-?1673), is thought to have first described it in 1685 in De Auro; thus it is called "Purple of Cassius." Johann Kunckel (ca. 1630-1705) commercially developed ruby glass, though only as a thin coating (a casing) [Weyl 1959:380-1]. The Bohemians mastered it around 1715, but most later improvements were made by Venetians. Its color was upgraded by Giuseppe Zecchin by 1859. Giovanni Giacomuzzi made ruby glass without gold [Morazzoni 1953:57-8], possibly using selenium.

From the 16th to 18th centuries the most famous Venetian glassmakers were the Miottis. Antonio was the first known to make glass by 1542. The family often broke the "golden rule" against exporting glass techniques. Antonio was denounced for starting a furnace at Ragusa in 1574, his son Peregrin built furnaces in Naples and Milan in 1571 and 1572, and his grandson Zuan Antonio in the early 17th century managed a glass bead factory in Holland and glasshouses in England and Belgium. Peregrin Miotti was back in Venice by 1575 making chevron canes, and his brother Bastian (1548-1594; Zuan Antonio's father) was making plain canes by 1586. The most renowned of the clan was a great-great grandson of Antonio, Vicenzo (son of Daniel, 1618-1673), the inventor of aventurine. His brother, Zuanne (b. 1650), was known for his opaque white lattimo or milk glass. Business continued a few more generations, but closed in 1791. Although Miottis made beads, their main work was speciality glass, such as aventurine and lattimo [Zecchin 1971].

The Nineteenth Century

The 19th century is something of a paradox in Venetian bead history. While production slowly declined as she lost ground to the fierce competition from Bohemia, Venice retained her leadership in many ways. The fame of Venetian beads rested on two pillars. One was the availability of large quantities of uniform beads. The other was the production of specialized beads and glass. Much else was going on, and most of the now popular trade beads sold to Africa were made at this time by celebrated and talented beadmakers.

Inventions and Improvements

The mass production of beads was due to the drawing technique and the later development of more efficient methods to produce ever more uniform beads. Tube makers were men, but nearly all the rest of the work was done by women and children. There are several descriptions of these processes, the most complete are by Zanetti [1869:34-52] and Carroll [1917:6-13]. To see how improvements were introduced, we shall look at the process in some detail. Differences in methods sometimes have as much to do with differences between houses or masters as with improvements over time. (See Figure 5, p. 29)

The first step was making the glass, as described before, with most of the ingredients kept a secret. Over the years, the furnaces grew larger and had better temperature controls. Glass was removed and a cylinder was formed by rolling it on a fire-resistant surface (a marver). The cylinders were made hollow, perhaps first by blowing through a pipe [American Mechanics' 1825; Lardner 1832, in Sprague 1985:88]. In 1835 a cone of glass was shaped, by hand [American Naval Officer 1835:79]; by 1869 these cones were made with a spring pincher ("barsetta") that opened the gather [Zanetti 1869:38]. A second worker would attach either an iron rod or a second hollow cone to the first, and then walk or run away, pulling out a long tube. The purer the glass, the smaller the original gather, and the faster and longer the tube was pulled, the thinner it could become.

In 1860 a new process was introduced by Lorenzo Graziati which allowed for making square, hexagonal, and other tubes to make "Macca" beads. A variety was made by scoring the cylinder before it was drawn into a tube, called "Channel" beads [Carroll 1917:20].

The long tube was laid on wooden crossbars on the floor, and after it had cooled was cut into meter lengths with a blade. These were sorted by hand into groups of similar color. Originally tubes were cut at a bench called the "zocco", where they were lined up against an iron plate (the "scontro") and chopped off by a cast iron blade brought down by hand. In 1822 Captain Longo invented a machine to automatically cut uniform tube segments. It was not widely used until improved in 1867 by Carlo Romiti, and further modified by Giovanni Sola [Morazzoni 1953:53-4; Gasparetto 1958:198, n. 48]. After cutting, the glass dust was fanned away from the glass segments.

Next the segments were tumbled. This was originally done by packing them in wood ash and sand, putting them on a plate resembling a large frying pan, and constantly stirring the beads over a charcoal fire [American Merchanics' 1825]. In 1817 Luigi Pusinich developed a rotary drum to tumble beads, and Antonio Frigio expanded its capacity in 1864 [Morazzoni 1953:53; Gasparetto 1958:198]. Beads packed in charcoal, lime, and sand were put in the egg-shaped drum, which was rotated over a fire. Then its contents were spilled out and the sand fanned away [Carroll 1917:9].

Then beads had to be sorted by size, at first all done by hand. In 1867 Giuseppe Zecchin and Agostino Ceresa built a mechanical sorter, a series of sieves, one above the other, which were rocked back and forth [Gasparetto 1958:198]. After sorting, women strung beads by running two dozen or more long thin needles though a basket of them. The women rejected beads with closed or tiny holes, often returning 20 % to the manufacturer. This great loss was alleviated by Cav. Salvatore Arbib, who invented the "tamburo," a series of wires which picked up beads by their holes, leaving those without holes. Meyer and Sons of Birmingham, England, built this for him in 1894. He and this company in the same year also produced an automatic stringing machine that put beads on wires, which were sold to France for beaded floral funeral decorations [Carroll 1917:11-12]. Not all beads were strung; some were weighed and sold by the pound.

Aside from the drawn bead improvements, processes for finishing beads were introduced. A matte finish, especially for the American market, was made by grinding the beads with emery, sawdust, or other materials in a process called lucidation [Carroll 1917:11-12]. Matte finishes were first done with hydrofluoric acid; the grinding was developed in France and kept a secret until a German discovered it [Scientific American 1884]. Isacco Bassano in 1838 built an eight horsepower engine to gave beads a brilliant polish, at least partly in response to Bohemian competition [Morazzoni 1953:59].

Lamp beads grew at a slower rate. By 1731, 800 pounds of oil a day were consumed by the Supialume [Kidd 1979:67]. Andrea and Pietro Bertolini made improvements in the glass and lampworking in the mid 18th century [Morazzoni 1953:37-8]. In 1843, Dominico Bussolin patented a gas lamp, and in 1846 credited Giovan Battista Franchini for persuading his colleagues that it was healthier and cleaner than tallow [Gasparetto 1958:195; Hollister 1983:203]. However, as late as 1869 leading companies, including Salviati and Giovanni, still advertised, "lampadari per candele e per gaz" [Zanetti 1869:170].

New Beads and Glasses

In addition to aventurine, lattimo and other famous Venetian glasses, a sort of "family" of glasses developed in the mid-19th century, imitating natural materials. Giobatti Franchini made a coral glass in 1826 and pink mother-of-pearl in 1827 [Morazzoni 1953:54; Gasparetto 1958:194]. A golden mother-of-pearl made Giovanni Giacomuzzi's fame (1867); 5000 pounds adorned a Treviso theater. He also created silver, red, green, and blue shades, and carnelian glass. Lorenzo Radi imitated chalcedony, agate and lapis lazuli; Zanetti said his colors were as rich as real gems [Morazzoni 1953:57-8].

Abbot Vincenzo Zanetti (1824-1883) was a giant of the 19th century. Not a glassmaker but a scholar, he wrote at least 30 books on Murano's glassmaking and history and famous artisans between 1861 and 1870. In 1861 he opened a a glass museum on Murano, at first a single room attached to the municipal archives, and the next year opened a design school for glassmakers [Zanetti 1866:123; 1869:180-2; Gasparetto 1958:134; Barovier 1974:111].

Among the famous beadmakers of the time, Antonio Salviati (1816-1890) was a leader of the new prosperity, activity, and artistry [Nesbitt 1879:652]. Formerly a lawyer, with Lorenzo Radi he formed the Salviati Enamel-Mosaic Works in 1861. By 1866 he had two companies: Salviati and Company and The Venice and Murano Glass and Mosaic Company, backed with English money, which he managed [Nesbitt 1879:652; Hollister 1983:205]. There was also Salviati, Burke & Co., selling Venetian glass to England [Riaño 1879:back cover]. Radi had his own company, Ditta (Firm) Lorenzo Radi [Zanetti 1869:31, 175].

The Franchini family won fame for their lamp-beads and was credited with increasing production and quality, especially Giovan Battista [Zanetti 1969: 53]. They were also famous for mosaic canes. Jacobo, Giovan's father, made his first mosaic portrait cane in 1845, and the two continued to make them for at least two decades afterwards [De Carlo 1987:46]. Jacobo died in 1863 in an insane asylum; it is said he went mad from the intensity with which he undertook the painstaking work [Carroll 1917:16]. The earlier ones made with the Bigaglia firm were not as fine as those made by Giovan after 1869 with the Moretti firm [Hollister 1969:19].

Giovanni Giacomuzzi (born 1817), was celebrated for his ruby glass without gold, mother-of-pearl, golden glass without silver, and other beads. He and his company, Fratteli Giacomuzzi su Angelo (Brothers Giacomuzzi [sons of the late] Angelo) is of special interest, as one of their sample books survives and is currently exhibited in the Bead Museum of Prescott, Arizona (U.S.A.). It was probably made between 1852 and 1870 [Francis n.d.].

The Twentieth Century

At the close of the 19th century, Venice faced declining orders. This has been attributed to competition from Albania, Egypt, and Turkey [Morazzoni 1953:64]. Although the latter two make glass beads [Francis 1979c:2-7;1983: 201], neither could have posed a threat to Venice; the Albanian industry is an unknown quantity. The real competition came from Bohemia.

It was surely Bohemian production which brought on the crises, which was met by merging 17 beadmakers into the Societa' Veneziana per l'Industria della Conterie in June 1898, the largest of which was owned by a German, F. Weberbeck [Pottery Gazette 1890]. The Conterie, as it is called, chose as director Luciano Barbon, another of the largest owners [Pasquato 1953:77-8; Gasparetto 1958:201]. <Carroll said that eleven houses were involved [1917: 2], while the (English) Foreign Office said it was 18 [1898].>

A united industry had great international reach. French firms controlled by the Venetians making rosaries for France and her colonies were regrouped in 1900. During World War I, the administration of the Conterie was moved to Pisa and beads shipped through Oporto, Portugal [Pasquato 1953:78]. Of significance was the acquisition of one of the larger Bohemian beadmaking houses, A. Sachse & Co. in 1920 [Ibid:80].

The Depression naturally hit beadmakers. They were, after all, producing a luxury. Emphasis on "art beads" in Bohemia also hurt, as did the rise in popularity of plastic beads. The late 1920s saw great growth in the plastic industry [Francis 1982a:49], as plastic beads became fashionable in the West and popular elsewhere due to their light weight and lower costs.

In the 1920s or 1930s mechanical drawing was introduced with a decline in the number of workers [Pasquato 1953:80; Picard 1987]. In the 1930s the Conterie was renamed the present Societa' Veneziana Conterie e Cristallerie.

Subsequent events weighed heavily on Venice. During World War II French rosary work declined, and the post-war independence of former colonies hurt exports. Newly independent Asian and African countries were concerned with their own political, economic, and demographic problems, and there was less emphasis on beads [Pasquato 1953:80]. Some developed their own beadmaking industries, including India/Pakistan, once a major market. New competition from Germany, Austria, a revived Bohemia, France, Korea, Venezuela, and above all Japan, have lessened the world impact of Venetian beads.

The Venetian bead industry is not dead, but it has a harder time selling its beads than nearly any time in the past. A sign of increased interest in producing excellent products was the establishment on Murano of the Stazione Sperimentale di Vetro (Glass Experimental Station), with modern equipment for testing glass and a well stocked library.

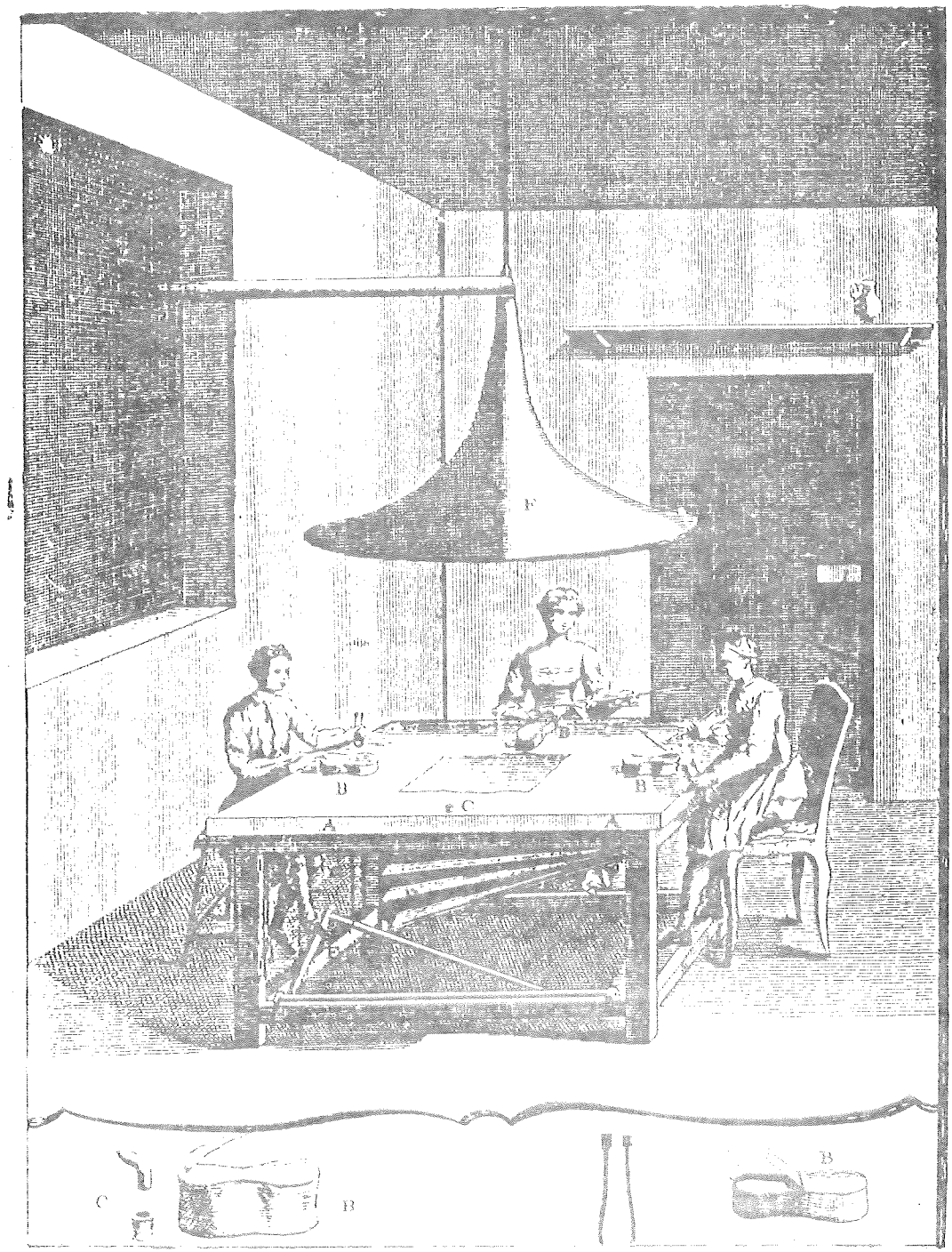


Figure 4: Lamp beadmaking in Venice in the 17th century. Three women are melting canes by the lamp (closeups on the bottom of the plate) at a table. Note the large vent above them. The tongs at the bottom of the plate are for rounding the beads after they have been wound on the wire.

THE IDENTIFICATION OF VENETIAN BEADS

As Venice was the leading beadmaker of Europe, an understanding of her beads is of special interest. We can now tentatively date many of these beads, but the precautions outlined at the end of Section One must be kept in mind. It should also be remembered that some bead styles were made for many years, and several were copied in 17th century Holland (see Section Five).

The first Venetian beads were apparently wound, similar to those made by other contemporary Europeans. Around 1480, tube drawing was discovered, borrowed, or reinvented, revolutionizing the industry. This coincided with the opening of the European Age of Exploration, positioning Venice well to supply beads for the newly explored and exploited lands of America, Africa, and Asia. The other great change was the development of lamp-winding, but this was slower in making an impact on the world bead trade.

The Sixteenth through Eighteenth Centuries

Although the earliest Venetian beads were wound, few of them (save possibly the small beads Columbus brought, which might be Spanish) were used as trade beads. The earliest trade beads were drawn. Opaque red on green cornaline d'Allepos <B 1,2> and plain opaque red beads <A 1> were apparently made to imitate a popular East Indian bead traded to East Africa [Francis 1982b]. Another early plain bead is called "early blue" in the Northeast, "sugarcane blue" in Pennsylvania, "Jamestown blue" in Virginia, and "Estaufa blue" in Florida. It is distinguished by having linear striations along its length. It was used for a long time, from about 1560 to 1760; the earlier ones were oblates <A 2>, while later ones were short barrels <A 3>.

To indicate the priority of drawn trade beads over wound ones we may cite two long American sequences. In the Seneca territory wound beads do not show up in any numbers until 1687-1710 [Wray 1983:45], and along the Susquehanna not until the end of the 1690-1750 period [Kent 1983:81]. In East Africa at Kilwa wound beads were "extremely rare" in the 16th and 17th centuries [Chittick 1974:480]. Early wound beads seem to have been plain monochromes and neither fancy nor decorated.

Early blues (Kidd IIa40) are found in the Seneca sequence 1560-1710 [Wray 1983:42-3], Virginia 1638-1720 [Miller et al. 1983:137], Ontario 1550-1585 [Kenyon 1983:60], Spanish sites 1560 or later [Smith 1983:150], and the 18th century Guebert site [Good 1972:117]. Kenyon discusses some of the names of this bead. Smith proposed that elongated ones are later. "Sugarcane" (used by G.B. Fenstermaker) should not be confused with the the same term used for different beads by Harris and Harris [1967].

Some early drawn beads were further decorated or finished after they were drawn. Such Paternoster work included the cold finishing of chevron beads, discussed below, and the hot decorating of others. There are not many of these latter known. One type is round or elongated, with added slices of fancy mosaic canes, which are technically closely related to chevrons <C 1>. These are known in America as "flush eye" beads, found from 1570 to 1635. Another type is more cylindrical and has also been hand decorated <A 4>.

Flush eye beads: Seneca 1570-1635 [Wray 1983:42]; Susquehanna 1575-1600 [Kent 1983:81]. The flush eye bead on the color plate does not match any of Kidd's (IIg), but is technically similar. Paternoster cylinder types: some examples among Apache material in the University Museum, University of Pennsylvania, Philadelphia, suggest a 18th-19th century date.

The most numerous drawn beads are small ones known as "seed" beads. These show up on American sites in the late 16th century, but were made at least 100 years before. Early "seed" beads are irregular in color, size and shape; they became more uniform after the invention of automatic cutting and sorting machines in Venice in 1867. Very tiny ones, with diameters less than a millimeter are called "micro" beads <A 5>, made as early as 1820, but common only from 1836-50; production ceased in the late 19th century.

Early seed beads in New York [Pratt 1961:6; Bennett 1983:53]. They did not reach the Seneca country in any numbers until 1710 [Wray 1983:47]. They were common in the early Alaskan trade ca. 1740-1800 [Francis 1987b]. In the Great Plains, Catlin recorded none about 1840. Wildschut and Ewers suggest they were introduced only in 1834 [1959:49], and Hail about 1840 [1983:51]. Micro beads in Wichita sites from 1836-50 [Harris and Harris 1967:154-5]; on 1899 Conterie card in the Scarpa collection, Venice. The greater uniformity of beads is clear from ethographic collections [Francis n.d. a].

Many early drawn beads have more than one layer of glass. A favorite with a blue core, a ring of white, and a blue exterior, is found on sites dating from 1575 to about 1650, especially popular in 1600-1620 <A 6>. Another had a white core, a clear ring, and a white exterior, known at the beginning of the 17th century. One of the longest lived of these beads has a white core and a clear exterior, and is found from 1580 to 1890. All of these beads were made in many sizes from "seed" to larger ones.

Blue-white-blue bead (Kidd IVa19) Susquehanna sites 1575-1630 [Kent 1983:80]; Spanish colonial sites 1565-1630 [Smith 1983:155]; Ft. Orange 1585-1624 [Huey 1983:102-4]. White-clear-white bead (Kidd IVa12) New York 1595-1625 [Bennett 1983:52]; Virginia 1660-1680 (one example) [Miller et al. 1983:133]. Clear over white (Kidd IVa13) Seneca 1590-1635 [Wray 1983:44]; Susquehanna 1690-1760 [Kent 1983:80]; New York 1595-1625 [Bennett 1983:53]; Ft. Orange 1695-1620 up to 1685, but rare [Huey 1983:106-7]; Alaska 1765-1807 [Francis 1987b]; Brain's compilation gives a range of 1600 to 1890 [1979:105-6].

Beads with multiple layers of glass were also decorated with longitudinal lines. One of the earliest, the "gooseberry" bead, with a clear core, 12 or more white lines, and a clear outer coat, was made from the early 16th to the early 20th century. They were first elliptical <A 7>; round and tubular ones <A 8> became popular from about 1650. Another bead has a blue core, a white ring, a blue coat, and white lines, and is found in the early 17th century. Similar beads but with two white rings inside are later.

Gooseberries (Kidd IIb18): Spanish sites 1525-1675 [Smith 1983:150], who mentions the priority of the olive shaped beads; Seneca sequence 1560-1615 [Wray 1983:42]; Kilwa, East Africa 16th and 17th centuries [Chittick 1974:401]; on sample card of the Conterie dated 1909 [Harter 1981:12]. Blue-white-blue with white stripes (Kidd IVb34) Seneca sequence 1610-1635 [Wray 1983:43], Virginia 1638-1680, rare later [Miller et al. 1983:133].

Not all striped beads had compound constructions. An early type, called a "rootbeer bead," has a dark red-brown base with three groups of three thin white stripes, found in the late 16th century. A bead with the same base color with three sets of white/blue/white stripes comes from the same time In general, beads with three sets of stripes appear to be older than those

with four. A blue bead with three sets of red/white/red stripes is found in America in the late 16th to early 17th century <A 9>. One with a similar color scheme, but four sets of stripes (often cut as a disc) was popular in Africa later <A 10>. There was also a tendency to make later lamp beads in the same color combinations as earlier drawn beads, such as the red-brown beads just discussed and white beads with three spiral blue lines <B 12>.

Rootbeer bead (Kidd IIb74) Seneca sites 1590-1615 [Wray 1983:42]. Red-brown beads with white and blue stripes (Kidd IIbb1) Oneida sequence 1595-1614 [Pratt 1960:7]. A blue striped bead with three sets of stripes (Kidd II bb27) is found in the Susquehanna sequence 1575-1600 [Kent 1983: 80] and at Ft. Orange 1624-1676 [Huey 1983:88]; with four stripes (Kidd IIbb*) from 1600 to 1840 at Dawu, Ghana, West Africa [Shaw 1961:72].

Chevrons and Cornaline d'Allepos

Without a doubt the most famous of all Venetian beads is the chevron, called the "aristocrat of beads" [Orchard 1929:96]. Chevrons (rosettas) were being made by the end of the 15th century, and the Morellis still make them today. They come in such a great variety of styles that it has long been hoped that some of these differences can help date them. To some extent they can, but many of the styles have been around for a very long time.

Chevrons were originally the work of the Paternosteri, as they had to be finished by hand. The earliest are generally the most complex, with seven layers (from the center out: translucent green, opaque white, blue, white, red, white, and blue; the inside blue layer is sometimes translucent). Most have 12 points to the star, though they may number from 9 to 18 or more. They were finished by being ground into facets (usually six) on the ends <A 11, 12>. These older chevrons were made from about 1480 until 1580 or 1600.

Early in the 17th century there was much experimentation with the basic chevron pattern. Later beads have fewer than seven layers, the ends were ground round <A 13>, and many exhibit different color combinations, most of which were used into the 20th century. Among such early chevron types are clear or red inner layers, followed by white, red, and white layers with red and blue (and sometimes green) stripes on the white, the whole covered with a clear outer layer <A 14-16>. Flattened chevrons, made by pinching the bead from a tube, are also known at this time <A 17; A 16 is also pinched>, as are chevrons with green exteriors. Most common from this period are four layered (white, red, white and blue) or five with clear cores.

Fewer layers became more and more common. Four layer chevrons were being made in the late 16th century, but were standard by the 19th. Those of the 20th century commonly have stripes covered with clear glass or are four-layered blues. Some modern chevrons seem to be made from old canes <A 18>.

16th century seven layers: Smith 1977; Francis 1987c; Mitchem and Hutchinson 1987:54-5. 17th century: striped with clear outer layers in West Africa 1640-1700 [Lamb and York 1972:111], Seneca sequence [Wray 1983:43], Oneida sequence [Pratt 1960:8-9], Ft. Orange 1647-1676 [Huey 1983:96]. Green chevrons: Susquehanna 1575-1600, 1690-1750 [Kent 1983: 81], early 17th-19th centuries Ft. Jesus, East Africa [Kirkman 1974:145]. Flat chevron: 1610-1635 [Wray 1983:43]. Four layers: Cameron site 1570-1595 [Bennett 1983:52], Virginia 1638-1660 [Miller et al. 1983:135]. 19th century: all chevrons in the Slade collection have four layers; one has only two [Karklins 1982:75-6]. For 20th century see Harris [1984:4-5].

The best known simple multiple layered bead is the "Cornaline d'Allepo." The name is a misnomer from several standpoints, and the beads have nothing in common except that their exteriors are red. The red may be translucent or opaque, the cores may be different colors, and the bead can be drawn or wound. The name is even applied to beads with white cores and other colors of coatings, although "white heart" is a more appropriate name for them.

The earliest cornaline d'Allepos are opaque red (sometimes with a clear outer layer), whose translucent green (more rarely blue, brown or clear) cores look black until held up to a light <B 1, 2>. At first they were thin tubes and round tumbled beads; the tumbling often removed the clear outer coat. These are found from 1600 until 1836, with "seed" bead sizes often being the earliest. Around 1830, the coating became translucent red and the cores ivory white <B 5a>. Both wound <B 3> and drawn beads in this color combination, as well as wound ones with yellow cores <B 4> first appear about 1830-40. By 1860 the core had become pure white <B 5b>; around 1880, selenium was introduced, producing a slightly orange-red coat <B 6>.

Brain's compilation of opaque red cornaline d'Allepos (Kidd IIIa3, IVa6) gives them a range from 1600-1836 [1979:106], in Africa they are as late as 1870 [Schofield 1945:20]. The "seed" beads often preceded larger tumbled beads [Harris and Harris 1967:144-5; Good 1972:122]. White cored drawn beads (Kidd IVa9) are found in the late 19th century at the Guebert site [Good 1972:123], after 1820 in the Wichita sites [Harris and Harris 1967:153] and at Ft. Laramie 1834-75 [Murray 1964:31]. They are said to have come into the African trade about 1830 [Schofield 1945:19], and were the most popular bead in East Africa in the 1860s [Burton 1860:392]. A yellow cored wound one was found from 1840 to 1910 [Fenstermaker 1976], and white cored wound ones are in the Giacomuzzi catalogue ca. 1852-1870. The difference between ivory (although he said the coat was still opaque) and pure white cores, and the date for the introduction of selenium red are in Sprague [1985:94].

Nineteenth Century

When many people think of Venetian beads, fancy lamp-wound beads come to mind. Though lamp beads were made earlier, their peak production was in the 19th century, and we can date some of them from sets of sample cards. These sets differ because they were made for different reasons. One of the oldest known is that of the Levin Company of London, founded in 1830, which gave cards to the British Museum in 1863. The Slade collection was catalogued in 1896, but acquired sometime earlier from a bead trader in India. The Dan Frost cards are of the Stephen A. Frost & Son Co. of New York, in business from 1848 to 1904. These sets belonged to dealers on three continents, and include beads made by various Venetians, as well as Bohemians. The cards in Museo di Vetrario di Murano (Murano Museum of Glass) are those of several Venetian houses of different dates. Only the Giacomuzzi and Weberbeck cards are from one beadmaker; the former from 1852-1870, and the latter 1871-1898.

Hence, the cards span the 19th century. Many beads are found on more than one card, and there are a great many beads involved. However, we can discern trends in the styles of beads being made, especially between the early 19th, the late 19th, and the early 20th centuries.

The Levin and Slade catalogues are described and pictured by Karklins [1982]; the Slade catalogue is not identified as such there, but see Francis [1984; also Slade 1896:163]. The Dan Frost collection is

discussed and partially pictured in Liu [1983]. The Giacomuzzi collection is currently housed in the Bead Museum, Prescott AZ; [for dating see Francis n.d. b]. The Weberbeck card is in the Jablonec Museum. The Murano Museum collection is included in a set of slides donated by Peter Pratt to the Center for Bead Research.
The Museum of Murano has at least nine sets of beads represented on these slides. The oldest appear to be two small cards with drawn beads with accession numbers 59 and 60. No. 59 has "seed" beads, tubes, including maccas, and small drawn beads and perhaps the name G. Zanzila. No. 60 has only "seed" beads and says in English and French "The bundle of 120 threads." Five other cards have lamp beads, the earliest of which seem to be three with hand written numbers and beads similar to the Levin cards; the one with crossed 7s may be the youngest of the three. One with printed numbers has beads similar to Giacomuzzi, including some 300 "satin" glass beads. One with no numbers has newer beads and a great deal of Aventurine. One card has only one strand marked "Pearls of Venice." One display case with Franchini mosaics is also included.

The Levin cards and the older Murano Museum ones have many beads that were popular in Africa, dominated by ocher or dull opaque golden yellow glass in biconical discs <B 7>, bicones and tubes usually decorated with multistripes or eye-like designs <B 9, 10>, along with green and black bicones <B 8>; similar beads excavated in Africa are dated 1750-1850. A popular polychrome was the decoration called a "squiggle," made by combing (or drawing a stick through) a series of circles laid on the bead <D 7>. The ones in the Levin catalogue have white ellipsoidal bases; similar beads have been found on American sites as early as 1725. Beads with black bases were common, such as those with white eyes and blue or pink pupils <B 13>, some with a plant-like decoration running lengthwise, and others with spiral lines and spots.

The African examples were excavated by Lamb and York [1972:110-112]. The term "squiggle" was coined by Kelly and Johnson [1979; see also Francis 1980]; the excavated examples come from the Tallapoosa Valley, ca. 1725 [Burke 1936] and Trudeau 1731-1764 [Brain 1979:113].

The Slade, Giacomuzzi, and some Murano Museum cards have similar beads. The Slade collection has eye and squiggle beads in many colors, the latter mostly round, a style used at least until 1899 <D 7>. Another eye bead has red and blue eyes set in a wide white band encircling the black bead. There are also many ellipsoidal beads with eyes and wavy lines.

The Giacomuzzi samples are the most spectacular of this group. It and some cards in the Museum have many ellipsoid and round combed beads <D 5, 6>. A round combed bead found in America is dated to the mid-19th century. There are also many wound cornaline d'Allepo beads in various shapes <B 3, 4>, as well as decorated ones <D 11>, multicolored melons (with lengthwise ribs) <D 8> and both round and ellipsoidal beads with ribs encircling the bead <D 14, 15>; round beads of this sort have been found in the U.S. from around 1860. There are also many beads with floral or arabesque designs, often raised above the base of the bead <D 9-12>. A notable type are "satin" beads made of a silky glass wound from thin canes <D 16>.

For squiggles down to 1899 see Francis [1980]. The round combed decorated bead is found in Sprague [1959:33]; a round ribbed bead is from Ft. Pierre 1858-1863 [Smith 1960:44].

The Dan Frost collection may be the latest of these, with beads not found on the other cards, including yellow beads with small protrusions all over their surface <E 1-3>, a large variety of floral polychromes, and thin canes of twisted multicolor glass spiraled tightly over the surface <E 12>.

The Weberbeck card, which can be dated from 1871 to 1898, has only drawn beads. These include "bugles" (plain tubes), macca beads, grey cored tubes with stripes, white hearts in five sizes, black tubes labeled "jais" (jet), and "Celyon Pearls," iridescent spherical beads.

Also popular was the mosaic or millefiori bead <C 1-10>. Although a few slices of fancy canes were put on "flush eye" beads in the late 16th and early 17th century <C 1>, these slices <C 11-14> were rare on beads for 200 years or so. Perhaps the first reference to millefiori beads was the comment by Bowdich in 1819 about trading "variegated or mosaic" beads to the Ashanti in what is now Ghana. They are almost never excavated. One which was dates from the late 18th to early 19th century. Millefiories are only found in the Dan Frost collection, 1848-1904, and the later Murano Museum cards, which seem to be contemporary with the Giacomuzzi. Millefiories appear to be 19th century products, especially from late in the century.

Bowdich is quoted in Eyo [1979:47]. Excavated bead: at Dawu, Ghana, West Africa [Shaw 1961: 73]. For later examples see Harris [1984].

Although there are relatively few excavations either in Africa or America from the 19th century, beads found in them match those on these cards, and furnish dates in line with the dates of the sample books. In general, the products of the early 19th century were dominated by ocher yellow and black glass with applied decorations of eyes, lines, and eye-like devices. By mid century floral polychromes, satin glass, and a wide variety of decorations became more popular, and the glass generally became more shiny. It seems that millefiories were made mostly late in the 19th century.

Twentieth Century

The beads of the first half of the 20th century can be judged from several sources. These include a bead catalogue from Allen's Boston Bead Store, ca. 1920-30, two Conterie cards dated 1925 in private hands, and beads remaining in the stock of a Belgium trading post in what is now Zaire.

Most notable at this time is the absence of complex lamp beads. The Allen catalogue has no floral sprays, decorated ocher beads, "squiggle" designs, or, indeed, many beads popular in the last century. Decorations are less regular, mostly simple loops or waves <E 7-10>. The Conterie cards from 1925 have only eye beads, spiral lines on ellipsoid beads, and combed beads; even these decorations are not found by the 1950s. Later beads are primarily striped drawn ones <F 11-12>, millefiories of simple canes <F 8-10>, and oval <E 11> millefiories (these are also in the Allen catalogue). From the 1950s round clear glass beads were decorated with only four or five fancy mosaic chips around the center <F 4>. Chevrons were still found <A 18>, as were white hearts. But, there was a definite trend in the 20th century away from complex fancy canes for millefiories and well-made complex lamp beads, and toward simpler and, therefore, less costly decorations.

Other beads from this period include: Finely made translucent beads said to be Venetian Art Nouveau beads <F 6, 7>. Beads built up of many layers of string glass said to have been made for Coco Chanel in the 1930s. A round tabular with a sad little face perhaps inspired by a vase Picasso designed for manufacture in Venice by Mazzega in 1954 <F 5>.

The Allen catalogue has been summarized by Liu [1975] and dated by Francis [n.d. c]. The Conterie cards of 1925 (one is marked for use in Addis Ababa, 1939) are in the Scarpa collection, Venice. For the beads used in the Belgium Congo (Zaire) see Harris [1984]. The information on the Art Nouveau beads came from Paola Scarpa, for the Chanel beads from Yone, Inc., San Francisco, and Picasso's vase is in Gasparetto [1960:50].

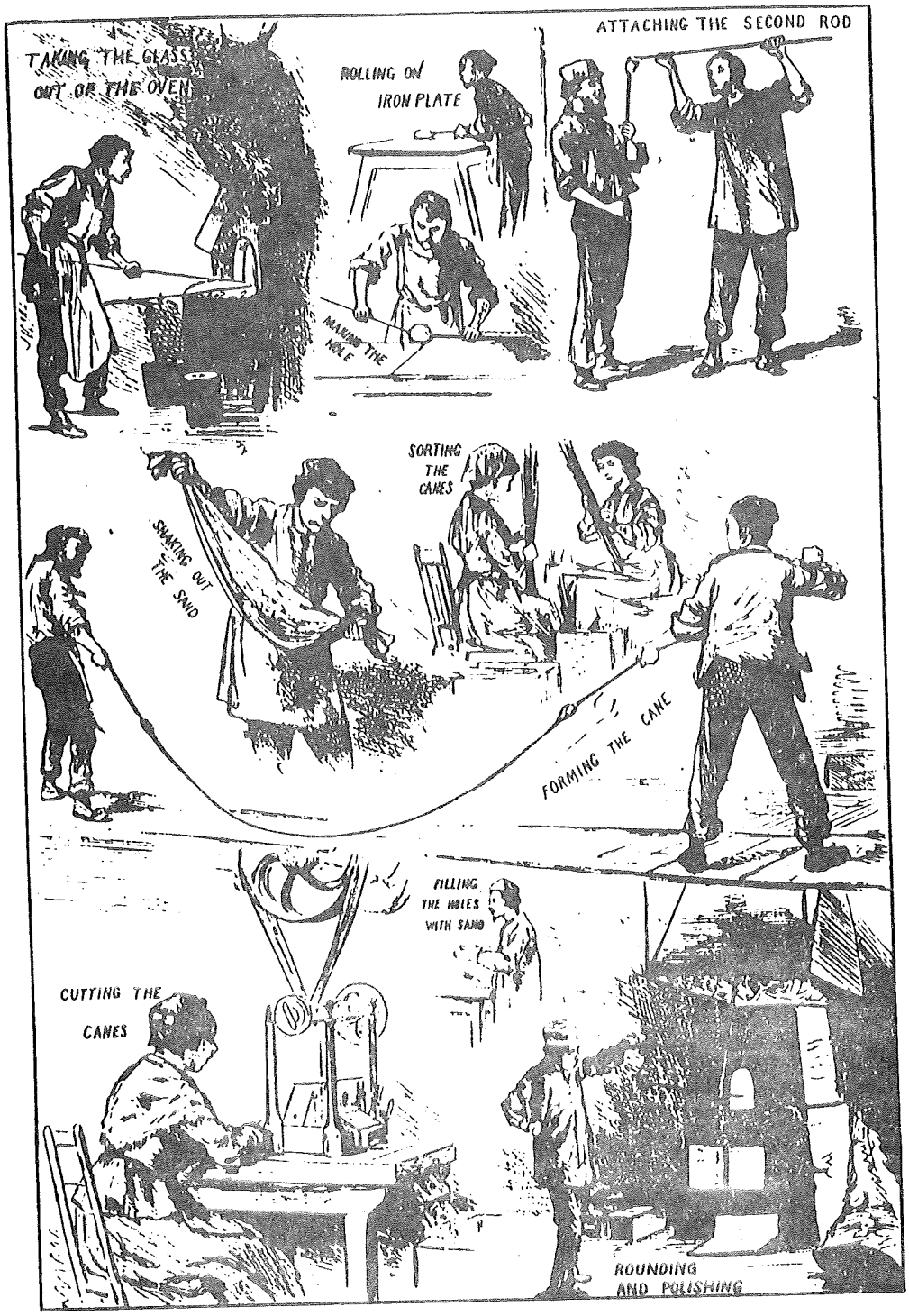


Figure 5: A composite of drawn beadmaking techniques as practiced in Venice, ca. 1890.

SECTION FOUR:

THE BEADMAKERS OF BOHEMIA

Of the many rivals to Venice as beadmaker, Bohemia was far and away the most successful. Since World War I Bohemia has comprised western Czechoslovakia, including the national capital of Prague. Its beadmaking is concentrated in the north, in and around Jablonec nad Nisou, a charming city full of houses in Succession (Art Nouveau) style, situated on the banks of the Nisou River.

Bohemian bead production is mostly a 19th and 20th century phenomenon, and perhaps this is why it had largely been ignored. Van der Sleen said their beads were but imitations of Venetian work [1967:114]. Kidd echoed this and said it was difficult to differentiate Czech from Venetian beads [1979:41].

This is far from the truth. The Bohemian bead story is a lively one, with distinctive production and unique marketing methods. The Bohemians have been even more influential than the Venetians in spreading beadmaking around the world. Yet, before the first edition of this work appeared [Francis 1979b] their beads and their story was all but unknown.

Early Glass and Beadmaking in Czechoslovakia

Glass for tableware, windows, mosaics and beads was made in Bohemia as early as the 8th or 9th centuries A.D. In the 12th century the Abbey of Sazava in Reginhard ordered glass "images," either stained glass or mosaics [Hetteš 1958:6]. One of the attractions for glassmakers in Bohemia was plentiful wood, the only fuel used until the 19th century, which also yielded a ready supply of potash, especially from beech wood.

The earliest historically identified Bohemian glassworks is in the south near the German border from 1359 at Vimperk (Winterberg). Weiss estimated there were four to six glasshouses in the 14th century and about two dozen by the 16th [1971:334], while Hetteš, on the basis of names in villages, counted 16 glassmakers in Bohemia/Silesia, four in Moravia, and two in Hungarian Slovakia [1958:6].

Early in the 17th century there were eight glass furnaces at Winterberg, four of which were listed as "Betel-Hütten" (bead furnaces) [Dillon 1907: 292]. Nearby in the Fichtelgebirge or "Royal Forest" area along the Czech-Bavarian frontier, rosary beadmaking for Dominican monks was established in 1486 by some Venetians. Beadmaking was the privilege of free peasants, who worked from August until Easter at furnaces with twenty openings for twenty workers. To make the predominately black beads they used local materials, including green hornblende, quartz, and beech ash. Each worker had two iron rods, using one to furnace-wind a bead while the second one cooled. After a bead was wound it was knocked (or "shaken") into an annealing pot. Later the beads were strung at home [Jackson 1927:A113-114; Hetteš 1958:11].

A bit later, Venetians sent tubes to Bohemia for finishing (perhaps by the Paternoster technique), but Venice forbade this practice in 1510 [Gasperetto 1958:185-6]. After the 15th century there is little evidence of direct Venetian influence in Bohemia, but the relationship between these two bead-making giants is a constant theme in the history of glass beads.

In northern Bohemia the earliest documents of a glass house are orders and taxes levied in 1376 on the Queysser factory in Sklenařice, a village named for glassmakers some 25 km (16 miles) east of Jablonec [Hejdová 1966; Hetteš 1958:6] The ruins of another late 15th century glass furnace were excavated

there. Its oval design and that of furnaces elsewhere in Europe prove that not all Europeans used the rectangular furnace described by Theophilus. An illustration to Sir John Mandeville's Tales, probably drawn in Bohemia about 1420, shows low domes on the main glass furnace and a small lehr that shared the same heat source (Figure 6) [Hejdová 1966; Charleston 1978:21-3].

Figure 6: Glassmaking in Bohemia in the late 15th century.

By 1414 there was a factory in Novy Bor (Haida), near Sklenarice. But the real growth took place in the 16th century. The Schürer family, attracted by the abundant wood and cheap labor of the Jizera (Iser) Mountain region, founded their first glassworks at Falknov in 1530. Through the rest of the century, members of this large family cleared woods, built settlements and started no less than seven other glassworks, including one at Mšeno, now a quarter of Jablonec, in 1548 [Urban n.d.:1; 1971; Čenský 1966]. Work was divided into glassmaking, painting, cutting, and so on. At Chribska a guild was established in 1661, a second in 1683 on the Sloup estate, and a third in 1694 at Kamenický Šenov (Steinschönau), a bit east of Jablonec. By 1723 104 painters, carvers, and merchants of glass were registered in the latter guild [Urban 1971; Ryneš 1966].

A description of a old Bohemian glasshouse gives an idea of its operation and the status of its workers. At the head was a master, who leased land from its feudal owner, and could build and cut wood there as well as raise pigs and cattle. The moldmaker and his family were very important; their wooden molds for vessels were the precursors of bead molds. Since most of the masters were illiterate, there was usually a cashier to serve as scribe and accountant. A team of four worked under a foreman. The master of the

team had such high status that he was allowed to change his apron after each batch! Under him were a melter and two fire stokers. The local creek sand was used for cheap glass, and ground quartz for Bohemian crystal. Furnaces were rebuilt each year, during which time the workers had a holiday, and when it was completed a ceremony was held and everyone went to church before starting work anew [Barta 1930].

Some men from the glassmaking towns became itinerant merchants. Georg F. Kreybich at the close of the 17th century made about 30 journeys to test markets in Europe and beyond. These traders established powerful trading companies, selling Bohemian glass around the world [Urban 1971]. Although glassware does not directly concern us, the early structures of the glass industry were later transferred to the bead industry.

Birth of Modern Bohemian Beads

The Bohemian bead industry began as a response to competition from Venice, ironically not by glassmakers but by stone cutters. Bohemia had long been a major garnet producer [Kouřimský 1982]; cutting was centered in Prague and in the village of Turnov (Turnou), about 20 km south of Jablonec. Venice threatened the Bohemian garnet business with her cheap glass imitations.

In 1706, Turnov sent Wenceslas and Franz Fišer to work in a Venetian glass factory, and discover its secrets. They got work and stayed for five years, but were not taught what they went to discover, and probably thought they had failed when they returned home in 1711 [Vavra 1954:182; Urban n.d.:3].

They were not completely discouraged, however, because soon they hit upon a formula for red glass, called "composition." We recognize this as lead glass, made from sand, saltpetre, lead, and gold. The lead gives sparkle to the glass and makes it easy to cut, and the gold yields a beautiful ruby red. They drew the glass into canes, and pressed bits into passable garnet imitations [Vavra 1954:182; Hetteš 1958:24; Urban n.d.:3].

The Rybář family soon emerged as leaders in the field. Václav (died 1716) and/or Jan (died 1724) started the business, while František (1723-1771) developed or improved upon drawing canes. At first the glass was pressed in molds of brick clay, but another Václav Rybář (1726-1790) invented a two part tong-mold to shape the glass [Vavra 1954:182; Urban n.d. 4].

The false garnet industry was very lucrative. In 1758, the stone cutter Josef Zich and the dealer Jan Modestin proposed to Count Wallenstein a new mock garnet factory using composition. They estimated they would eventually employ 1600 people and produce 2,880,000 dozen pieces a year, netting a profit of 30 % [Nožička 1966:39, 179]. The proposal was turned down, but later projects showed that their estimated profits were on target.

The transition from stone- to glass-cutter was not very difficult for most Turnov workers to make, as many of them already had second jobs connected with fire (smiths, bakers, soap-makers). They tried to prevent their secret processes from spreading to neighboring villages and beyond, but in vain. For a long time, no official records of the industry were kept because Turnov pretended to cut only gems. Glass was worked secretly in cellars, and only the revised guild rules of 1792 hints at this by naming both "hard work," or gem cutting, and "soft work," or glass cutting [Vavra 1954:183].

But the business grew, as did exports and the variety of products made. Although we know little about bead production at this time, records of an exporter in Lisbon in 1751 included white beads with stars and yellow topaz beads. In 1783 Jan Františck Schwan exported glass crosses and "wolves' teeth" [Urban n.d. 10]. Most, if not all of these, were molded products.

Bohemian beads became popular in Europe, and Venice began to notice. In the mid 18th century Polo Querini, a Venetian diplomat, said that although Bohemian beads were inferior to Venetian ones, they were less than half the price because polishing was done on a lead rather than a tin wheel as Venice used [Morazzoni 1953:40]. Other factors, including lower wages, abundant raw materials, and labor saving devices also played their roles.

By the end of the century, the leading Bohemian glassmaker was the Riedl family. Jan Leopold, a successful window maker, rented John Joseph Kittl's ten year old glass factory at Nová Louka (Newiese) in 1766, putting Frank Anthony, his brother, in charge making tableware, chandelier ornaments, and the like [Urban 1966]. In 1775 Jan opened a second factory at Kristiánov (Christiandorf). When he died in 1786 the Nova Louka factory was taken over by his son Anthony. Both factories began to produce beads. The Kristiánov factory first recorded ruby red beads in 1781, other colors during the next two years, and glass tubes from 1810. At Nová Louka, glass rods were first mentioned in the ledgers in 1792 and glass composition "stones" in 1799. By the early 19th century only glass for jewelry was being made, and there was heavy demand for beads from Poland, Germany, Denmark, Italy, and Turkey. In 1814 the Riedls moved to the Zenkner glass works in Antoníov, near Jablonec. Ledgers from 1786 to 1812 interpreted by Czech historians indicate that management-worker relations were far from ideal. The Reidls are said to have regarded the workers as their property, and the low-status workers were totally dependent upon the owners [Urban 1966; n.d.;6-7].

As the 18th century drew to a close, Bohemia and Venice were politically joined. The Peace of Campoformino of 1797 between the Hapsburgs of Austria and Napoleon fused the two beadmaking states. Napoleon had put an end to the Venetian Republic. In exchange for the Venetian fleet and the Ionian Islands, he signed Venice over to Austria, which also held Bohemia. Venice was not firmly under control until the Peace of Vienna in 1815, which marked Napoleon's defeat, but it only left Austria to join a unified Italy in 1866. The only cooperation between the two bead giants during this period may have been that Venice exported some Bohemian beads [Chambon 1962:87].

The Rise of Jablonec nad Nisou

By the 1760s Jablonec was giving serious competition to Turnov. Its costume jewelry of imitation gems set in the showy but false gold newly developed in Europe was molded, cut, and polished cheaper than at Turnov, and had the advantage of not having to be hidden, as at Turnov. The glassmakers of Nový Bor and Kamenický Šenov freely helped Jablonec get started, probably because it did not compete with their glassware. Jablonec became a center for this work, and soon the township grew to 30,000 [Hetteš 1958; Vavra 1954:185].

The first Jablonec glass beadmaker was Bernard Unger. He applied in 1785 to the Bohemian Land Office to open a factory to make buttons and "Nuremberg ware." Permission was at first denied because of the fear of competing with Turnov. However, he managed to convince the authorities two years later, and was allowed to start a factory in 1787 [Urban n.d.:8], at about the same time as the Riedl factories were making beads. Unger made composition glass canes for lamp-beads. He prospered; at the 1829 Exposition of Prague his sample book displayed 410 bead styles, while Anoniov H. Goble exhibited 202 strands of cut, lamp-wound, and pressed beads [Ibid.:8-11].

Beadmaking became big business. By 1821 mass volume and productivity had lowered the prices of Bohemian beads, and exports reached an estimated 2.4 billion. The largest customers were the United States and independent Latin

America, followed by Haiti (via France), Egypt and the rest of Africa (via Leghorn, Italy), the Levant and on to Asia (from Trieste through Istanbul), Italy, France, and Germany. German sales went mostly to the jewelry centers of Gmund, Idar, and Oberstein. By 1840 employment in the industry was about 10,000 [Urban n.d.:14].

Bohemian beads were made by a wide variety of techniques. Some were lamp-wound, often imitating Venetian beads. The process was slightly different, because the Venetians shaped beads with tongs and the Bohemians used metal half-molds. Václav Rybář's tong-molds had been improved by Kájetán Šir of Dalešice, whose dies were engraved by local workers. Glass blown into molds for hollow beads was first used in 1810. The Riedl family learned to make small drawn "seed" and "bugle" beads, apparently with the help of Venetians [Urban n.d.:13-16]. Beads were also ground, either for faceting or to remove the extra glass from molding.

The increasingly sophisticated industry expanded its line. A recipe for mosaic or millefiori from 20 October 1837 at the Riedls' Zenkner works shows this was produced then [Hollister 1969:25]. In 1845 Dr. J. Weisskoph devised a way to etch and luster beads called "Pearls of Paris" [Rogers and Hawkins 1977:8]. By 1887 the Bohemians were making aventurine [Urban n.d.:16].

Different methods required different beadmaking shops. Drawn beads and some others were made in factories. However, many glass canes were sent to private homes, as in Venice, but to mold beads rather than lamp-wind them.

Glass canes were heated at a small wood burning furnace. When the tips were molten they were pinched off and put into a two part tong-mold. The temperature of the mold was important; if too cold, imperfections would be left, and if too hot, the glass would stick and could not be removed easily. The worker closed the mold, stuck a pin in to perforate the bead (some molds had pins built in), then removed the bead and set it into a small clay pot next to the fire to anneal. After the bead cooled, the flash or mold seam was ground off against a piece of sandstone and the bead polished against a rotating wooden disk, often driven by an adjacent stream. Small beads with no molded designs might be fire-polished by being held above the fire just enough to let the surface run [Schwartz 1886:350-1].

Considering all of the disparate elements of the Jablonec bead industry it is something of an accomplishment that they all functioned smoothly, almost as though they were part of a single company. One of the strengths of the Bohemian beadmakers was their diversity, while another was their unity. The forces which unified them are important to consider.

One of these was the method of marketing. Merchants provided feedback to the beadmakers about the types of beads desired. This feedback came in a most unique way. A small army of men traveled to the most remote parts of the Earth to scout out beads in use. They sent samples back home, earning them the name "Sample Men." Some were on the road up to two years, going to quite inaccessible places in Africa and Asia. The Bohemians copied bead materials and styles, some with very limited markets. By 1875, 322 samples and 343 drawings of beads had been registered by these men [Urban n.d. 18].

Not all beads to copy came through the Sample Men; some were commissioned by traders or other authorities. The British government had Conus shell discs imitated for East Africa in 1892, after the many problems they faced upon destroying the original shells [Liu 1975a]. Nor did imitations always work. There is the "sad experience of a trader who, upon learning that the natives of Portuguese Angola highly valued their old beads, sent samples to

Europe and had them duplicated by a Czech factory. Upon receiving barrels of them he was astounded to find that the natives refused them, clinging to their own beads. Another example of civilized people underestimating the intelligence of their primitive brothers." [Sigler 1952:896]

Another focus of unity were glassmakers' schools. The earliest was set up in 1839 at Kamenický Šenov, and is still functioning, the oldest such school in Europe, and no doubt the world [Urban 1971]. A School of Applied Arts was founded in 1880 in Jablonec, with a broad and expanding curriculum including all aspects of glass and jewelry production. In 1904 and 1905 "itinerant schools" were opened at Luchany, Smržovka, and Kokonín to teach jewelry making and metalworking [Peštovà n.d.:27-8].

A third unifying force was the increasing power of the Riedl Glass Works, now at Polubny (Polaun), about 20 km east of Jablonec. By the beginning of the 20th century, the Riedls had monopolized the production of raw glass and canes. Hence, all the many homes and small factories making beads purchased glass canes from them [Urban n.d.:19]; this situation did not last forever.

Finally, there was the growing prestige of Jablonec itself, the "capital" of the bead and jewelry industry. The real turning point may be said to be 1866, when it was incorporated as a city and the railroad reached it. The Emperor Franz Joseph visited in 1906. In 1912 the city leaders attended the launching of the largest Austrian Lloyd ship, Gablonz (Jablonec in German). In 1911 Jablonec paid 1,954,904 Austrian crowns in taxes, equal to the whole province of Dalmatia [Urban n.d.:15; Peštovà n.d.:24]. Population data clearly show its growth, stagnation, and later decline (Table 5).

Table 5: The Population of Jablonec nad Nisou 1800-1969

Year	Population	Source
1800	2,254	Urban n.d.:15
1857	4,553	Ibid.
1866	5,350	Ibid.
1869	6,752	Ibid. (includes 2,878 foreigners)
1914	32,894	Ibid.
1930	33,958	Webster's Geographical Dictionary, 1969
1937	33,885	Hammond's Modern Illustrated Atlas of the World
1962	25,820	The Curtus-Doubleday World Atlas
1969	27,802	Hammond Ideal World Atlas

Throughout the century, coal was slowly replacing wood for fuel. Augustine Seidel opened a lignite mine near Bechlejovice in 1803, and applied to build a glass factory using coal the next year. It was not successful, but by the end of the century several factories used coal or improved methods to burn scrap wood and branches. The railroad eased coal transportation and reached the Riedl factory at Polubny by 1890 [Sacher 1966:47; Schwartz 1886:347]. Many glass furnaces relocated in the south to be closer to coal sources, but those for beadmaking stayed around the Jablonec area [Winans 1922:1, 6].

The Twentieth Century

At the turn of the century the Bohemian glass bead industry was at the peak of its form. Jablonec was a creative center for Succession (Art Nouveau), and the School of Applied Arts had gradually added many faculties to include

drawing, painting, and ceramics [Peštovà n.d.:28]. World War I impacted on the industry, as might be expected, but it recovered afterwards, the number of exporters rising from a low of 200 to 700 [Weston 1929], while population remained steady (Table 5). After the war, Bohemia was joined to Moravia, Slovakia, and part of Silesia to form the new state of Czechoslovakia.

The Bohemian glass and bead industry was important to the economy of the new country. In 1920 glass was the second largest Czech export, 90 % of it being made for export, and the bead industry was a key component: "[It] has contributed in no small degree to the development of the foreign commerce of the Republic." [Winans 1922:2] During the 1920s the Encyclopedia Britannica reported that Bohemia made, "by far the largest proportion of the world's beads." [Weston 1929]

In 1920 a new glass center arose, eventually to rival Jablonec seriously. This was Železný Brod (Eisenbrod), near Turnov, whose School of Glass-Making was a leader in design. Many of its young masters were graduates of the Prague Academy of Applied Art. Jaroslav Brychta, the first Professor-Artist, initially developed new and innovative styles. Bohemian beads became less imitative and more original in design [Peštovà n.d.:28]. Also in 1920, one of the largest Bohemian beadmaking houses, A. Sachse & Co., was purchased by the Venetian Conterie combine [Pasquato 1953:80].

The monopoly the Riedls had enjoyed was broken, perhaps due to the surge in demand. By 1922 the districts of Jablonec and Železný Brod had 30 firms with 80 furnaces making glass tubes and canes for the home-based bead and jewelry industry. There was beadmaking in Horice, Nova Paka, and Kralove Dvur (Koningenhof), and in Moravska Budejovice (Marisch Budweiss), Moravia. Popular items were artificial fruits for hat ornaments, beaded braiding, and glass bangles, especially for export to India [Winans 1922:6-7].

Just before the Great Depression, Jablonec's 20 firms produced about half of all Bohemian glass beads and costume jewelry. Along with glass, beads were made from wood, galalith (a casien plastic), horn, and tortoiseshell [Weston 1929]. The region had some 3000 firms employing 30,000 workers at home or in factories [Vavra 1954:185], with annual production at 1,500,000 tons [Urban n.d.:20]. If this is accurate (though it may include buttons, metal parts, and other non-beads), it clearly greatly overshadowed Venice. There are no comparable figures for Venice, but production there hardly ever exceed 6,000 tons and was usually closer to 2,500 tons annually (Table 3).

Then three events of global proportions seriously damaged Bohemian leadership in beadmaking. The first was the Great Depression. The number of exporters, which had been about 600, dropped again to 200, the lowest level since World War I. The output of 1.5 million tons of beads and jewelry in 1928 was not met again until 1938 [Urban n.d.:20]. There was hardly any time for the industry to recover. Just as production had regained its lost ground, Europe was plunged into a great war, ending with Czechoslovakia as a member of the Socialist block.

The once booming private glassworks were soon nationalized. On 28 October 1945 all primary glass producers and the larger secondary producers, making up about 65 % of the industry, passed under state control. In February 1948 all the smaller secondary glass industries were also nationalized. The bead industry all but disappeared. The necessities of rebuilding a nation and the socialist vision of reality had little room for such trivolities. Some beadmakers left Jablonec for Austria and Germany; the population figures in Table 5 between 1939 and 1962, reflecting at least in part this exodus.

However, the history of beads shows them to be one of the most enduring of artifacts, and as Czechoslovakia recovered and the value of exports came to be realized, restrictions were relaxed. Despite the loss of customers and the decline in production, the glass bead industry was revived around 1955. Tremendous growth has followed; by 1958 the industry had largely recovered. Production at Železný Brod between 1955 and 1961 alone grew 15 % a year, or more than 130 % [Urban n.d.:21-2]. In 1970, 25,000 new costume jewelry designs were registered, bringing the total to 250,000 [Jablonex 1971].

Today there are five costume jewelry firms, each with their specialities: Jablonec Glassworks, Železný Brod Glass, The Stone-cutting Works, Costume Jewelry, and Glass Costume Jewelry. There are also two export firms, Glass Export and Jablonex. Jablonex, founded in 1949, is responsible for nearly all costume jewelry export. A separate firm, Uniprojekt, designs glassware and costume jewelry. The production and designing firms employ about 25,000 people, while Jablonex alone employs another 1000. Exports are sent to 110 countries [Urban n.d.:22; Uniprojekt n.d.; Jablonex 1971]. A recent Jablonex advertisement in Russian, French, German, and English tells of the extent of the current Jablonec production and export:

> Imitation pearl necklaces, seed bead necklaces, imitation jewellery and necklaces made of plastic and wooden beads, costume jewellery made of metal, brooches, earrings, rhinestone jewellery, enamelled jewellery, filigree jewellery, rocailles, pressed beads, lamp beads, machine-cut beads, tin cut beads, fire-polished beads, hollow glass beads, plastic yarns beads, beaded evening bags, glass mosaic, imitation glass stones, machine-cut chatons. Christimas-tree ornaments, artificial flowers, artificial fruit, Christmas and Easter decorations. [Jablonex 1987]

The list is quite impressive and includes nearly all the sorts of beads that we have discussed in our history of Bohemian bead production. A major drive to expand Bohemian markets with the same aggressive and innovative production and sales techniques that once made it the leader is on.

In addition to production, design, and exporting firms, several subsidiary institutions have grown up around the bead industry. Foremost among these are the Glass and Costume Jewellery Museum at Jablonec, and the School of Glass-making at Železný Brod. In addition, separate glass museums are set up at Novy Bor in a house built in 1804 by J.K. Sachr, an exporter active in Mexico, and at Kamenicky Senov, the home of the oldest glassmakers' school. A Memorial House of Glassmaking at Kristiánov, where the Riedls set up in 1775, has models of the works in the last original building of the factory.

Bohemian Beadmaking Abroad

Two mechanisms have been employed to spread Bohemian beadmaking techniques outside Bohemia itself. The beads thus produced often resemble those made in Bohemia, and it is important for us to observe their techniques, as they show us what is now often hidden from view due to time or the closed nature of the present industry. At least three European bead industries were begun by refugees after World War II. At least two others have been started by Bohemian technologists advising Asians how to make beads.

The largest of the refugee groups settled in Bavaria at Neu-Gablonz (New Jablonec) near Kaufbeuren, Germany [Van der Sleen 1967:114]. <Van der Sleen spells it Kaufbueren.> A great variety of beads are made there, many of which quite resemble Bohemian ones; all appear to be molded.

Some refugees settled in Krimsmunster, Austria, including Bruno Ulbrich, who does not use tong-molds, but a mechanized system which likely resembles the Bohemian method early in this century. Glass canes are lined up on a table with one end projecting into a furnace. When the ends are soft, they are put in a table top mold with piano wire running through it which slices off the heated ends of the canes. The mold is then closed with a handle. The finished beads are tumbled with an abrasive, and finally separated with water from the grit in a centrifuge [Winagura, Winagura, and Harris 1983].

Some 4000 Czech refugees went to Gmund, Germany, some of whom were bead or jewelry makers, as Gmund has long been a jewelry-making town. In 1947 beads were made there by the winding process. A cane was heated at a lamp, wound around a kaolin coated copper wire, and then while still on the wire placed in a half-mold and twirled to form a perfect shape. A number of beads were made up the wire, then it was set in a can of sand. Later, the beads were slipped off, thanks to the kaolin [Strache 1947].

In addition to refugees, Czech technicians have gone abroad to teach bead-making to others. In 1940, Mr. and Mrs. Hendricks went to Benaras, India, to open a school of glass and beadmaking. The school functioned until about 1962. Glassmaking did not take hold (Firozabad is the center of the Indian glass industry), but beadmaking did. Lamp beads are made in precisely the same way as described from Gmund [Francis 1982c:11]. Most recently, Czech methods have gone to China, and the old beadmaking ways at Boshan (Poshan), long the Chinese beadmaking city, have been replaced [Sprague 1986; 1987].

THE IDENTIFICATION OF BOHEMIAN BEADS

By far our most important source of information for these beads are those preserved in the Muzea Skla a Bizuterie (Glass and Costume Jewelry Museum) in Jablonec. Unless otherwise noted, the following chronology is based on their collection. The numbers in parentheses refer to catalogue numbers in effect in 1979; they may have been revised since. The letter "B" refers to the general collection, "BS" is the collection of A. Sachse & Co., and "M" refers to a museum display or beads without other numbers.

The 18th Century

Nothing is preserved from this period, and we know of these beads only from documentary records. The most important types were of ruby red glass used for imitation garnets. Tong-molds were in use early in this first century of Bohemian beadmaking, and white beads with stars and "wolves teeth" were probably molded, while garnet and topaz imitations were probably molded and ground; the Bohemians had an early reputation for beads faceted on a wheel. Tubes for drawn beads, including "seed" beads, were also made at this time.

First half of the 19th Century

Between 1800 and 1850, the most popular beads continued to be the imitation garnets made of "composition." Other molded beads, including spacers, used to hold several strands apart by their multiple perforations, and granulated glass beads, as well as beads with incised decorations, were being made at this time (M, BS 73-82).

One popular molded bead is known to collectors as a "Vaseline bead," as it is often translucent green or yellow; opaque blue, green and white were also made. The green and yellow contain uranium, first isolated in 1789 and used

for glass, especially in Bohemia, soon thereafter; these must have been some of the first beads colored with uranium. The holes are conical, and a ring of broken glass surrounds the smaller aperture <G 1,2>. They are found on archaeological sites from the 1820s and 1830s; the earliest at the Museum date from 1860 (B 1878); they were made through the late 1900s (BS 470).

For a discussion of uranium glass see Weyl [1959:205]. Ross [1974] first described these beads, but the process he invoked for their manufacture (mandrel-pressing) is not entirely convincing. They have been found on Wichita sites 1820-1836 [Harris and Harris 1967:154] and in Florida 1824-1846 [Piper and Piper 1982:218-20].

Not all beads were molded, however. Wound beads were made in 1815-1840 and 1840-1850, the latter with conical perforations (BS 73-82). In 1829 Gobel exhibited lamp beads along with cut and pressed beads [Urban n.d.:12]. Drawn beads were also produced. Some of the the earliest "seed" beads are quite small with metallic coatings (BS 73-82). Another type with a satin sheen was called "Atlas," and made from about 1800 (M).

Middle of the 19th century

Although blown beads were introduced in 1810, their zenith came later. In the years 1850-1870 multi-faceted hollow beads in yellow and red (B 1735, 2578), as well as hollow faceted white beads with pink zones (B 1724) were made. Plain round hollow blue beads were also produced (B 532), as no doubt were many other styles.

Among molded beads were light blue and milk glass spacers and hexagonal tabulars with faceted tops (BS 46). Molded black glass "French jet" jewelry and beads were a popular line. Drawn beads included "seed" and macca beads.

One unusual pendant is flat in cross section with an ellipsoidal profile and squared-off platforms above and below, perforated through the top <G 3>. In stone this shape has been popular in the Muslim world since the 9th century A.D. [Francis 1987b:19]. Glass ones in many colors usually have a Qoranic inscription on one side, and a looped design and the words "Made in Austria" on the other; some also have ancient Egyptian motifs. Unless these were made in Austria proper, which does not seem very likely, they must have been produced when Bohemia was still part of the Austrian-Hungarian Empire, from 1814 to 1914, and probably early in that period.

The best known drawn bead is, in its most simple form, a dark translucent blue hexagonal short tube (sometimes heptagonal or octagonal), which has been ground into facets at its twelve corners. Some of these are large and were cut roughly from their tubes <G 4>. A second type is smaller with flat ends and a white interior layer; several other colors are known too <G 5,6>. These have acquired many names: "Russian beads," "Ambassador beads," and "Hudson's Bay beads," the least approprate of which is probably "Russian," as it was not the Russians who brought them to Alaska. They were traded far and wide and have received much attention [e.g. Harris 1985].

The earliest are found in the first quarter of the 19th century, at which time all types (large blues, small blues with white rings, and other colors) are contemporary. There is no evidence to show which type is the oldest, and the only known source for these beads is Bohemia, though the large solid blues ones are not recorded in the Museum, and may have been made elsewhere. Richard Burton in East Africa mentioned, "blue Bohemian glass beads cut into facets" [1860:394]. They are probably the "cut glass beads" sold by John

Jacob Astor's American Fur Co. in 1833 for 37 ½ cents per dozen [Good 1983: 165]. The smaller ones are on Bohemian sample cards from 1870; similar long unfaceted hexagonal tubes are found at the same time (BS 562). Opaque light blues ones (BS 492) and long faceted ones (BS 557) are on sample cards from the late 19th century.

In the Wichita sites small blue ones with white interiors are found in 1780-1820 levels, while large solid blue ones, as well as small green and black ones appear after 1820 [Harris and Harris 1967:151-3]. In Florida small amber and clear ones were in 1824-1846 [Piper and Piper 1982:214]. Small black, clear, amber, blue and green ones appear at Ft. St. Pierre 1858-1863 [Smith 1960:141-2]. Small white cored blues and long blue and greens were found at Ft. Laramie 1834-1846 [Murray 1964:28]. Both large and small blue ones were present in the Northwest 1840-1910 [Fenstermaker 1976]. In East Africa green ones are reported at Kilwa from the 16th to 17th century, probably intrusions [Chittick 1974:480], and from the late 17th to 19th centuries at Ft. Jesus [Kirkman 1974:146]. (Kidd Type 1f)

Late 19th Century

From about 1860 to 1900 Bohemian bead production was at the top of its form. In this period Jablonec outpaced Venice to become the leading bead purveyor to the world. Beads of this period are often quite distinctive. Although lamp-wound and drawn beads were made, often imitating Venetian beads, and simple monochrome forms were produced, the overwhelming number of beads are more easily recognized. Most were molded, and were often made in direct imitation of other beads, bead materials, or bead styles. It is easiest to divide this production according to the styles of beads produced; unless otherwise noted all these beads are molded.

Many beads were made to imitate materials other than glass. Semiprecious stones were favorites; some carnelian imitations are a bit too red (BS 474) <G 7>, while others were closer to the color of the stone (BS 443, BS 507) <G 8, 9>. Most were faceted to simulate beads then popular in Europe [Van der Sleen 1967:56]; some were made by the "mandrel-pressed" technique. Both black and brown onyx were copied (BS 489) <G 10, 11>, as were the delicate stripes of banded agate <G 12>, though these clearly show mold marks (BS 488, B 577, 576). Lapis Lazuli was imitated, especially in the popular shape of cornerless cubes (BS 465) <G 13>, as was turquoise <G 14>; at least some of which were commissoned by Lorenzo Hubbard for his Arizona trading posts [Sorensen 1971:16, 33], though there is some controversy over exactly what constitutes a "Hubble" bead.

Bloodstone (BS 508), amber (BS 507, BS 508, BS 577) <G 14>, and tortoise shell <H 11> were popular, and amber was especially mimicked in plastic (BS 505). Coral was also imitated (BS 509, 511), some with impressed striations <G 15>. Orchard [1929:99] quoted Louis Rosenberg, a bead importeer, "[red imitation coral beads] were made sixty or seventy-five years ago [ca. 1855-1870] in Bohemia for export to India, Africa, and America. At the time, they were made there was no natural color coral glass manufactured, so they were made in crystal and covered with coral lacquer. In later years they have been made of coral and other colored glass."

Prosaic materials were also worth emulating, the most important of which was shell in special shapes for particular markets. Conus shell tops were ordered by the British in 1892, and were still being stocked in 1913 for Eastern Africa [Liu 1975a; Harding 1961:63]. Beads cut from the large Arca

shell, both gabled as square tabulars <H 8> and large rectangular naturally ribbed tabulars ("Hippo teeth") were made, as were cowries, some of them decorated (BS 491), and perforated as spacers (B 573). Other imitations of shell included long tubes with incised lines (BS 481) and small conchs with none-too-convincing stripes (BS 478) or millefiori eyes <H 7, 12>.

Even less scarce materials were not too obscure for the Bohemians. They put out a line of imitation bone beads, rings, and toggles (BS 482), and tubes and interlocking beads resembling bauxite for the West African market (BS 482). The economics of this is interesting. Natural bone, bauxite, and some shells were inexpensive materials, but apparently the Bohemians could make them in glass, ship them long distances, and still make a profit; their popularity may have been because of their greater regularity.

The Bohemian Sample Men that wandered the globe sent beads from all over, including some just noted. They also found ancient beads to copy. One was the comma shaped jade pendant known as "gokuk" in Korea and "magatama" in Japan <H 1>, a development of the Korean Bronze Age [Francis 1985b:9] (BS 491). Another was an Indian glass bead popular in Southeast Asia, shaped like two interlocking chain links; the Bohemains made blown ones (BS 512-516). A third was the dZi bead, greatly valued in Tibet and neighboring areas, originally made by darkening chalcedony and soda-etching lines on the surface. When visiting Tibet, de Codrington remarked on these imitations, "Here is another instance, among several that I have recently come across of the extreme astuteness of the Central European manufacturers, who seem to control this trade.... Their knowledge of anthropology is, perhaps, a little one sided, but it is obviously detailed as far as it goes." [1932:128]

Another ornament the Czechs copied was the "talhakimt," a flat, pointed pendant of carnelian with very wide holes, probably Indian made, and popular in North Africa. The Bohemians imitated them in their excellent carnelian glass (BS 491) as well as smaller copies in other colors <H 2>. Also for the Muslim market were imitation charm case beads, originally hollow metal tubes to hold a written amulet, and later made of stone in India [Francis 1987b:18-19]; the Bohemians copied these shapes in glass (BS 480) <H 3>. They continued to make the peculiar flat pendant described above, but now in carnelian glass (BS 548).

For West Africa the Bohemians copied beads locally made by melting crushed glass in a long horizontal mold [Sinclair 1939] <H 4>. A small green disc with yellow inclusions <H 5> is perhaps a copy of the "Beads of the Water," a popular heirloom in East Africa [van Reit Lowe 1937]. The interlocking "snake" beads <H 6> may have been made to imitate snake vertebrae (BS 484) [Liu 1976]. Shell, bone, and bauxite imitations were also sent to Africa.

The Chinese market must have been lucrative, as many Bohemian copies of Chinese beads are known. Ordinary Chinese beads, with their distinctive colors, knotted strands, bubbly glass, and not very precise shapes were imitated by Bohemian wound beads, although they were usually more regular, often in graduated strands, and had smaller holes [Chu and Chu 1973:141] <H 10>. The Chinese also made a round bead with several coatings of glass and then ground the outer coats away to reveal eyes; imitations in blown glass were made by the Bohemians (BS 533-4) <H 11>.

The Bohemians were not above copying popular Venetian beads. The chevrons on record primarily had black cores, with red, white, and blue outer layers and ends ground round or square (BS 478). They made White Hearts in yellow, red, and orange (BS 458), as well as blue and green, and they heated them slightly to make them collapse a bit "in the Venetian manner" [Lamb 1979].

The Bohemians were making aventurine by 1887; their earlier attempts have a poor, streaky quality (BS 474). Millefiori canes were made from 1837; many beads decorated with them can be distinguished from Venetian beads by their molded bodies (BS 481) <H 12> or of frosted surfaces (BS 544). Their lamp beads, including foil beads (BS 507), have fancy floral decorations which are very difficult to tell from Venetian ones, as on two sample cards in the Center for Bead Research collection. They also made gooseberry beads with lines of white sandwiched between two coats of clear glass (BS 618).

The Muslim market was appealed to in several ways. We already noted copies of the flat pendants, charm case beads, and the talhakimt. The Bohemians produced a line of beads specifically for Muslim clients, including round or hexagonal tabulars with stars and crescents <I 1a> or the name "Mohammed," <I 1b> commonly in red glass (BS 468). They also made heart shaped pendants, again mostly in red, with short Qoranic sayings on them <I 2>. Many Muslim prayer strands were fabricated. One of the most popular beads for these is a small ellipsoid with an impressed rosette of dots (BS 506) <I 3a>. They also made disc beads for counting the strand <I 3a>, long pendant-like beads for the ends <I 4>, and wooden prayer strands (BS 341), some with circle/dot motifs cut into the beads (BS 342).

During this time many novelty beads were produced in shapes resembling natural objects. These included small corn cobs (BS 463) <I 5a>, berries <I 5b>, seeds, strawberries (BS 507) beans in thirty color combinations (BS 511), and fish spacers (BS 490). Flowers were popular, including impressed roses in spherical beads (BS 466) <I 6>, blossoms which interlocked (BS 506) <I 7> and flat flower discs which resembled interlocking beads (BS 508).

By no means were all beads of this period imitative; the Bohemians could be inventive as well. They turned out a wide variety of toggles, which hang above a string as much as below it (BS 547-548), and spacers with more than one hole for keeping two or more strands apart <I 8>. Their pendants were especially varied, with heart shapes (BS 464), inverted drops (BS 481), reversed triangles <I 13>, arrowpoints, and others <I 12> (BS 490).

Baroque shapes were used for both solid and hollow beads (BS 464) <L 1>. Among incised decorations were square tubes with impressed rows of dots (BS 511) <I 9> and bicones with incised lines (BS 466). A distinctive style was a black bead with a frosted surface ground away in spots for decoration (BS 40-3). Decorations often accented the mold seams; these included sploches in different colors (BS 511, B 572) <I 10>, and zones that did not meet all around the bead (BS 547-548). A distinctive blown bead was a cube with crosses on four sides (BS 451), a type later made in Japan [Blair 1973:294]. A wound bead which may have imitated a Venetian bead or vice-versa was black with a milled white zone at the equator (BS 625). At least by this date the Bohemians were also making Prosser beads (BS 508) <L 6>.

In truth, the variety of beads made in Bohemia at this time is so great, that we have little more chance of listing all of them than we do of all the contemporary Venetian beads.

The Early 20th Century

While it is likely that many beads just described were made for a long time, beginning with this century there was a movement away from copying other beads. Coral branches were still nicely imitated in the 1918-1937 period (B 2816), and remain a popular export to the Soviet Union. The same was true for novelty beads, including elephants (1910-1930 M <J 1), and insects in various colors <J 2>, which may have been attempts at Egyptian scarabs.

But the great variety of imitative beads dropped off. Many 20th century beads had no specific regional or ethnic connotations. A popular line from 1900 to 1930 were white beads with incised lines in various designs (M) <J 3-5>. Baroque shaped beads continued to be made (BS 2751, 2804, 2805), as did foil beads 1910-1930 (B 3284, 3608), toggles, spacers, hexagonal and striped tubes, and beads of more general types.

Artistic movements caught the fancy of the Bohemians, who designed many beads for Art Nouveau and Art Deco lovers <J 6-9>; the former phase influenced many of the buildings in Jablonec. When Howard Carter opened Tutankhamun's tomb in 1922, the event set off a world-wide "Tut craze," and the Bohemians made beads at least until 1925 <J 10, 11>.

Late Twentieth Century

After World War II, and to the present the trend begun early in the century accelerated. Few of today's Bohemian beads are novelties or imitations. Dice beads are still made, ironically rather popular in the non-gambling world of Muslim countries <K 1>. Pendants shaped like small leaves <K 2, 3> and fairly clumsy grape bunches <K 4> are currently produced. One useful bead made today is a small round tabular with a letter on the faces, used by hospitals and others to spell out the names of babies <K 17>. Austria makes similar beads, but their lettering is thinner than the Bohemians' <P 6>.

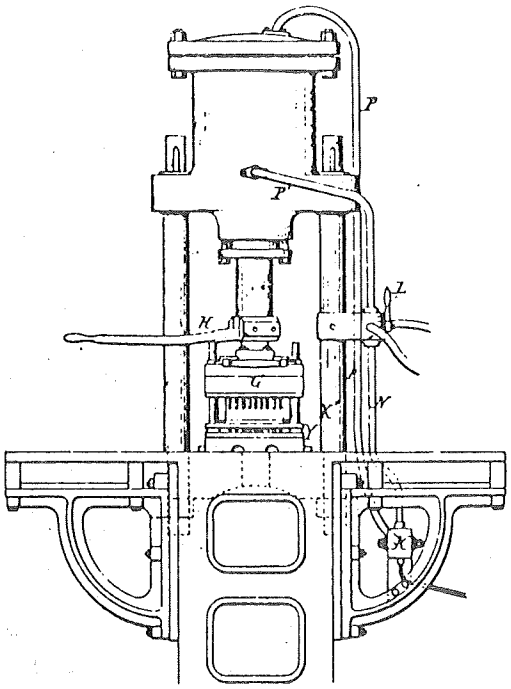


Figure 7: Jean Felix Bapterosses' machine for making buttons, etc., 1880. On such machines Prosser and tile beads were also made.

SECTION FIVE:

OTHER EUROPEAN GLASS BEADMAKERS

No glass beadmakers of modern times dominated world trade as much as Venice did for centuries and Bohemia did later. Yet, it is an error to assume that all glass trade beads originated from these two centers. There are glass beadmakers around the world, and some of their beads (especially from India, China, and Japan) are nearly as widespread as Venetian or Bohemian ones.

Nor could Venice or Bohemia prevent the growth of other bead industries. The economic system of mercantilism and its cousin, colonialism, encouraged attempts at beadmaking in many European states. We know the Dutch industry best, but it was by no means alone. Unfortunately, we know little about any of the others. Kidd [1979] attempted to trace some, but the references are infrequent. Thus, this section is not complete, but only a survey of what is known about minor European beadmakers. We are in an even worse position when it comes to knowing about the beads produced. Much more research will be necessary before we can draw an accurate picture of all of them.

The Spread of Beadmaking

Those most responsible for spreading beadmaking throughout Europe were the Venetians. This may seem remarkable, given strict laws against exporting glass or technology, but it was the case. Other countries were anxious to have Venetians, who were often given special privileges. France guaranteed naturalization and the right to set up shop, and they enjoyed high status there [Scoville 1950:82-3]. As early as 1486 Venetians helped set up a bead factory along the German-Bohemian border [Jackson 1927]. During the 16th century several Venetian glassmakers went to Paris, Rouen, and Montpellier, France, although it is not clear if they made beads [Morazzoni 1953:41].

In subsequent years, several Venetian beadmakers went north. Sebastian Orlandini (Orlanden) worked in an English glasshouse from 1579 making beads [Winbolt 1933:51; Thorpe 1935:120]. Beadmakers were apparently smuggled out of Murano by Jan Hendrikszn Soop around 1603 to go to Amsterdam. One of the Miotti family, Zuan Antonio, managed a bead factory in Middleburg, Holland in 1605 [Zecchin 1971:78; van der Sleen 1967:108; Karklins 1974:54-5].

The real outflow of Venetian beadmakers occurred in the mid 18th century. Much of it was directed by Domenico Vistosi, who by 1767 is said to have been associated with all the clandestine expatriates, including those going to Florence, Rome, Naples, Torino, Marsailles, and Innsbruck. Some of the known wandering beadmakers were: Zuanne Cedolin and Pietro Sicca in 1730 to Amsterdam, Aloisio Deo to Florence, Zuanne Battello and Gasparo Milani to Pisa, Battista Zanoni to Portugal in 1773, Franscesco Bigaglia to Bologna, beadmaking attempts in Graz and Florence in 1760, Vincenzo Longi at Mantova, and Giovanni Cimei in Loreto, who used smuggled canes [Morazzoni 1953:41-8].

Cimei wrote L'Arte del Perlero in 1779 in order to transfer work to Spain under orders from Ferdinand IV. Gaetano Acquabona was commissioned by Marie Theresa in 1765 to bring beadmaking to Innsbruck and Graz, intending to make aventurine, ruby glass, and rosaries. The news that the plan had failed was received with glee in Venice, where there had been some apprehension about its possible success [Ibid.:43-4].

Venetian glassmakers were rivaled by those of Altare in northeast Italy. Unlike the city fathers of Venice, the Duke of Altare encouraged his glassmakers to journey abroad, as long as they paid him duties. This was one way glassmaking spread throughout Europe, though the itinerant glassmakers were not supposed to teach their secrets to outsiders. There is no evidence that they made beads [see Engle 1981].

We noted in the chapter on Bohemian beads that beadmakers left Czechoslovakia after World War II and set up in Germany and Austria. It is possible, but unknown, that earlier emigrations from Bohemia also took place.

Glassmaking was widespread, and beadmaking is a skill that glassmakers can acquire, given incentive and patience. Furnace-wound beads have been made in Europe for millennia, and were probably in the repertoire of many small glassmakers. Drawn beads were made in Russia before the Mongol invasion, and this technology could have spread elsewhere. The methods for making clear and colored glass eventually came to be common knowledge, especially after the popularization of Neri's book. Thus, a given beadmaking industry need not necessarily have been started by beadmakers coming from elsewhere. Nonetheless, it appears that the Venetians were instrumental in much of the spread of glass beadmaking throughout Europe.

THE NETHERLANDS

Holland is the best known of the minor European beadmakers, largely because of Van der Sleen, who publicized the industry widely. However, he did not discover the industry, and virtually all the documented proof was collected by Hudig (1923), most thoroughly summarized by Karklins [1974; 1983]. In addition, physical evidence in the form of finished beads and bead wasters have enlarged our understanding of Dutch beads. The first collection of this evidence was by Van der Sleen [1962]; Van der Made has added to this material [1978]. Recent excavations have turned up more evidence [Karklins 1985], and we can expect to learn more about the industry soon.

Documents show a thriving bead industry in Holland between 1597 and 1697, with production in Amsterdam for most of that time [Karklins 1974:64-6]. Archaeological evidence indicates bead factories in Amsterdam in the 1590s and perhaps a decade earlier [Karklins 1985:36]. Beads may have also been made after 1697, perhaps as late as 1750 [Karklins 1983:113]. We know that Zuanne Cedolin and Pietro Sicca went to Amsterdam to make beads in 1730, but we hear nothing of their success or failure [Morazzoni 1953:42].

The first Dutch bead factory was that of Govaert van der Haghe in 1597 in Middleburg, making among other things, drawn tubes for beads. He died in 1605, and in July 1606 Zuan Antonio Miotti took over its management, backed by the wealthy Dirk van Os of Amsterdam, with large interests in the East India trade, and others. By 1610 he owned the factory himself. Miotti was persuaded to move to England in 1619, and the factory was closed by 1623 [Thorpe 1935:121-2; Karklins 1974:65; 1983:111; van der Made 1978:3].

In Amsterdam, Jan Janszn Carel, a trader, established a glass factory in 1602, managed by his son-in-law, Jan Hendrikszn Schryver (or Jan Heindrixszn Soop), who smuggled out beadmakers and equipment from Venice, at what he reckoned was an immense cost. Some 60 to 80 Dutch families joined them in beadmaking, but soon competition from other (bead?) factories, became stiff, and by 1633 Soop left Amsterdam. The factory was managed by Willem Schryver Jr., but we do not know if it made beads. Nicolas Jaques opened a bead factory in 1656, which was still operating in 1665. Claes Claesz Jaquet had

a glass and bead factory, which moved to the Rozengracht in 1660; Venetian and Liege workers were employed. It closed in 1676 but was soon reopened by Anthony Maire and Fredericq Rihel, who transfered it to Haarlem in 1679 [van der Sleen 1963; Karklins 1974:65-6; 1983:111-3;]. <Van der Made [1978:4] gives a somewhat different version of these events.>

In Haarlem, Rihel and Maire continued to make beads, and sold the factory in 1686 to Juane and Giacomo Pallada (more Venetians?), who made drawn beads until 1697. In Rotterdam, Hendrick van den Heuvel and Cretentius Thomer began making glass beads in 1615; their charter was renewed in 1634 for nine years, but we know no more about them. Matthieu Simony de Tournay of France opened a factory in Zutphen in 1689. It is not known whether he actually made beads; he left bankrupt in 1692 [Karklins 1974:66; 1983:113].

In sum, the Dutch apparently made glass trade beads from as early as 1580 to perhaps as late as 1750. At least six bead factories are known, several of them under different managers, and a few other glasshouses may also have made beads. In addition to the information on bead factories, there are orders from American traders for beads from Holland as late as 1734 [Kidd 1979:38; Brain 1979:298-9].

The Beads of Holland

With Dutch beads we are in a better position to describe old examples than for any of the other minor beadmakers. They are of two types: drawn beads and wound ones.

Drawn beads were made between about 1580 and 1697. The eleven most common varieties from a recent excavation in Amsterdam include: red tubes, red tubes with superimposed stripes, opaque red cornaline d'Allepos with black, green, and clear centers, and tumbled versions with green and clear centers, grey/red/grey and grey/white/grey tubes and tumbled versions of the latter, and tumbled beads of white on grey or clear with four red and four black or blue stripes. Other types found in the canals of Amsterdam are monochrome tumbled beads, beads with twisted stripes, beads of square cross section and blue/white/blue layers, gooseberries, and blue chevrons in three, five, or seven layers, as well as striped chevrons. Obviously, most of these are very similar to contemporary Venetian beads.

Wound beads which are believed to be Dutch are generally of translucent glass: blue and clear being most common: the clear often appears golden when held up to the light <L 14>. They appear to be a bit later than the drawn beads, perhaps from around 1680 to 1750. Amber and green glass and opaque light blue and red are also known. In shape many are round or ellipsoid. Some of the more obvious shapes are twisted square beads with eight pressed pentagonal facets <L 11>, pentagonal ridged tubes <L 9>, and mulberries <L 10>, with many knobs on the surface. Wound black beads with longitudinal white or yellow lines or encircling lines, often making a lattice design <L 12, 13> were also made.

The best source for these beads are Karklins 1974 and 1985, the latter being the source of the 11 most common varieties. Van der Made [1978] and the works of Van der Sleen can also be consulted. The origin of the mulberries is still under investigation [Francis 1987a; Karklins 1987a]. The "Dutch" beads on the color plate were selected for their superficial resemblence to known wound types. However, some (the lattice design <L 12, 13>, and the pentagonal tube <L 9>) are on late 19th century sample cards and may not be Dutch [Springett and Springett 1987:center fold].

F R A N C E

The French bead industry has not been studied as throughly as have others, but was long-lived and likely made many more beads than some of the others. There was no single beadmaking center, as in Italy; work was spread out, and the sources of our knowledge are also scattered.

Lorraine has long been a center of glassmaking in France. In 1477 Petit Colin Thiedry held the lease to the glassworks named La Pastrenostrière, a title that strongly suggests that it made rosary beads [Ladaique 1975:12].

Henry II, who founded the first Royal Glassworks at Saint-Germain-en-Laye, brought Theseo Mutio from Bologna in 1551; among his products were canes and beads [Barrelet 1953:65, 91, 178]. Venetian tubes were finished by French workers in the same century. In Nevres in 1565 and 1577 enamelers obtained the right to make fine beads. By 1593, the patenôteier (paternoster) guild could "make paternosters and buttons of enamel and of glass, chains, collars and bracelets by the fire and furnace." [Ibid.:91-2]

The 17th century was important for French beads. Kidd recorded five cases of the English importing French beads between 1608 and 1698 [1979:29]. No doubt research into similar records of other countries would turn up more examples. France was a leading power and England's greatest colonial rival.

One invention of this period is often described, although we lack precise details. The apparent facts are that Monsieur Jaquin, a rosary maker of Passy, near Paris, extracted the scales of a freshwater fish, the bleak, or alewife, *Alburnus lucidus*, to produce a lustery paste known as "essence of orient" or "essence of pearl," composed of the protein guanine. This was applied to the inside of hollow beads, which were then filled with wax. These "Roman Pearls" were often carefully made (such as slightly paddling the blown bead while still hot to resemble pearl imperfections) to excellent effect. They did not scratch, and were far more resistant to moisture than the older types of artificial pearls.

Though false, these pearls were never cheap. It took up to 4000 fish to produce a pound (c. 450 gm) of scales, for four ounces (112 gm) of essence [Beckimann 1846:267]. Manufacturing was also time consuming. Diderot's Encyclopedia (1761) shows one worker preparing the essence by soaking the scales in hot water for half a day. Another is blowing a ball from a tube, while another smooths off the edge where the ball was broken from the tube. One sucks the essence into a pipette, and blows a single drop into a bead. Others grade the beads for size and dip them into a basin of melted wax. Finally, the wax is pierced with a tightly rolled cone of paper. All the workers were women [Gillispie 1969:pl. 427-8]. (Figures 8 and 9)

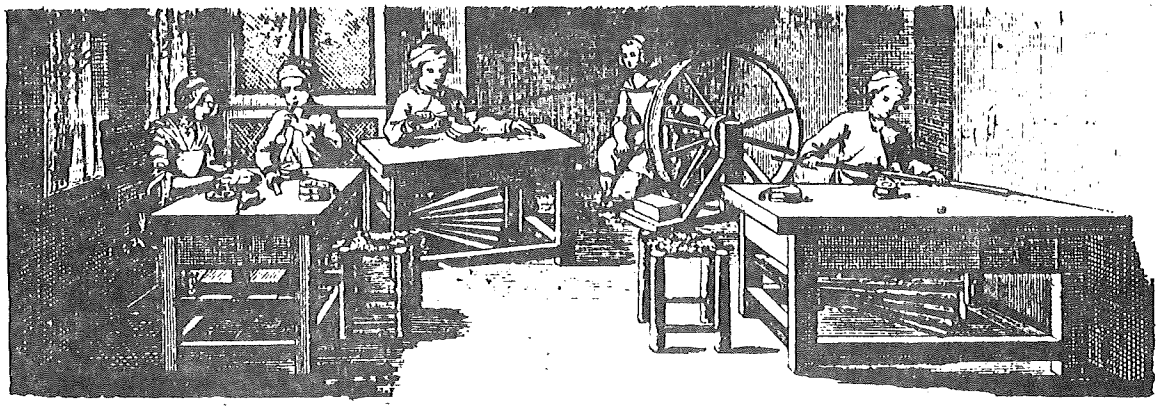


Figure 8: Making artificial pearls in the 18th century. The woman on the right is cutting tubes. On the left one woman blows a bead and the other smooths the edges. The women in the middle are working with spun glass.

Details differ in other accounts. Abbott said that ammonia, not hot water, must be used to prepare the essence [1871:354]. Some pearls were perforated with pins, but paper was used on better ones so some would stick to the wax, to prevent the string becoming waxy later [Beckimann 1846:267]. In 1871 men blew the beads and women coated them; the men made 50 to 75 cents a hundred, and the women about two cents the thousand [Abbott 1871:353]. One account says the first of Jacquin's pearls were made on gypsum, but the coat flaked off, and that isinglass is mixed with the essence [Pottery Gazette 1890].

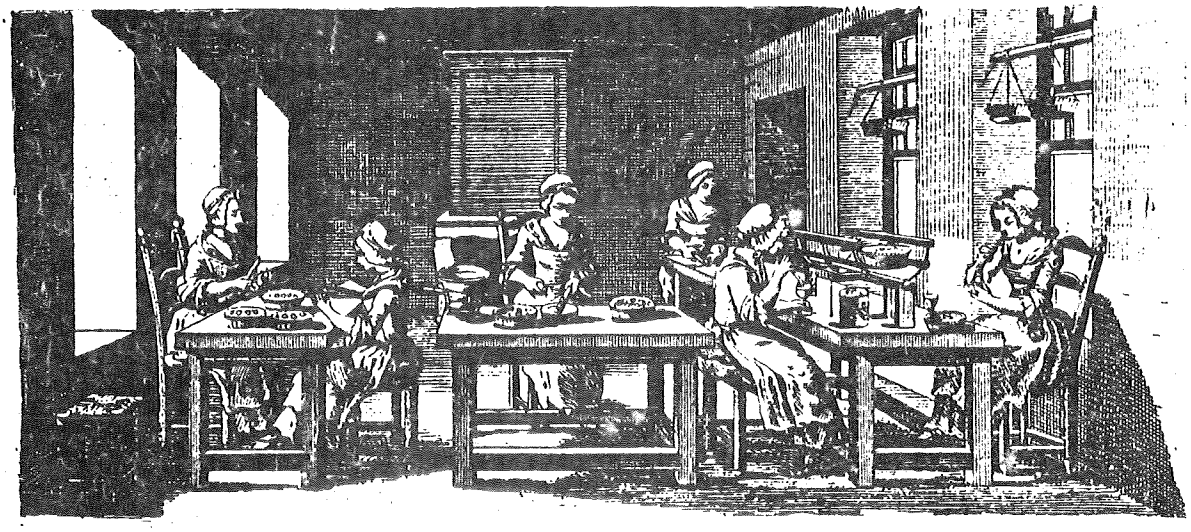


Figure 9: The women on the right are blowing guanine into hollow beads. The one in the center is filling them with wax, and the two on the left are piercing them with rolls of paper.

The facts of the invention of these pearls are lost. It has been dated to 1656 and 1686. Jaquin has been spelled Jacquin and Jonquin [Webster 1973: 210]. Only Beard reported a first name: Moise M. [1879:324]. Whether this was suppressed due to antisemitism and what Beard's source was is unclear. The story has been retold countless times, sometimes greatly embellished [e.g. Abbott 1871:353], and one can only wonder about the true facts.

In 1697 Blancourt described different processes for artificial pearls, and there were several manufacturers of them. Charles Dupin and Robert Drumgold were permitted to make them in 1725 [Barrelet 1953:104]. A factory at Saint Jean de Maizel (Mezel) made 10,000 a day. Jaquin's heirs had stopped making them shortly before 1846 [Beckimann 1846:267-8]. France led in the industry until 1919, when they found that the sardine herrings of Norway were a good source of guanine, and set up a factory there until 1939. South Africa, the U.S., and others now produce it as well, but the best comes from fish in the Bay of Fundy, Canada [Webster 1957].

In 1834 the French developed an opaline glass for the pearls. Later they were filled with gum instead of wax, and the glass surfaces were matted with hydrofluoric acid [Pottery Gazette 1890]. Still later, the guanine was used to coat the beads rather than be put inside them <L 2> (See also Spain).

Another bead industry grew up around false jet. Jet is a form of coal; false jet is black glass. Sewing jet on bonnets especially for mourning was introduced in France by Gabreielle d'Estreés in 1599 [Sauzay 1869:181]. It was popular a long time. Sauzay quoted Savery on its popularity in 1725, as it was still in fashion when Sauzay wrote in 1869 [Ibid.]. Barrelet noted

18th century texts referring to false jet [1953:118]. It was due to this early French manufacture that the term "French jet" came to be used, though much later French jet was made in Bohemia.

In addition to false pearls and jet, French beadmakers worked through the centuries. We have little specific information on what most of these beads were, but they were called rassade or rocaille. France made many rocaille beads, especially in the 18th century for export to her colonies [Barrelet 1953:118-9, 166]. Exactly what a rocaille bead was has been a matter of debate. Van der Sleen described what we call a "tile bead," [1967:114-5], and Kidd said it was any sort of large bead [1979:59]. French dictionaries do not define rocaille in terms of beads, but a review of the use of this word shows that it means small objects decorating a surface. Thus, the term does not indicate a bead type, but beads used to decorate. "Tile" beads are so used, but even more common are the small drawn "seed" beads, and the term rocaille usually refers to them [Francis 1988].

In Braire, M. Bapterosses et Cie. was making "tile" beads by the Prosser method at least by 1866, when they perfected a process to wet the clay (with milk?). In 1872 Jean Felix Bapterosses obtained an American patent for this improvement [Sprague 1983]. <This has not been located, but see other of his patents.> The process (including the milk) was used in 1909 [Baedekar 1909: 625], and "porcelain beads" were still made in 1929 [Weston 1929]. (Fig. 7)

The Art Nouveau movement of the early 20th century inspired beadmakers, among whom René Lalique (1860-1945) is best known. A jewelry designer and maker, he started glassworking on a major scale around 1890, with necklaces at least by 1921. His 1932 catalogue lists ten necklaces with 245 bead types and 16 pendants [McClinton 1975; Percy 1977; Martin 1981; Mourey 1981].

In 1922 Pierre Rousselet began making beads in Paris. His work was soon popular for its finely crafted style. Artificial pearls, galaith (a casein plastic) and glass beads were produced. The glass beads were made by lamp-winding down to 1975. The company still makes metal findings to string up their old stock of beads [Gumpert 1988]. <Von Nessen n.d. reported on Louis Rousellet, a beadmaker at the same time, who appears to be the same man, despite the difference in names.>

The center of French beadmaking is now the province of Rhône. Rosaries were made at Bron in the last century. This industry came to be controlled by the Venetians, and was reorganized in 1900 after the Conterie was formed, but declined greatly in the 1930s [Pasquato 1953:78, 80]. Today there are two glass beadmaking companies there. At Bron, a suburb of Lyon, is the Société Générale pour l'Industrie de la Verroterie, and at Villeurbanne is Maschio Frères (Ets.) Sociétié. Both apparently make drawn beads, the one at Bron including cornaline d'Allepos. At last report they made their tubes by inflating a gather of glass and drawing it out about 100 meters. Danner tube machines are used in other French industries, but apparently not by the beadmakers. The tubes are cut mechanically and tumbled with sand and ash. [Fédération 1954:29, 114, 116; Bovis n.d.].

The Beads of France

Rather little is known of most French bead production. "Roman Pearls" may be distinguished by having the coating on the inside of the bead, unlike modern artificial pearls.

The beads of Lalique were heavily inspired by nature motifs <M 1>. His beads are rare, and many offered for sale as "Lalique" are only in his style or are simply frosted glass, a technique used by many other beadmakers.

The Rousselet beads are all wound in a great variety of colors and styles. A distinguishing mark seems to be the paddling of even the simplest shapes to produce a baroque effect in their outlines <M 3-9>.

The French also produced "jet", Prosser beads, both round ones and tile beads, and drawn "seed" and larger beads. These may be hard to distinguish from the work of others, though the modern "seed" beads generally have holes larger than those from other centers [Gulick and Gulick 1987:18]. Red, blue, and yellow White Hearts are made at the moment only in small sizes.

The Lalique bead on the plate appears in Hughes 1972. The Rousselet beads were donated by Anita Gumpert, who acquired them directy from the family shop in Paris.

G R E A T B R I T A I N

With England's manufacturing skill and extensive markets, it would be almost unthinkable if she did not make beads. Yet the evidence suggests that she was never as great a beadmaking power as France, Germany, or Holland.

The first modern glass beadhouse in England was at Beckley, near Rye, from at least 1579, owned by a Venetian, Sebastian Orlandini, Sondaye Exanta (an Italian or Frenchman), Godfrey Delahay (a naturalized scion of one of the oldest Norman glass families from De la Haye near Lyon), and an Englishman, John Oakes, and run with the help of Lorraine glassmakers. They produced "bugles, amells" [enamels or colored glass], and "glass in collers" [colors? collars?]. Orlandini was hired away by John Smith in London by 1580. When Delahay sold all his tools and glass to Smith in 1587 Stephen Duvall said in court that Orlandini should get a third of the money for working at Beckley [Winbolt 1933:51-2; Thorpe 1935:119-20 Engle 1977a:2; 1977b:34]. <Different accounts spell the names differently.> Glass tubes, perhaps for beadmaking, have been found at an old glasshouse site at Sidney Wood from about the same time [Winbolt 1933:39]. Early bugles were dark green or black glass tubes.

In 1615 the dashing admiral, Sir Robert Mansell (b. 1573) joined the glass firm Zouche and Co., and assumed its operation in 1618. He appointed James Howell to manage his factory, but Howell did not like working in such a hot environments, and got permission to travel to France and Italy to bring in more glassmakers, the first of whom was Zuan Antonio Miotti, whom he met at Middleburg, Holland. On 22 May 1623, a patent for glassmaking, including bugles, was issued to Mansell, who set about encouraging the mining of coal at Tyneside and shipments of sea coal from Newcastle and Scotland, importing soda from the Mediterranean, and becoming the first to use Stourbridge clay for the pots. He may also have intended to make colored beads or import them from Venice. Mansell originally knew little about glass, but he continued to import Venetian workers and opened other factories. Unfortunately, how many or what sorts of beads he may have made is unknown [Thorpe 1935:115-20].

Around 1635 Sir Nicholas Crisp (d. 1666), a personal friend of Charles I, obtained a patent which granted him the monopoly, "for the sole making and vending of Beads and Beaugles [sic]." Crisp thus outmaneuvered Mansell for the right to make beads, and it seems likely that he made both dark tubular bugles and colored beads. He was an African trader, and for some time held the exclusive right to trade to West Africa. Again, however, none of his beads have been identified [Thorpe 1935:120].

Kidd presented evidence for beadmaking in the 16th century, but it is not compelling. He pointed out that the duty on glass beads increased between 1603 to 1660, but this may have been as much a revenue measure as protection

for a local industry. The letter he quotes from John Greene to Allesio Morelli in Venice does take the beadmaker to task, but does not prove that Greene had local alternatives [1979:44-5].

In the late 18th century we have more definite information of an English bead industry in Birmingham. Karklins cited a 1767 city directory listing William Simmons as a necklace maker among "glass pinchers," whom he assumes worked glass in molds [1987a]. A London Gazette advertisement for 13 May 1795 called Richard Hudson and William Shakespear, "Glass Buttons, Bead and Toymakers." The two partners broke up, while Shakespear, with various other partners, continued in business until 1822 [Buckley 1927:383].

A private directory for 1800 listed glass, patent pearl, gilt, wax, and fancy beads made in Birmingham. Another from 1812 listed 11 beadmakers, six of whom made glass beads of some sort. By 1829 there were 16 beadmakers, but only four of glass; this number continued through most of the century. There were no listings for glass beadmakers after 1895 [Karklins 1987].

Import figures for India in 1883-84 show Britain as the fourth largest supplier of glass beads by weight, but only a third as much as Austria (with Bohemia) or China, and one thirtieth of Italy. However, in value English beads ranked second, twice that of Austria, five times as much as China, and 65 % of Italy [Watt 1889:428]. If these beads were made in England, she may have priced herself out of the market, as a given weight of beads was worth nearly 20 times the same weight of Venetian beads.

Tiles (beads) were made by J.M. Blashfield after 1858 [Sprague 1983:168]. Weston listed "porcelain [Prosser] beads" as an English product in 1929. As late as 1952 the Board of Trade reported that in 1948 England produced £ 20,000 (ca. $100,000 at the time) worth of beads and glass jewelry articles [Federation 1954:81]. It is also known that some families outside Belfast, Northern Ireland, make glass rosary beads [Howell 1982; Francis 1983b].

The Beads of Great Britain

Again, little is known of British production. Bugles, which were a common early bead were, at least in the beginning, dark green or black in color; we have this on the authority of the great Bard himself:

> 'Tis not your inky brows, your black silk hair
> Your bugle eyeballs nor your cheeks of cream
> That can entame my spirits to your worship
> -- Wm. Shakespeare, As You Like It III, v, 46-8

G E R M A N Y A N D A U S T R I A

Germany was unified later than Britain or France, and was a latecomer in the game of colonialism. Nonetheless, its natural resources and commercial bent made it a good beadmaking candidate. German beadmaking was extensive. Beads may have been among the many goods called "Nuremberg wares," which were sold around the world. Idar-Oberstein, Gmünd, and Pfrozheim have been important jewelry making centers for centuries, although from what we know, they did not make glass beads. Our knowledge of the German industries is spotty.

Some Germans were buying glass from Venice as early as 1280 to make into beads. By 1510 this was forbidden because the Venetians wanted to control all aspects of beadmaking. The Germans responded by making their own beads.

In the Thuringia Forest, an important glassmaking area, glassmaking began at Lauscha in 1597. Probably in the early 19th century Hans Greiner started blowing hollow beads from tubes and silvering them inside, for milliners and jewelers and as Christmas ornaments. Later the tubes were blown into molds, but the depletion of the forest forced the return to lamps that burned paraffin, turnip, or other oil. A bellows system was perfected, and a forge invented in 1820 by George Greiner. The early 19th century was their apex. After that, Bohemian competition drove them from beadmaking and into making scientific instruments, toy glass eyes, and other toys [Rogers and Hawkins 1977:7-8].

Anther beadmaking area was around Potsdam, where Johann Kunkel began the Royal Glassworks in 1679. On Pfauen-Insel he made beads to be exported by the Brandenburg African Company [Dillon 1907:292] <Brandenburg united with other smaller states to form Prussia in 1701.> False pearls, considered inferior to French ones, and known as German fish-pearls were made in Saxony [Pottery Gazette 1890].

The real heart of German glass beadmaking is in Bavaria, where beads have been made for 500 years and are being produced today. Nuremberg, Bayreuth, and Franckfurt-am-Main have all been called beadmakers, but it may be that the beads were made in the Royal Forest and only sold through these cities.

In the Royal Forest of the Fichtel Mountains (Fichtelgebrirge; in former Franconia) the making of furnace-wound rosary beads was begun by Italians in 1486. These beads were mostly black; later other colors were made. Along with abundant fuel, the raw materials were a green stone called "preterobas" or "beadstone" (a type of hornblende), quartz and potash. Production peaked from the 16th to 18th centuries, with Warmensteinach as the center. By the late 19th century work declined, and stopped by World War II. Some Bohemian refugees tried to revive the industry after the war, but they soon moved on to New Gablonz. Most recently, a costume jewelry industry has been started using old beads, and plans are afoot to revive beadmaking, under Martin Schnabel's direction [Scientific American 1884; Schmidt 1894; Jackson 1927; Feulner 1986; 1987].

In 1630 Abraham Fino, trained by a Venetian, left Amsterdam for Nuremberg to teach the use of, "'a little copper pipe fixed over a burning lamp' for making small objects of glass" [Dillon 1907:292]. This has been cited as proof of lamp beadmaking [Kidd 1979:33], but this is not precisely what was said, and whether beads were involved we cannot tell. Nuremberg is said to have made beads later, as is Frankfurt-am-Main [Charleston 1963:58]. The traveler Richard Burton listed two beads imported to Zanzibar as German: flat wound annulars with large holes, and "pigeon egg" beads he said came from "Nuremburg?" [1860:393].

Most modern German beadmakers are descendants of Bohemian refugees, as at Kaufbeuren (Neu Gablonz), the heart of the modern industry. This includes those that first settled in Warmensteinach [Feulner 1987]. Weston said both Germany and Austria made "porcelain beads" (Prosser beads) in 1929, and round ones were made by Riesler at Hetzogenrath near Holland until 1957 [Sprague 1983:171]. In the 1920s, W. Augenstein near Pfrozheim invented an automatic faceting machine for glass beads [Howes 1928].

In Austria, the plans of Maria Theresa to have Gaetano Acquabona bring beadmaking to Innsbruck and Graz in 1765 did not long bear fruit [Morazzoni 1953:43-4]. A recent list of Austrian beadmakers shows seven, five located

in Steyr, and one each in Vienna and Tannheim Tirol. Their products include beads imitating precious stones and pearls (see section on Spain), most of which appear to be molded, as only one company claims to make wound beads. Austrian cut crystal (lead glass), among the most expensive of modern glass beads, are apparently made in Vienna [Exportiert ca. 1981].

The Beads of Germany and Austria

Only one older German bead can be identified with any confidence. This is a large annular (ring) of wound blue, amber, green or clear glass, with a large hole in the center. These beads were very popular in Africa. The oldest ones are thought to be blue with a gray tinge <N 1> and amber ones <N 3>, dating before 1850. In 1860 Burton reported blue and opaline (clear) ones. Toward the end of the century the blue takes on a more purple tinge <N 2> and green examples first appear. They were apparently not imported after 1897. They are sometimes called "Dogon beads."

Burton [1860:393] gave first hand information on these and says that they are German; he may be the source for most later commentators. Beck [1931:240] reported them from Pemba, but suggested no date. Laidler [1935:10] said they come from "a couple of centuries back." Schofield [1945:23, 27] gave the most detailed chronology for them. Harding [1962:105] suggested they may imitate earlier beads, and gives the terminal date. Chittick [1974:401] said they were from Bavaria.

The beads from the Royal Forest have undergone changes over the years. The earliest were wound and invariably black. As late as the 1920s, they were still wound, but were in a greater variety of colors, including, it seems, a multicolored transluscent type <N 6, 7>. In shape they included spheres <N 5>, faceted beads <N 4>, and baroque shapes <N 6, 7>. Bohemian refugees brought Warmensteinach molding techniques; some beads from the late 1940s and early 1950s look much like Bohemian beads <N 8, 10>, but many of them were further refined by fire polishing, which removed the mold seam and left more perfect beads <N 9, 11-15>. Pearled <N 12> and iridescent <N 10> beads were both made as well.

The beads of Neu Gablonz (Kaufbeuren) are very similar to Bohemian beads <O>. All are molded, including some which at first glance look like short wound suboblates <O 1, 2>. There are a few novelty shapes <O 7>, and pearly and iridescent surfaces are common.

The Austrians make a line of blotched glass beads <P 1, 2>. Austrian cut crystal is made of lead glass and is relatively heavy and brilliant <P 4, 5>. The Austrian tabulars for spelling out names have thinner letters than do the Czech ones <P 6>.

The beads in the plate from the Royal Forest have been donated by Erika Feulner, who obtaned them from their source. Those of Kaufbeuren were donated by Karlis Karklins, who received them from a manufacturer. The Austrian beads were donated by Ken Howell of Sedro Woolley, WA, Murray and Marion Winagura of Los Angeles, and Yone of San Francisco, all importers.

RUSSIA AND THE SOVIET UNION

The first modern bead industry in Russia was opened by the polymath Michael V. Lomonosov (1711-1765) in 1753. In March, Tzarina Elizabeth permitted him to build a glass factory at 'Ust Ruditsy in the Koporsky district, which was

finished in the summer. He wrote the chancellor of the Academy of Sciences on 6 September: "According to a decree of Her Imperial Highness read and issued by the Senate, for the building of a factory for the making of beads and other articles of glass, it is ordered to all whom it may concern to give any assistance which is required." He asked for a stove maker, who was sent. In May 1754 he ordered a lathe to be used for, "many colored glasses and pearls, strings of beads, glass jet, and all sorts of fancy articles and decorations." A copper and lead cylinder (for tumbling?) was made, and a second lathe was ordered the next year. Despite the equipment and labor from the local peasants, the factory was not a financial success, and very soon turned exclusively to making mosaic tiles [Menshutkin 1952:96-9].

A glass industry was founded at Laashone, Estonia in 1764 with German beadmakers, who produced clear spool shaped beads [Roosma 1969]. Beads for local consumption were wound near Moscow in the 1880s, when the annual output was said to have been 162,000 pounds (73,636 kg) [Anonymous 1882?]. At Bohkara, Uzbekistan, a family made beads until 1917, when they moved to Herat, Afghanistan [Francis 1979c:7-9], but other beadmakers are still at work in Bokhara.

The Beads of Russia

One bead on the color plate <P 7> was made before 1917 in Bokhara, obtained from the family which later moved to Afghanistan. Another <P 8> is current production from there.

S P A I N

In Madrid in 1615, Cristóbal Suárez de Figueroa translated a book published in Venice 20 years before, Tommaso Garzoni's La piazza universale. He added to the text, "These are the various colours from which are made threads to decorate the crystal glasses, forming also buttons, stones for rings, rosary beads, charms, and a thousand other trinkets. At the present time in Murano and Barcelona, so precise is this work that everything imaginable may be done with glass and crystal." [Frothingham 1963:15] This is about the only evidence for Spanish beadmaking, though Frothingham says that beads were one of the products of the important Catalan glass industry [Ibid.:23]. In 1779 Giovanni Cimei wrote L'Arte del Perlero in order to transfer beadmaking to Spain at the request of Ferdinand IV [Morazzoni 1953:43], which suggests that there was no beadmaking there at the time, or at least it was not much of an industry. Riaño y Montero mentioned no beads in his survey of Spanish glass, but did emphasize how much Spanish glassmakers imitated the Venetians [1879:228-49].

Several American archaeologists excavating beads brought by the Spanish suggest that at least some they found were Spanish made. Some conquistadors mention beads from Castile (but not Cataluña), but they may have simply been bought there. In cargo lists of beads sent to the New World the origin of those from European countries is sometimes mentioned, suggesting that the other beads might be Spanish [Goggin 1982:12; Smith and Good 1982:12-4]. Much more work needs to be done to learn about Spanish beads.

The most famous modern Spanish bead industry is in Mallorca on the Island of Majorca, where M. Heusch produces the finest artificial pearls. After the French industry declined, these were made by coating white glass beads on the outside. From the 1930s the beads were buffed with leather, coated,

and given a protective coat. Between 1955 and 1960 Spain and Austria began to put on a second coat in a vacuum chamber under heat. Among all artificial pearls, Majorica Pearls are the considered the best. They are made on lamp wound glass beads, carefully polished and coated many times, and still use Jaquin's essence of orient; other makers now use a synthetic [Howard 1973].

The Beads of Spain

A few beads are suspected as being Spanish because they are found on early Spanish colonial sites. Small wound, clear yellow and green ring beads are perhaps one type brought by Columbus. Their heavy lead content suggests a Spanish origin to some [Smith and Good 1982:3; Francis 1985c:10; 1986b:33].

The other bead that some suspect to be Spanish is the "Nueva Cadiz Bead." Although there are a number of minor varieties of them, they are all tubular and square in section, usually with wide translucent dark blue cores, a thin white coat and light or dark blue exteriors. They are usually left as long tubes <P 9>, many of which are twisted <P 10>. A smaller, shorter, darker blue variety is also known <P 11>. They are most common on early Spanish sites in the Americas, occasionally found in the Northeast, and rarely in Africa. The larger variety is the earlier, from about 1500 to 1550 or 1575, while the smaller one persisted a quarter century later [Fairbanks 1968; Liu 1978; Smith and Good 1982; Smith 1983; Harris 1982]. The Dutch made some similar beads, but later than this period.

B E L G I U M

As we have discussed, Zuan Antonio Miotti, who made beads in Holland, went to Brussels and Narmur after leaving London. In 1622 and 1623 he was given the rights to work glass, but these patents say nothing about beads, only tableware in the Venetian manner [Chambon 1955:103]. Nothing seems to be known about beadmaking in Belgium among earlier glassmakers [Lefebvre 1938].

Val-Saint-Lambert, the leading 19th century Belgian glassmakers, wanted to make colored drawn beads. The Venetian inventor, Carlo Romiti sent his tube cutting machine via London in 1869. In 1870 the Belgians devised a system to make beads, but stringing was expensive relative to Venetian wages. Some beads were made and sold through their London agency, Gunthel, but probably not for long, as it was not profitable [Philippe 1974:120-1]. Antwerp was reported as a beadmaker in 1900 [Scientific American], but without details.

O T H E R E U R O P E A N C O U N T R I E S

Glass beads may well have been made in other countries, but to date there is no evidence for them. The history of glass industries of many countries has been written, others are awaiting interested local historians. However, beads are rarely mentioned in such histories. That may indicate that none were made, that no evidence for them has been found, or that the author felt beads were such a minor item as not to warrant attention.

Among those countries for which we have only negative evidence is Sweden, which Kidd investigated in the hopes of finding something on bead production [1979:47-8]. Portugal, which would have had ample opportunity to use glass beads in its far-flung trade and colonies, also is not reported to have made them herself [Valente 1950].

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Abbreviations Used: Annales = Annales du Congres International d'Etude Historique du Verre <title varies>; AV = Ars Vitraria; BSGWW = Bead Society of Greater Washington Newsletter; HA = Historical Archaeology; HNMM = Harper's New Monthly Magazine; JGS = Journal of Glass Studies; JSGT = Journal of the Society of Glass Technology; RGH = Readings in Glass History

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