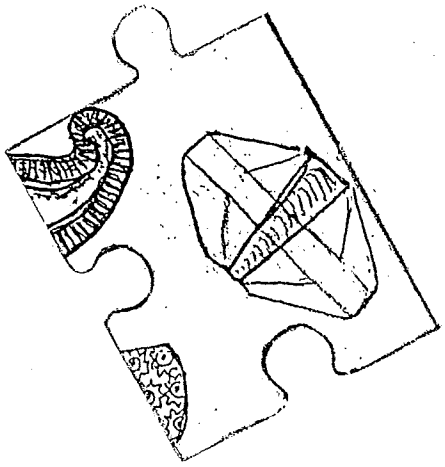
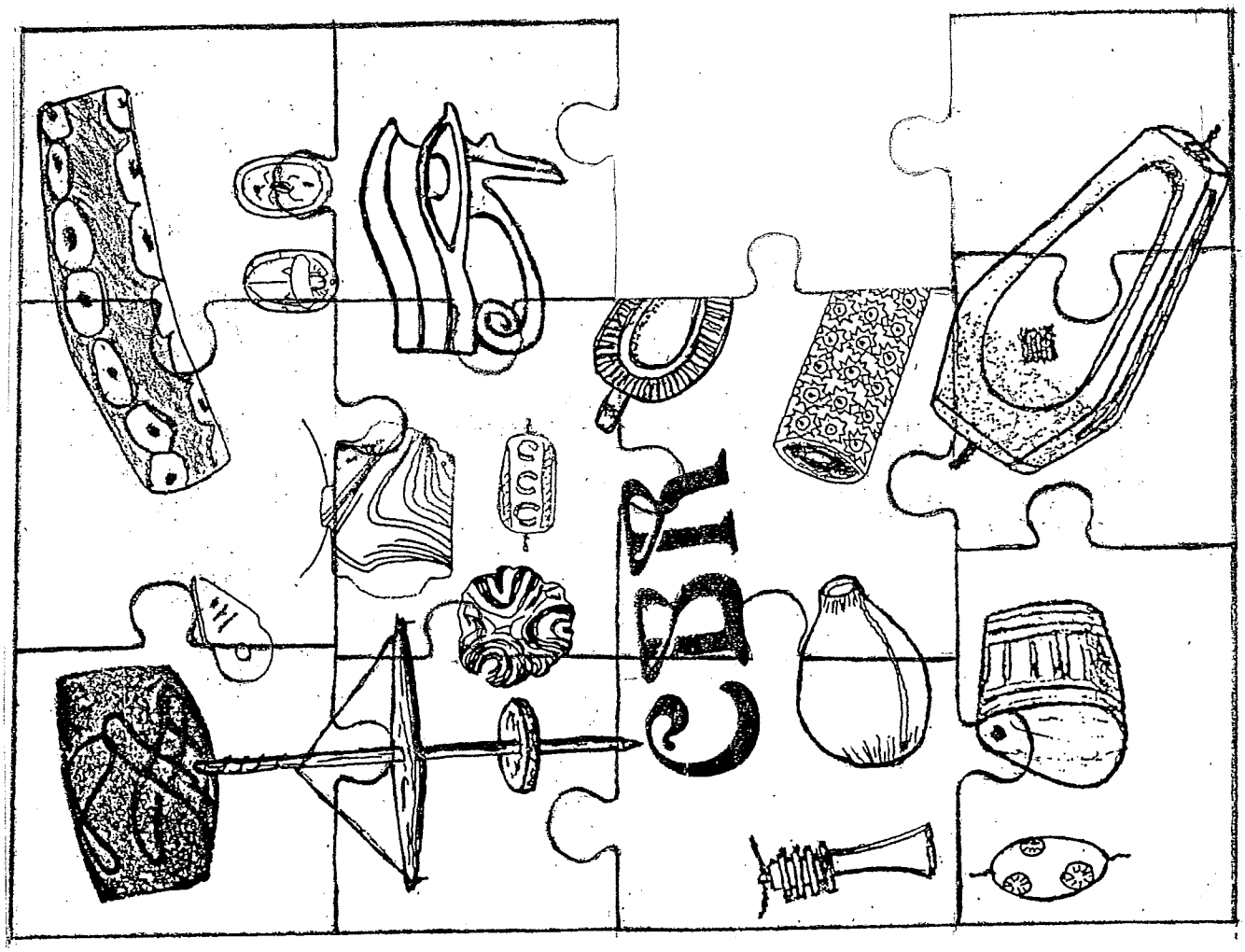
C.B.R. Workshop Handbook 2:

HANDBOOK FOR THE C.B.R. BEAD IDENTIFICATION WORKSHOP II: THE ADVANCED WORKSHOP



ADVANCED BEAD IDENTIFICATION

Peter Francis, Jr.



1993

Lapis Route Books
Center for Bead Research
Four Essex Street
Lake Placid, New York 12946 (USA)

This book has been published by Lapis Route Books in conjunction with the Center for Bead Research at Lake Placid, New York

LAPIS ROUTE BOOKS

Lake Placid, New York

Printed by the Bead Press Associates, Lake Placid, New York

Manufactured in the United States of America

ISBN 0-910995-16-8

BEAD IDENTIFICATION WORKSHOP II: THE ADVANCED WORKSHOP

While the Advanced Workshop is not quite as rowdy as the Beginning one, it is still a riot of questions, note-taking, oohing and aahing and other activities commonly associated with true bead aficionados. Advanced is truly the right title for this Workshop. It goes into considerable more depth and breadth than the Beginning Workshop. It also presents information which is not available anywhere else.

The theme of the Beginning Workshop was "Look and Think." Once someone has trained themselves to do this, they are ready to take on a more complex problem. Hence, the theme of the Advanced Workshop is "Make the Connection," by which is meant the opening of the process by which we begin to understand other places and other people through their beads. Beads are not merely pretty little perforated objects nor interesting collectibles, though they are both of those things. They are even more interesting when viewed as a means to an end, the end being a better understanding of the natural and human world around us.

The Workshop Handbooks have successfully fulfilled their role. They are most valuable when used in conjunction with the Workshops themselves. They can serve as a notebook for notes taken during the presentations, but even more importantly, they contain the kernels of information that are being presented during the Workshops. The Advanced Workshop in particular is so loaded with information, so much of it new to the participants, that this function proves invaluable.

Of course, the Workshop Handbooks can stand on their own. They can be valuable to anyone who cannot attend the workshops. On the other hand, the Workshops, presented with hundreds of slides, thousands of actual bead samples and hands-on demonstrations, have no equals.

As the finishing touches are being put on this Handbook a third Bead Identification Workshop is being planned. It will impart to the participants more in-depth knowledge about beads and bead research, further the understanding of the connections between beads and history and equip the participants with the ability to do serious work with their beads.

Again, Welcome to the World of Beads!

Contents

PLANTS

Plant products -- seeds, leaves, flowers, wood and so on -- were likely the earliest bead materials. They do not survive burial long, so there is virtually no archaeological evidence for early use, but they are almost exclusively worn by many people who have not yet succumbed to the paraphenalia of modern civilization.

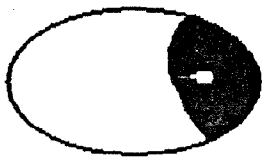
They are widely used because they are attractive and come in a great variety. There are so many that it takes a specialist to identify all of them. Some of us with unhappy memories of high school biology may cringe at the need to know correct Latin binomials, but there is a very good reason for us to do so. As we advance in bead studies, it becomes important to identify materials more and more precisely.

Unfortunately, there are no general books to help us recognize seeds as beads. For collectors specializing in such beads or those interested in them, the only recourse is knowledge and a lot of detailed work. We cannot begin to list all plants used as beads, but the detailed story of a few important ones will illustrate how interesting the bead story becomes the more we know about the topic.

Job's Tears, a widely used plant bead

Job's Tears is the popular name for the hard fruit capsule (technically not the seed, though often so-called) of a tall grass whose scientific name parallels the popular one: ***Coix lacryma-jobi*** The fruits are commonly tear-shaped, though oblate and spindle shaped varieties exist. The hard outer shell is white to black in the natural state. A 1925 article said they could not be dyed, but whatever problem that once presented has been solved; today they are found in many bright colors.

The fruit is nutritious, and some believe that it was cultivated before rice, thousands of years ago. The cultivated fruit has a soft coat, so that only wild or feral plants produce good beads. How long have they been used for beads? A single Job's Tear was found in Timor about 5000 years old, but since it is naturally open on both ends when snapped from the stalk, we cannot be sure it was strung. Recently several examples in which they were undeniably used as beads have been documented in India, one about 4000 years ago and another some 2000 years ago.



Abrus seed

Coral Seed or **Bean** is a popular name for a small scarlet seed with a black spot on one end. ***Abrus precatorius***, its proper name, reflects its role as a bead, referring to its once popular use for rosaries in Europe.

This seed is called **rati** in India, where it is used in the jewelry trade. They are standard enough to be one of several seeds used as weights for gold and precious stones; a rati is equal to 1296 motes seen in a beam of sunlight, the smallest weight. (Chick-peas or garbanzos are used this way in Iran as were carob seeds in Europe, giving us both forms of the word carat/karat.) Rati juice is used as a glue to hold bits of silver or gold together so they may be soldered.

There is a downside: Abrus seeds are quite poisonous. Every year cases were registered in India when a farmer made a dart of the seeds to blow at his neighbor's cattle or even at his neighbor. They are beautiful in a collection, but one must be cautious. EVEN ONE SEED COULD POTENTIALLY KILL A SMALL CHILD OR PET. HANDLE WITH CARE.

Rudraksha

Rudraksha means "eye of Rudra or Siva," and these dark brown, rough round beads are worn by followers of that Hindu god. ***Elaeocarpus ganitrus*** is native to Java, from which it is still sold to India. Java was Hinduized early and must have given this bead to Sivite worshipers long ago; it is recorded in India by the 11th century.

Rudraksha exteriors are divided by grooves (or into facets), usually five in number, sometimes four or six. Only one example with a single groove is known and it is worth a fortune. Others are available, but they are fakes, either carved out of (usually Eagle) wood or ground down from common seeds to look like single faceted ones.

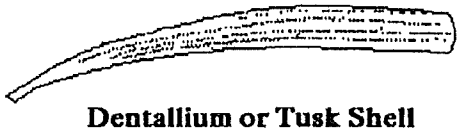
Two much smaller seeds are sometimes misrepresented as "baby Rudrakshas": the dark brown, very rough ***Canna indica*** and the reddish-brown, smoother ***Zizyphus jujuba,*** the jujube fruit seed.

THE TIME TO BE NOSEY

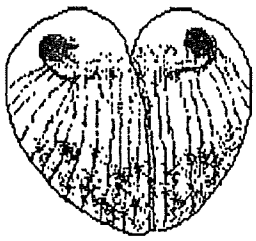
Sorry there are no scratch and smell strips in this book, but consider the plant beads you can identify by smell: **sandalwood** (genuine wood is fine-grained and yellow in hue), **cloves** (Persian Gulf brides), rose (rose petal beads usually have added oil for the scent) and the wonderful variety of scented beads from North and West Africa

SHELLS

As with seeds, the more you know about shells, the more interesting beads in your collection become. There are seven classes in the phylum Mollusca. Several are of no interest to us. The advanced cephlopods include the beautiful chambered nautilus, the octopus (with the intelligence of a house cat) and squids, whose cuttlebones are used not only by caged birds but by jewelers as molds. The class of scaphopods consist of only one genus -- **Dentalium** or tusk shell, one of the few naturally perforated beads, used for tens of millennia. The two classes most important for us are the gastropods or snails and the bivalves, with two halves such as a clam or scallop.



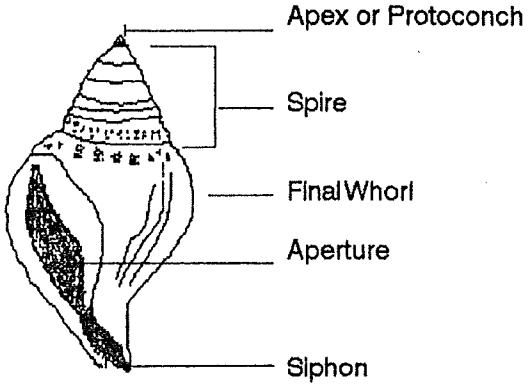
Dentallium or Tusk Shell



A Bivalve -- The Heart Cockle

Bivalves are widely but sparingly used for beads. Small ones are pierced to be strung whole; large ones are cut up. One of the most famous and confusing is the large rectangular bead called "hippo tooth." Though made from **Arca** shell, they have been identified as wood or tooth (one book identifies them as both on different pages!). Czech glass imitations also exist.

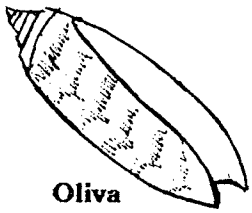
Gastropods or snails are the most popular shell beads. To appreciate them you must be familiar with their architecture. As the snail grows, it produces larger and larger whorls to live in. Up the center of the inside it produces a shaft, known as the **columella**. But some gastropods reabsorb their columella as they grow, leaving the shell naturally hollow. These are easily strung, for they need only a single hole, usually by grinding off the tip or apex of the shell, to serve as a bead.



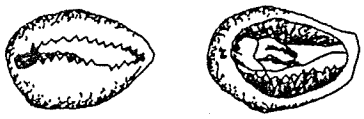
Parts of a Typical Gastropod (Snail)

Typical of these are the olive-shaped **Oliva** shells, among the oldest beads in the world. Because a string going through its apex and out its aperture does not allow the shell to sit nicely, many ancient Olivas had an additional hole on the last whorl to make it sit straight. In our day, the point of the aperture is sometimes glued onto the string to make it sit evenly.

Another important internally hollow shell are the cone-shaped **Conus.** The large spire is commonly separated from the rest of the body by crushing the base and grinding the edge smooth. A hole ground at the apex forms a nice disc, widely admired all over the world. (Careful with these terms: recently a well-known writer featured Conus top disc beads in an article, incorrectly calling the spire a "basal whorl," which it is not, and offering a picture of a Conus columella, which does not exist.)



Oliva



Cowrie (Cypraea)

Conus Top Disc

Probably the world-favorite shell bead is the **cowrie** (***Cypraea spp.***). To some the ventral side (with the opening) looks like an eye and is effective against the Evil Eye; to others it looks like female genitals and is considered a fertility symbol. It is common to smash off the dorsal (the back) and grind the edges smooth (this operation is not done by "sawing" as many references tell you).

Cowries are quite special. They were long in use for money around the Bay of Bengal and into China, later being taken to West Africa for the same purpose. The money cowrie (***Cypraea moneta***), with its crinkly edge, is favored for this over the far more common ring cowrie (***C. annulus***), with a smooth outline and a ring around the dorsal.

Cowries have also given us the name of an entirely different product. When first brought to Europe Italians called them ***porcellana*** or "little pig" from their shape. Later, when fine Chinese pottery came to Europe, the gloss of the shell was compared to that of the kaolin wear and Chinaware became porcelain. Marco Polo (ca. 1300) used the word in both senses.

An important precaution: do not store shell beads in wood or wood products, including paper (unless acid-free) or cotton. Emitted gas interacts with the shell and eats it away. Store them in metal or plastic.

RESINS

Natural resins are fusible, flammable, waterproof substances exuded by plants. Two were discussed in Workshop I: amber and copal. **Dammer**, a non-fossilized resin, was used to cement stones onto sticks to hold and grind a bead blank. Two other resins, often confused, are used for beads.

Lac is produced by a female insect (***Laccifera lacca*** and others) from juices sucked from trees. She makes a nest around herself, swarming in great numbers (lakh means a great many and today specifically 100,000 -- always written 1,00,000). Full branches are gathered by (non-Hindu) tribals, and boiled to extract the resin. When poured into thin sheets and dissolved in alcohol, shellac results. The body of the insect supplies a bright red dye, though today synthetic dyes are used to color it.

The majority of "painted" wooden articles from India are actually covered with lac. Alternately, lac is used a as raw material, with a bright colored layer on the outside. You can chip lac with a pin and it will melt with a hot point.

Lacquer is a Chinese/Japanese product made from the sap of a sumac, ***Rhus vernicifera*** It is used as a paint, but can also be built up in layers, which are then cut away. Chinese cinnabar beads are usually only colored with bright red cinnabar, but made of lacquer.

Lacquer coated objects have been discovered in tombs of Chinese nobles more than 2000 years old. Lacquer will be scratched but not chipped with a pin; it does not melt with a hot point.

The Dreaded Plastic

The most common resins in our lives are synthetic ones we call plastics. I know, I know most bead people shun plastic beads, but there are actually several good reasons for giving them some attention.

For one, plastics are much older than often thought, going back a century and a half (the first experiments were in 1833; the first plastic was produced in 1865). Early plastics were expensive and valued, and even into the 1930s American workers were hand carving plastic beads and other jewelry.

The USA, Britain, France, Germany, Switzerland and Japan held a monopoly on production until after World War II. Since then, the relatively simple technology has been transferred to developing countries, which make plastic beads in styles dictated by their own cultures. Such beads are cheap and fun to collect. Horses in Turkey are happy to wear light plastic beads made for them instead of heavy glass ones. And only in India would someone make plastic mango leaves, which outlast the real thing during the many celebrations which call for them to decorate doorways.

There are over 40 families of plastics, at least a dozen of which have been used for beads. However, the bulk of interesting beads are made from one of these groups:

Celluloid, the original plastic (Xylonite in the U.K.), is highly flammable and was replaced by cellulose acetate in 1926. It gives off a strong camphor smell when rubbed vigorously or scratched with a knife.

Caesin, invented in the late 1800s, was long a Franco-German monopoly. It cannot be molded and must be carved. It crackles in high humidity (as in most of the US) and will slowly absorb a drop of water. Made from milk, an early trade name was Galalith (milk stone).

Bakelite (phenol formaldehyde) is a well known collectible, but poorly understood. Invented by Leo Baekeland in 1909, it does not color well; it is typically black (telephones), dark brown or green. What is called Bakelite by many is actually the pastel-shaded **urea formaldehyde**, first marketed in 1928 or the more brightly colored **melamine formaldehyde**, first marketed in 1939.

In a flame these three plastics are hardly affected, especially the melamine; in a prolonged fire they crack. If there is any odor, Bakelite smells like formaldehyde, the urea is musty, and the melamine is fishy.

The most common bead plastic is **polystyrene**, invented by Staudinger using his theoretical principles which had been ridiculed up to that time. Polystyrene is highly versatile and widely used. It rings when dropped; in an open flame it burns easily with an orange color, melts and gives off soot.

The open flame test is clearly a boon to identifying plastics, but be careful around the fire. Remember: celluloid is highly flammable; avoid direct smelling; be careful of plastic melting on something important.

TRADE ROUTES I: LOCAL BEADMAKING NETWORKS

Some beads are made to be worn by the beadmaker or a relative or friend. In such cases, the beadmaker has developed techniques for making beads and works in spare time for pleasure. Far more commonly, however, beads are made by a specialist who has learned the craft from a parent or close relative. The products are meant to be sold, either to earn a little extra money or as full-time employment. To fully understand the World of Beads and all its connections, an understanding of the trade mechanisms is necessary.

When beads are made from locally available materials or materials traded from regional centers and sold principally to local markets we call their trading networks **Local**. Local networks are characterized by nearby sources of raw materials, a small and closely-knit group of beadmakers and a distribution network measured only in hundreds of miles. Many bead materials we have just discussed -- plants, shells and natural resins -- fit this pattern.

STONES

Beads of rocks and minerals have been popular throughout time. The durability and beauty of many stones make them prime bead materials. As mentioned in Workshop I, many rocks and minerals have been used for beads. Fortunately, there is information available to help identify stone beads in your collection. In addition to the two most important types -- steatite and the quartz minerals -- a few others are of such interest that we shall briefly discuss them here.

LAPIS LAZULI

Lapis is a rock, that is, composed of more than one mineral. The prized blue of the stone is **lazurite**, always found in conjunction with **calcite**, **pyrite** and other minerals. The calcite and pyrite aid in identification. Calcite is white, and the more there is, the less value is attached to the stone. Pyrite (fool's gold) is found in tiny flecks or crystals spread throughout the stone. It is diagnostic of lapis lazuli.

Imitations and doctored examples of lapis abound. Imitations can be spotted from the fake pyrite crystals, usually simulated with flecks of copper. Poor quality stone is also commonly dyed; the acetone test will help uncover this fraud, but it is often easy to spot by light blue patches, which is the dyed calcite.

The only source in the ancient world for lapis was northern Afghanistan, which remains the principal source today, though Russia and Chile now produce it commercially.

JADE

Jade has been a popular, often highly venerated stone in much of the world for ages. To the Chinese it is the "stone of heaven." In ancient Mexico a single jade bead could be worth 100 or more pounds of gold. The Marois of New Zealand also considered it special. In our day, it holds the record for the most expensive single and string of beads bead ever sold.

There are two jades: **jadeite** and **nephrite**. Both received their name from the mistaken notion that the stone was good for the internal organs as a remedy against colic (jade is from the Spanish for loin and nephrite refers to the kidneys).

Nephrite was the traditional jade of China, which did not use jadeite until Burmese deposits began to be exploited a few centuries ago. Nephrite was also used in New Zealand. Jadeite was the jade of ancient Mexico. Nephrite comes in a wide variety of colors, white being favored and yellow reserved for the emperor. What we think of as the "typical" spinach green jade is almost always jadeite.

Jade has many imitators, and one should be careful when buying it. Both types are fairly hard (about the same as agate), but quite tough. They take a high polish, but tiny pits remain on the surface. When broken or unpolished jadeite has a distinctive sugary appearance. The most common stone to imitate jade is serpentine; glass has been used as a substitute in China for centuries, often worked as though it were stone. Both can be distinguished by being softer than jade. If you are going to buy jade in any amount make sure you can trust the dealer.

BEAD TRADING NETWORKS II: REGIONAL NETWORKS

The two stones emphasized here are good examples of the next stage of bead trading networks: **Regional** ones. The raw materials for such networks are usually scarce and highly valued. While they may have been admired first by people within a local bead trading network, their intrinsic beauty and undersupply soon made them desirable to a much wider audience. In such circumstances, the bead networks grow in order to satisfy the demand.

Regional bead trading networks are characterized by a raw material which has only one or a few sources of supply, a series of people who work this material often in stages and a range of distribution which covers thousands of miles.

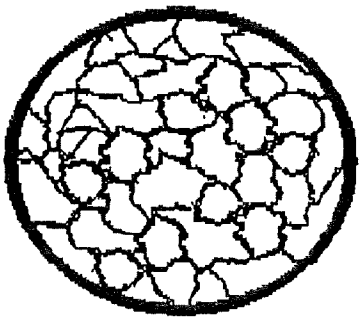
Lapis lazuli is a perfect example of a regional trade network. The only source known to the ancient world in northern Afghanistan was of sufficient importance for the Harappan Civilization to establish its northernmost settlement near the mountains bearing the gem (imported copper from Central Asia was also another lure; the Harappans also placed their most southern settlements so as to exploit carnelian and agate deposits).

The raw stone was not made into beads at this settlement of Shortugai. Rather, it was shipped southward to Shahr-i-Sokhta near the Iranian-Pakistan border. There some beads were made from it, but most of the material was refined by eliminating the unwanted calcite matrix. Fine quality stone was then shipped to Tepe Hisar near the Iranian-Iraqi border, where the beads were cut. Finished beads were then sold (no doubt at great profit) to Mesopotamia and Egypt.

Similar networks were used for jade in both China and Mesoamerica. What other Regional bead trading networks can you think of?

SINTERING -- Part I: FAIENCE

This section and the next concentrate on beads made in a process called sintering. Tiny bits of material such as glass or quartz dust are joined not by being melted but by fusing together only on the surface.



The Structure of Sintered Materials

The oldest sintered material is the misnamed faience. Invented at least by 3400 BC, it was the principal synthetic bead material for 2000 years until replaced by glass. Many beads were made of faience in industries around the ancient world.

There are three ways to make faience. In one, a core of powdered quartz is given a dry or wet coating of alkali (and usually copper to impart its typical blue color) and the bead heated. The quartz of the core binds and at the surface joins with the alkali to produce a glaze, a true glass. In the second method, the alkali and copper are mixed in with the quartz, a bead is shaped and put in the sun for a few days. The alkali migrates (wicks out) to the surface and then the bead is fired. In the third method, formed quartz beads are packed in a power of alkali and copper and heated in large pots. When finished, the mixture is dumped out and kicked and bright blue beads come rolling away. All three methods were used in ancient Egypt, long the principal faience maker.

Faience is distinct because of the difference in the coefficients of expansion between its glaze and the core. The glaze of nearly all ancient faience has long chipped off (exceptions are beads from Egyptian tombs, where the temperature was relatively steady). This lets us see the core and sometimes detect the manufacturing method. Beads made by adding the alkali to the surface will have a white core (if the glaze were green rather than blue, the core will be brown). Beads made by the "wicking out" method have blue or green cores. Beads fired together often have a scar or two on the body where they touched neighbors in the firing pot.

WHERE FAIENCE WAS AND IS MADE

Egypt may have invented faience, but its production spread over much of the ancient world. Faience beads were made in Mesopotamia (modern Iraq), Persia (modern Iran), Turkey, Cyprus, Lebanon and Syria, Hungary and England. Further East, the Indus Valley of Pakistan/India and China were faience makers.

The spread of glass technology put an end to faience production in most places. India was still making faience beads 2000 years ago, long after glass had become commonplace. Faience was made in Egypt and Iran in the Middle Ages, mostly for animals to protect them against the Evil Eye.

Today only one traditional faience making center exists, in the holy city of Qom, Iran, where "donkey beads" are produced. Early in the 1900s the villagers of Qorna, Egypt, foiled by the government in their occupation as tomb robbers of the nearby Valley of the Kings, started making faience. Their beads and other objects are sold, often as genuine antiquities, to unsuspecting tourists. Fortunately, modern Egyptian faience does not use quartz, but steatite. resulting in an opaque faience, as opposed to quartz faience which is slightly translucent.

In this century several ceramicists became interested in the "lost" art of making faience, and there is now limited specialized production in the U.S. The most successful of these craftspeople has been Carol Stick of Florida, whose faience necklaces are widely sold as museum reproduction.

BEAD TRADING NETWORKS III: GLOBAL NETWORKS

Faience and its close relative glass ushered in a new era in beadmaking and trading. As long as production of these materials was secret, they were as rare as any gem. The manufacture of both materials spread, but it is likely due to the movement of makers rather than people figuring out their manufacturing secrets.

The era of **Global** trading networks (the Western Hemisphere is excluded from this analysis until some five centuries ago) came only when great empires were established. These empires, formed by joining many different nations, developed more than 2000 years ago. The Romans around the Mediterranean, the Parthian-Sasanian holdings of west and central Asia, the Maryans and their successors in India and the Han in China represent this step in world integration. They all supported upper and aristocratic classes which demanded the latest in luxuries and the ultimate in opulence. What better way to keep, flaunt and proclaim one's elevated status than to dress in the finest cloths, eat the rarest cuisine and wear the most expensive jewelry?

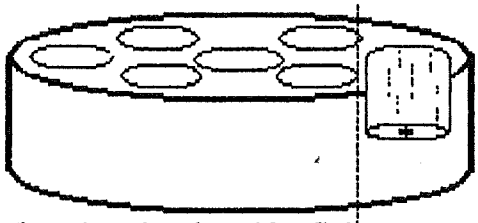
Once the stage was set, global bead trading networks grew. Historically there have been six such networks (seven if one counts the amber trade), characterized by using scarce materials, with multiple centers of source exploitation and beadmaking and distribution networks stretching tens of thousands of miles.

Most of the six achieved global status in this early period, rising from regional rank. They are: the glass bead industry of the eastern Mediterranean, the coral industry of the Mediterranean shores, the agate/carnelian industry of western India and the Indo-Pacific glass bead industry of southeast India. All made unique products which were for some time the mark of great affluence. Eventually, their beads become more commonplace, but they never lost their appeal. The two great industries which developed later were the Chinese glass bead industry and that of late Medieval and Modern Europe.

SINTERING Part II: POWDER-GLASS

Finely ground particles of glass can be fused in the same way as quartz to make beads. The best known of these are from West Africa, and the beads have been given all sorts of inappropriate names (pot beads, sand-cast, priest beads) which are best discarded.

To make beads, one grinds glass into a fine powder and pours it into a clay mold. The molds typically have a short piece of cassava leaf stem stuck into a small depression at the bottom of each cavity for the beads; the stick will burn out and leave a perforation. The molds are put into a small oven and fired for an hour or so. The beads are then removed and cleaned and maybe ground to smooth them.



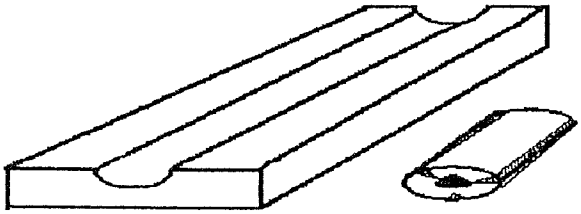
Powder-glass bead mold. Cell cut-away on right shows a depression for cassava stick.

Two older Asante powder-glass beads from Ghana. Muted colors and striking contrasts are hallmarks.

Designs of the beads are commonly made in one of two ways. By putting in layers of different glass, a bead with different colored zones will result. Poking a stick down the side of the powder in the mold produces a cavity which can be filled with another color of glass to make longitudinal stripes. These can be made twisted before the bead has completely fused by giving the bead a twist in the mold (typical of the Krobo of Ghana, known as **Adjagba** beads).

There are other variations in making powder-glass beads. What may be the oldest is practiced by a shrinking number of women in Mauritania who make a core of plain glass bound with gum, sugar or saliva. Onto this they carefully pour different colors obtained from pulverizing beads to produce the famous and spectacular **Kiffa** beads.

In the Asante region of Ghana in the 1930s a long horizontal mold was used. The glass was poured in layers and when the mold was filled a long cassava stem was placed along the glass-filled trough. Then more glass was carefully poured on top to make the other half of the bead. The whole was fired and the resulting tube was cut apart and polished. These beads, with their characteristic stripe patterns and notches along the sides are no longer made.



Horizontal mold for powder-glass beads made in Asanti territory around 1935. No longer made, these are becoming valuable.

The Krobo have become great experimenters with powder-glass in recent years and are coming up with new designs, many of which mimic European trade beads. Some of these beads are made in two halves fused together.

Collectors once paid little attention to powder-glass beads, but that is now changing. The beadmakers of Ghana are turning out new styles and types to attract a larger audience and older beads are rising in price. The traditional colors -- white from clear glass bottles, brown from brown bottles, yellow from added sulfur and blue from added washing blue, along with the occasional cobalt blue and opaque white of special bottles and touches of other colors from crushed beads -- have largely been replaced by brighter colors made with commercial additives.

AGE AND DISTRIBUTION

How old is this craft? We know powder-glass beads were made in what is now Mauritania in the 10th century, using molds without provision for a small stick to burn out for the perforation. Some of the most valued beads in West Africa such as the **Bodom** and **Akosu** were made by a powder-glass technology, though exactly where and when have not been discovered.

Nor are powder-glass beads only made in West Africa. In the U.S. the Mandan and Arikara of the Mid-west made beads and pendants by this technique (without molds) in the 17th and 18th century. Could they have learned from an escaped slave? We will probably never know.

And then there is the case of the industry at Tanjong Selor in Borneo (Kalimantan, Indonesia) in the 1930s. Thick yellow disk beads were their speciality, with one end commonly pitted and uneven perforations. The technique was similar to the West African mold technique -- where was that picked up? Or were both of these simply cases of independent invention? Just another of the many mysteries of beads we have yet to

GLASS

As we discussed in Workshop I, glass is a complex material and glass studies is a complex science. None of us have access to the machines that can analyze glass, and analyses are expensive. However, our eyes and a simple test can tell us some things that we need to know about glass.

SPECIAL GLASS COLORANTS

Translucent reds: clear red glass (**"ruby glass"**) is one of the most desired and more difficult colors to achieve. Such glass is usually made with one of three ingredients: **copper, gold** or **selenium,** each with a story to tell. Copper ruby glass is unknown for beads (though for a short time used for stained glass windows) in Europe until George Bontemps won a prize offered by the French government for its development in 1836. Long before that, however, from the 10th century the Chinese made a copper ruby glass which was a major type of bead for them.

In the late 1600s Andreas Cassius worked out a gold ruby glass. The first to use it for beads were the Bohemians because it nicely imitated the red pyrope garnets they were famous for cutting. It was used only sparingly in Venice. For example, true cornaline d'Allepos (white hearts) with ruby red coats did not replace opaque red green hearts until about 1830.

In 1891 selenium was introduced to make a ruby glass. The Venetians used it for some years, but around 1930 began replacing it with gold again because selenium was even more expensive.

The three types are fairly easy to distinguish. Copper ruby glass is dusky. Gold ruby glass the most beautiful, about the color of red wine. Selenium is garishly red.

Yellows: Ancient glassmakers sometimes used iron for a yellow and arsenic was used in China for the bright **"Imperial yellow."** But most yellow glass was made by adding coal to the glass batch. The coal burned off and the sulfur in it colored the glass. Since this was always variable, the colors of this **"carbon amber glass"** ranged from rich yellow to ocher. Around 1860 **cadmium sulfide** was introduced to European glass to make an Imperial yellow. The difference between it and the old sulfur (or carbon) yellow is easily spotted.

Uranium colors: distinctive greens, yellows and oranges are created with uranium. These were invented by the Czechs (where uranium was discovered) and in common use by them by the 1820s. They are easily spotted with a black light (next section). Only they and the Japanese use uranium colors extensively. The preliminary indications are that uranium colored glass beads are not dangerous to wear.

Dichroic glass: this is not a color, but the effect of glass changing color depending on whether you are in the sun or under artificial light or looking at the bead or through it. Its chemistry is complex, but it is an important and easy effect to recognize.

LEAD GLASS

Lead is a glass former and has several advantages to the glassmaker. It is sparkling when used with potassium (as with Waterford crystal). The glass melts easier than leadless glass and it is softer and easier to cut (Waterford crystal again).

Lead in glass is also advantageous to us, because the only people making much lead glass for a long time were the Chinese. All their earlier glasses have lead (and barium). The barium dropped out about 2000 years ago, but the lead remained, though it became less important after the 14th century or so. Hence, nearly all ancient beads with heavy lead contents are Chinese.

How can you tell if glass has an appreciable amount of lead? The easiest way is by determining the **specific gravity** of the sample. This is not onerous, though you need a decent scale. It is a simple test, good not only for lead glass, but also provides an important tool for identifying stone beads.

WHAT TO DO: Weigh the bead. This is called its "dry weight." Then string it on nylon and suspend it in water while weighing it; this is the "wet weight." [Hints: wet the bead and blow through the perforation so that a bubble will not be trapped there -- do not let the bead touch the side of the water container -- let tap water sit so there are no bubbles in it.] Divide the difference into the dry weight and the result is the specific gravity (Sp.Gr.).

Calculate: Dry weight (any unit will do)	6.00 gms
Calculate: Wet weight	- 4.00
Subtract:	2.00
Divide this into dry weight:	6.00 / 2.00
The answer is the specific gravity:	3.00

The specific gravity of **pure quartz is 2.65,** that of common glass slightly less. As Sp.Gr. approaches 3.00, lead (or another heavy metal) must be present. By 3.00 and over there is virtually no question.

ALTERING GLASS BEADS

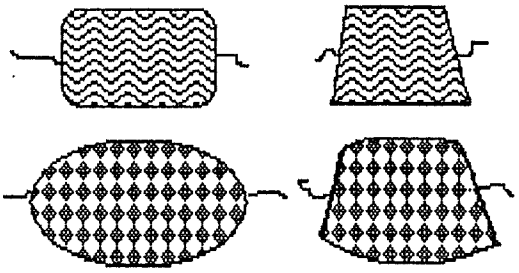
The importance and prevalence of altering beads has only recently been recognized. By altering is meant the changing of the appearance of the bead after it leaves the hands of the manufacturer. There are no doubt many more examples of this than are now known. Each one sheds light on how people use and view beads.

This is not a new phenomenon. Archaeological evidence shows that glass beads were altered in both East and West Africa 1000 years ago. Sixteenth century opaque red Venetian beads were faceted in New York by the Iroquois to more closely resemble native catlinite. A Dutch visitor to West Africa reported the breaking up and grinding of European beads in 1605. And the "beads of the water" of the Venda of South Africa are a product of grinding, done sometime before 1700.

Why are beads altered? Sometimes it is done for a practical purpose to make them easier to string or nicer to wear. Sometimes it is done for aesthetic reasons to give beads the look that a particular people desire. Sometimes the chief motive seems to be that by altering beads a people make them their own.

GRINDING

The most widespread means of altering beads is to grind. In West Africa this is done today by bead dealers, who string beads on a wire and grind them against a stone so that the beads on a string will be the same diameter and the strand will be smooth. Single beads are held with a stick in the perforation and ground to bevel the ends so that they fit better together on a strand. This is done to even tiny "seed beads," resulting in the "beads of the water" and heirloom beads of the Ambo people of Angola.



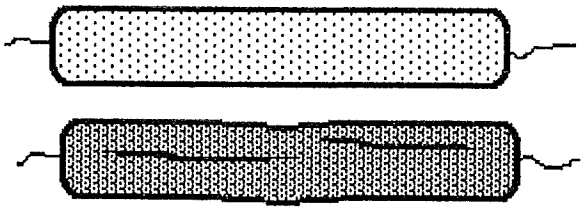
Beads altered by grinding. These have been beveled at the ends.

Other grinding operations remove the decorations on beads. The Kelebit of Borneo do this, as does someone in West Africa. Shapes can be changed, and some beads (faceted white hearts; square sectioned millefiories) were shaped by dealers or customers, not the beadmaker (though Venice also offered squared millefiories). The popular blue cornerless hexagonal beads of Bohemia were ground into rounded barrels by the Kalinga of the Philippines as part of their heirloom necklaces.

THE MOST FAMOUS ALTERED BEAD

A complex and ironic story involves the simple monochrome furnace-wound beads made in Hebron (see page 13) in the last century and before. They were sold into Egypt and shipped up the Nile where they were popular in the inland states of Wadai and Darfur, now parts of Chad and Sudan. By the 1930s their popularity had waned and no one wore them; women sold them for a song, mostly to itinerant Hausa merchants. The Hausa took them home (their "capital" is Kano, Nigeria) where they beveled the ends by grinding. In the last few decades so-called "Kano beads" now fetch high prices in Khartoum, being sold to the granddaughters of the woman who first wore them. Some writers thought they were made in Kano, but they were only altered there

HEATING BEADS



Beads altered by heating. Drawn European beads are heated to make blue Koli and related beads. The "stretch marks" are bubbles in the glass which have been broken at the surface by the heat treatment.

By putting glass beads over a charcoal or similar fire for some time, they tend to melt. There is often an alteration in color and the beads are often made more opaque. Elongated air bubbles near the surface of drawn beads break out making what some incorrectly call "stretch marks." The beads may also change shape somewhat.

The Koli beads of Ghana are made this way by heating European drawn blue glass beads in a pot along with organic matter; they may have been made to replicate the famous Aggrey beads. To the north around the ruins of ancient caravan cities, Asian Indo-Pacific beads (see page 14) and more recent European beads are heated, apparently while sitting on a flat plate, so that one side slumps and the beads turn more opaque. This is the source of the "nila" (Sanskrit for blue) beads of this area.

IDENTIFICATION WITH A BLACKLIGHT

This is the one test we present that requires some special equipment. You can buy it or sometimes borrow it. It is not strictly necessary, but when it is demonstrated to Workshop participants they go "oooh" and "ahhh." And it is quite useful for a wide variety of beads.

"It" is a **blacklight, an ultraviolet (UV) light;** a tube that fits into a desk lamp works well. It excites electrons in some materials, making them emit light. You've seen it in advertising and in discos, but it is also a handy tool because the colors of the lights (seen in a dark room) can aid in identifying many bead materials.

STONES

Fluorescence is characteristic of some minerals, often easily identified by this effect. Along with hardness and specific gravity tests, nearly all stone beads in any collection can be pinpointed.

One stone bead that fluoresces is a genuine Pumtek made of common opal. Imitations, made of a petrified but not opalized wood do not fluoresce. Another interesting phenomenon is to look at a chipped onyx bead. The artificially darkened surface masks fluorescence, but the chalcedony of the interior will fluoresce.

ORGANIC MATERIALS

Bone and teeth do not fluoresce when they are fresh. However, when they have been buried they frequently absorb fluoride, which fluoresces a deep blue. While you cannot date these beads this way, it will tell you if they have been in the soil for a long time.

Shell is composed of calcite and aragonite. The calcite does not fluoresce, but the aragonite emits an orange color. This is usually in patches, and is quite distinctive, another way to distinguish shell from look-alikes.

Amber fluoresces, as do some plastics, though differently. Cloudy amber fluoresces only a little if at all.

GLASS COLORANTS

The ingredients of glass, especially colorants, may fluoresce unless masked by iron or other factors. This can be handy for identifying the dates of some beads and the sources of some others.

GUIDE TO FLUORESCING GLASS

If the bead is... colored ---	**and fluoresces, ---**	**it contains --**	**first used in ---**	**used by**
translucent green	yellow	uranium	early 19th C.	Czech/Japan
opaque yellow	orange-red *	cadmium sulfide	mid 19th C.	everyone
topaz	orange *	cadmium sulfide	late 19th C.	everyone
	yellow	uranium	early 19th C.	Czech/Japan
clear	blue	selenium + CdS	late 19th C.	everyone
	yellow	manganese	ancient times	everyone
"ruby" red/pink	orange	selenium + CdS	late 19th C.	everyone
white	white (yellow)	tin	13th C.	everyone
	yellow	uranium	early 19th C.	Czech/Japan
translucent violet	yellow	manganese	ancient times	everyone
opaque orange	yellow/white	uranium	early 20th C.?	everyone

* Requires short-wave UV lamp; date not clarified yet.

REVIEWING TESTS FOR BEAD MATERIALS

We have now covered tests used to identify the vast majority of bead materials. Some require nothing more than your senses: the teeth-knock test, seeing the gain of many materials and smell, for example. Most others need little equipment. A candle is used for the open-flame test and, by adding a long probe, for the hot-point test. A pin chips some materials. An unglazed piece of tile is used for a scratch test. For hardness under 7, add a penny, a piece of glass and a steel file to your fingernails.

The more beads you encounter and the more interested you are, the more equipment you will want. It is not expensive to purchase some raw topaz (H 8), ruby/sapphire (H 9) or even a small diamond (H10) for minerals higher than 7 on the Mohs scale. A small but accurate scale for specific gravity can be used for other things (postage, for example). A blacklight has wide uses in testing, and think of the fun you can have with one. A microscope is better than a hand lens and need not be of high power to let you look closely at your beads.

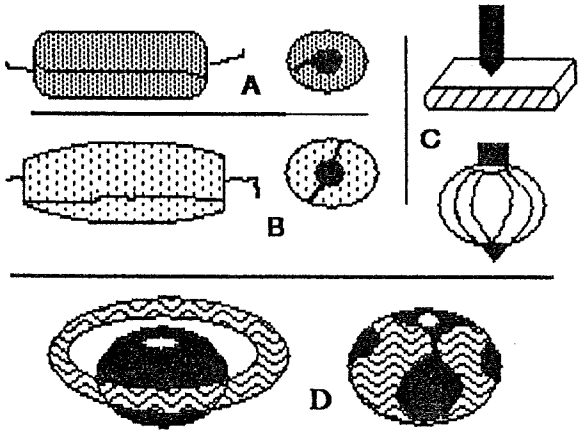
Testing tools we have not discussed include a gold (and silver) testing kit and a polariscope for some minerals. We use these occasionally at the Center, but so rarely that we have not had to buy them. An antique dealer friend lets me borrow his gold testing kit and I fix up a polariscope from old Polaroid camera filters.

Test your own beads? No problem. Things are not as mysterious as they would seem, nor is a world-class laboratory always necessary. All you need for 99.44% of beads is knowledge and very basic equipment.

Naturally, the ingredients in glass, the pattern of succinic acid in amber, the specific source of minerals or the precise identification of some plastics need much more elaborate trappings. But then our goal is not to put all scientists out of business but to make the world of beads more openly accessible to everyone.

OTHER GLASS BEADMAKING TECHNIQUES

Modern glass beads are almost all produced by the now-familiar methods of winding, drawing, molding or the powder-glass technique. But, there are many ways to turn glass into a bead. Some are quite distinctive as to where and when they were used. Several are not being employed any more and we are not precisely sure how they were done. Recognizing them is a key to several glass bead industries.



Folded beads. A is single-strip, B is double strip; notice the seams. C is a pierced and folded bead with the mandrel; note the decoration. D is a torus folded bead with torus and core.

FOLDING

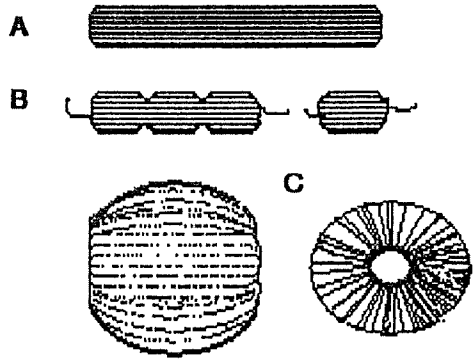
In this operation a plaque or ribbon of glass is heated and folded around a mandrel. The simplest is the **single-strip fold**, resulting in a seam running from aperture to aperture. **Double strip folding** involves fusing two pieces of glass around a mandrel, with two seams. **Piercing and folding** is done when the glass plaque is pierced by the mandrel and the glass folded up, resulting in a bead with a distinctive pattern in its fabric. **Torus folding** involves folding a glass torus (ring or doughnut) up onto a core to form a continuous wavy decoration.

Of these methods the single-strip was most common. All are associated with the ancient Middle East. Single-strip folding is found as early as the 3rd century BC. Torus folding was restricted to the Early Islamic Period, 7th to 12th cenuries. None were used after AD 1200.

SEGMENTING

This is done by heating a glass tube and constricting it along its length; the resulting bulges are cut apart as single or multiple **(segmented)** beads. In Early Islamic Alexandria, stones were grooved along the top for a hot glass tube to roll along to constrict it. Simple wire tools have also worked experimentally. Again, this is a Middle Eastern technique datable between the 3rd century BC and AD 1200. Its most famous product is the gold-glass bead (see page 12).

A variation on segmenting is known as **"pinching"** or **"hot pinching."** It was used to make large round beads as by-products of the Indo-Pacific bead industry (see page 14). It was used because you cannot round off a thick piece of tube by merely heating and tumbling it. These beads must have been made by heating a tube end, constricting it and cutting off the bead; they are never found as multiples. The same, or a similar method was used by Venetian (and probably Dutch) beadmakers, especially for chevrons.



Folded and Segmented beads. A is a drawn tube; B are beads segmented and cut from it. C is a pinched bead from the side and end.

BLOWING

Again, one begins with a tube. Traditionally, it would be heated at one end which is closed. When gently blown into, it inflates and a bead can be made from it. The technique was not known in antiquity (though the beads are fragile and may not have survived), but used sparingly by the Czechs, Germans, Japanese, Venetians and French "Roman pearl" makers.

A more sophisticated way to blow beads is to put a whole tube of glass into a long mold (the tube is frequently blown just before being placed into the mold). The result is a line of beads, like those that decorate Christmas trees, which are then cut apart. This was a German invention adopted by Czechs and Japanese, who taught it to Indians. These beads are often silvered inside with silver ammonia nitrate, traditionally sucked up into the multi-bead tubes.

LAPIDARY TECHNIQUES

It doesn't happen too often, but one should be aware that sometimes glass was worked in the same manner as stone to make beads which imitated precious stones. They are found in small numbers on ancient sites from the Middle East to East Asia. The beads will test like glass (hardness, etc.), but have been ground to shape and drilled. The Center also has two faceted clear glass beads in its collection bought in Iran treated this way. They are old, but not ancient. Who made them remains another one of (the bead) life's little mysteries.

GLASS BEADS -- THE MIDDLE EAST Part I

The Middle East, roughly the region from Egypt to Iran, is the home of glassmaking. There is a debate as to who invented glass. Glass in the form of glaze on stones and faience had been employed for a long time, but the primary invention was to make this rather complicated material stand on its own. Some believe that it was a Semitic development and that **Jewish** glassmakers were the historical leaders in the field. Others point northwards to the **Hurrians** (the Horites of the Bible; the Urartians), who were developers of several pyrotechnics, that is the use of heat in furnaces for metal and other working.

In either case, we do know that **around 2500 BC** glass was first being made, that beads were its first product and that glassmaking was either a closely guarded secret or otherwise slow to spread to the rest of the world. Whether glassmaking arose as an offshoot of metallurgy, pottery making or faience production is not known, and may never be.

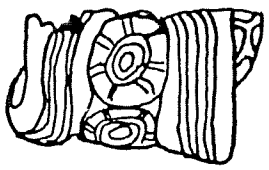
At first glass was rare, but glass beads were soon being sent to neighboring regions. In time, the beads of the Middle East became important trade items. By the first millennium BC they were being sold in considerable numbers throughout the Mediterranean.

The **Phoenicians** are usually given credit for the spectacular glass beads made as early as 800 BC and found in many parts of Europe and North Africa. By this time glass beads were already quite sophisticated. Many colors were used and the workmanship was excellent. An important bead category even at this early time were eye beads used to protect the wearer from the ill effects of the **Evil Eye**. Another bead type associated with the Phoenicians was the exquisite head or mask pendant made on clay cores which were later removed. One school of thought asserts that the Phoenicians were merely the dealers of the beads, dominating as they did the trade of the Mediterranean. The real beadmakers are said to have been Jews living in the mountainous region inland from the Levantine coast.

A bead factory on the Greek island of Rhodes dated to around 300 BC shows that many beadmaking techniques used in the later industry, including segmenting and folding, had already been developed. By the time of Roman hegemony over the Mediterranean the bead industry was a venerable and well established institution. Many beads made in this region are popularly called "Roman," though some were made long before the Latin tribes became powerful and others were made long after the barbarian invasions. Few glass beads were likely to have been made by actual Romans, though a mosaic factory is known in Rome itself. The real credit goes to different people subjected by the Roman Empire.

Unfortunately for us, the dividing line between glass beads made in Roman (or even pre-Roman) times and those from the same region in the Byzantine/Coptic period or the following Islamic period are often hard to drawn. That is because the Romans inherited the principals of the industry from the Hellenistic and Egyptian world and they were passed down to their successors. We identify beads from this long period, but cannot yet differentiate all of them. These beads can be grouped into several divisions:

MOSAIC GLASS: The principals of mosaic glass were discussed in Workshop I. The first and second centuries were the height of mosaic production. Complex and beautiful beads, some of which illustrate actual rulers, were produced in limited quantity, as were fine mosaic birds and other designs. In the Early Islamic period (ca. 700 to 1200) mosaic eye beads were still being made, but the exacting work of the earlier period had been abandoned.



Folded mosaic bead, Early Islamic Period

SEGMENTED BEADS: As defined on page 11, segmented beads were popular in pre-Roman times (3rd century BC). The most important segmented bead is the gold-glass bead, formed by coating a tube of glass with a foil of gold (or tin for a silver effect) and covering this with another tube. When heated, constricted and segmented, a glass bead which shone like the gold it contained resulted. These were popular and no doubt expensive; they are known throughout the first millennium AD. Muslim traders spread them far and wide, to India in some numbers and even China, Korea and Java. The last ones known are from the 10th century. Imitations of various kinds were also made.

FOLDED BEADS: Another technique recorded in pre-Roman Rhodes (3rd century BC), single-strip folded beads were a basic Romano-Islamic type. Two styles, blue bicones and brown or black beads with white zones, were most common and long-lasting. The torus-folded beads, in which a ring of glass was folded up and onto a core, are known only from the Early Islamic Period (ca. 7th to 12th centuries).

AGATE GLASS: This is defined as beads made from glass which has both opaque white and translucent blue and/or amber colored sections. The colors are not mere surface decorations, but penetrate the whole bead. Certain styles containing all three colors seem to have been made only around the first century AD, but those of blue and white or brown and white composition are known throughout most of the first millennium.

Hellenistic World/Egypt	Mesopotamia/Syria/Levant
	2500 BC - Glass invented in Mesopotamia; beads virtually the only product
14th century BC - glass beadmaking at Armana, Egypt	1500 BC - Whole repertoire of decorative techniques and maybe folding, (especially at Nuzi); Crude mosaic vessels
6th century BC - Greeks establish glasshouses in Black Sea colonies.	
3rd century BC – Rhodes making segmented beads, including gold-glass, and single-strip folded	In time, work shifts to Tyre and Damascus. All beads were furnace-wound and continued to be so down to the present.
332 BC - Alexandria founded; it becomes the center for mosaic and gold-glass manufacture.	
By the 1st century AD - Segmenting (including gold-glass), piercing (for mosaics), fusing (for mosaics) and folding are well established in Alexandria Agate glass also begins at this time; where was it made?	Syrians using mosaic canes for eye decorations on wound beads
By the 4th century AD - Double strip folding; piercing and folding	
640 AD - Arabs take Alexandria and the city goes into decline; focus shifts to Babylon/Fustat/Cairo	
7th century - mosaics, at least for eye bead decoration, and segmenting shifted to Fustat (Old Cairo; founded in 674; perhaps at Babylon before this).	
10th century - Fortified Cairo was founded in 968 and made the capital in 975. Fustat Fused Rod beads; torus folded beads (where made?) Technology transfers to Southeast Asia (Srivijaya, Sri Lanka), Viking lands and probably Spain.	Syrians making "big blob" bead decoration
1168 - Fustat destroyed. Egyptian glass beadmaking disappears.	1124 - Tyre captured by Venice; workers shift to Armanez and Hebron
16th century - last of torus folded beads	1402 - Damascus captured by Timor; takes beadmakers to Samarkand.
17th century - last segmented and gold-glass beads (in Spain).	

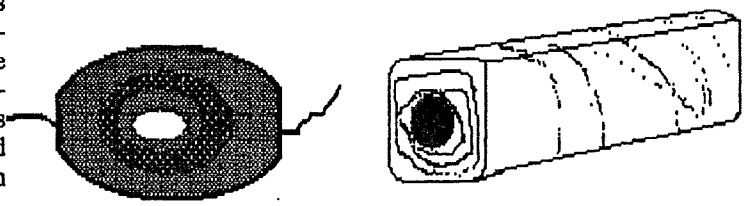
GLASS BEADS -- THE MIDDLE EAST Part II

The year AD 1200 (give or take a few decades) is a key date in the history of the world bead trade. The Middle Eastern glass bead industry underwent a sharp decline. Two outside factors were responsible for this: the European Crusaders and the central Asian Mongols. As wave after wave of invaders swept in on the Islamic world, city after city was ransacked. Some of them -- Alexandria and Fustat (Old Cairo), Tyre and Sidon, Damascus and Allepo -- were principal glass and beadmaking centers. As they were laid waste, so too were their beadmaking industries. None survived, yet there are still echoes of the days of glory.

HEBRON AND ITS SUCCESSORS

One of the world's oldest cities, **Hebron** very near Jerusalem is holy to three religions. It seems that as Tyre was being sacked beadmakers moved inland to this place. We do not know what was produced in the first several centuries, but by 1600 Hebron glass (probably including beads) were being shipped to Egypt. Typical Hebron crude furnace wound beads of opaque green, blue, yellow and black were being made by the 17th century. They were shipped up the Nile to isolated inland kingdoms, reaching all the way to West Africa. The opaque glass of these beads was made with salts from the Dead Sea, and though limited in range they were still popular (later to be into "Kano beads" -- see page 9).

By the 1880s the Hebron beadmakers stopped making their own glass and recycled glass from bottles which had become easy to obtain. These were made to combat the Evil Eye -- simple blue beads, beads with stratified eyes and pendants shaped as hands. These were still being made in the 1920s, but more recently only plain translucent beads with large holes and bubbly glass are being produced.



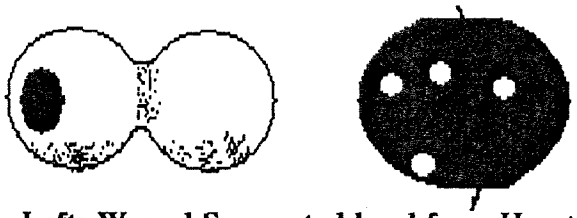
Left: Evil Eye bead as made in Hebron in the 1920s and currently in Turkey. Right: current Hebron production.

Around 1880 two beadmakers migrated to western **Turkey** (at that time both areas were part of the Ottoman Empire, which encouraged the free movement of craftsmen). They settled in Izmir making blue beads for horses. Around 1930 they were invited to leave by their neighbors, tired of smoke and afraid of fire, and they settled in the village of **Gorece**. In the 1960s Zakai Erdal, inspired by ancient beads in the museums of ancient sites of the region, taught his fellow workers to make beads to replicate Roman types (sometimes artificially weathered and sold as ancient -- watch out). A few other villages now also make these beads. Turkish Evil Eye beads are descendants of this venerable industry.

Another branch of the industry was reborn in **Cairo**, which had not been making beads since the 12th century. A Cairene beadmaker went to live in Hebron in the 1930s, married a local lass and returned to Cairo to reintroduce beadmaking to that city.

CENTRAL ASIA

Yet another thread of the ancient Middle Eastern glass bead industry was woven when the fierce Tamerlaine (ca. 1405) took glassmakers and other craftsmen from **Damascus** and **Allepo** back to **Samarkand**. A bead workshop of that date has been excavated there. Though we are not sure when, beadmakers moved to nearby **Bokhara** (which dominated Samarkand for centuries). There are still some people making simple white spotted black eye beads in nearby Tashkent.



Left: Wound Segmented bead from Herat. Right: Eye bead from Tashkent.

In 1917 as the region came under Communist influence, one family emigrated to **Herat, Afghanistan**, to make simple monochrome beads in a limited range of shapes. I do not know what has happened to them. I visited them only weeks before Afghanistan was taken over by Communists (1978) and Herat was badly hit during the subsequent civil war. They may have moved to Iran or be back in Herat. Beadmaking usually survives, but this may be a case in which it didn't.

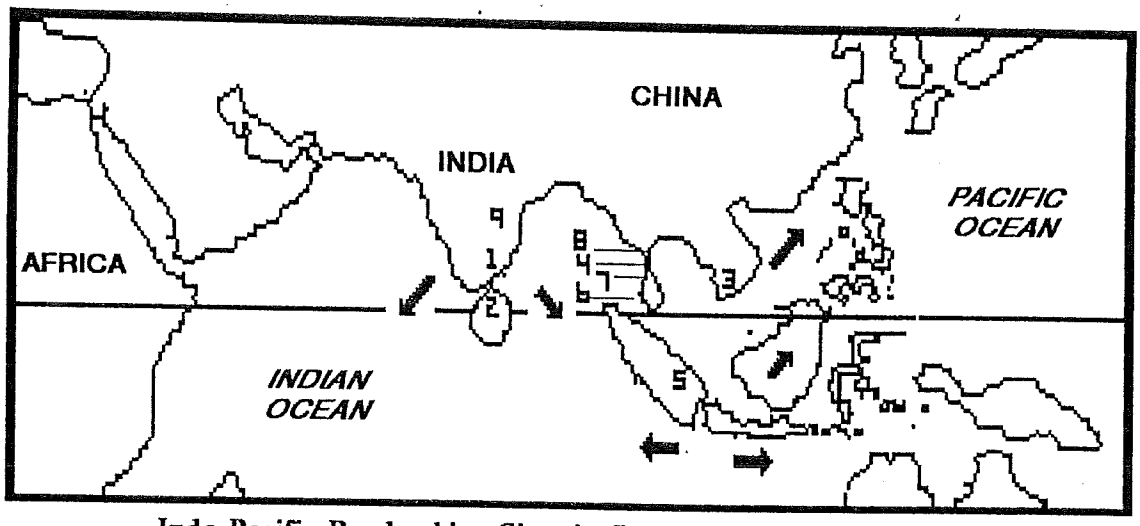
A WORD ABOUT SEGMENTED BEADS

We have met two types of segmented beads. Drawn segmented beads, made by pinching a tube a to make bulges which are cut apart are called segmented whether they are single or multiple beads. On this page are wound segmented beads. In Herat many beads were wound in groups of four or five and later cut apart. Sometimes in Pakistan and India two or three adjoining beads are made both on purpose and accidentally.

There are faience and bone beads molded or carved into segment-like parts never designed to be cut into smaller beads. "Segment" means "a part or ... fragment of something." It would seem best to call segmented beads only those cut from multiple beads. But the other meanings of the word are well established. Thus, we should be careful to understand which type of segmented bead is meant.

INDO-PACIFIC BEADS

In Workshop I we discussed the basics of how Indo-Pacific beads were made. That doesn't affect most of us, but the waste materials of the process helped me identify the places were these beads were manufactured. This turns out to be very important because **Indo-Pacific beads are the most common trade bead -- probably the most common trade item -- in history.** They are found, often in great numbers, from the Forest Zone of West Africa to Korea and Japan.



Indo-Pacific Beadmaking Sites in South and Southeast Asia
"Mother Site" of Arikamedu (1). Beadmaking moved to Mantai (2) and Oc-eo (3) and Kong Thom (4) of Funan in the first/second century. In the 7th century beadmakers went to Srivijaya (5) and under it to Kuala Selinsing (6), Sungai Mas (7) and Takua Pa (8). It survives today only in Papanaiduper (9). Arrows show trade route directions

They were first produced at **Arikamedu** on the southeast coast of India. By the first century or so, some beadmakers moved to **Mantai**, Sri Lanka and the western and eastern ports of **Funan**, the first state in Southeast Asia, based in southern Vietnam. When Funan collapsed the beadmakers moved to the successor state, **Srivijaya**, based in Sumatra and the southern Malay peninsula. Mantai was destroyed in 957. Srivijaya continued making the beads until it dissolved around the year 1200; from this point on they disappear in Southeast Asia. Arikamedu continued making the beads, which were still very popular in Africa, until it was abandoned in the 16th century, when the beadmakers moved north to the village of Papanaidupet.

Indo-Pacific beads are small drawn beads in a limited range of colors: opaque red, orange, yellow and black and translucent or semitranslucent blue, green and violet. The glass is usually of poor quality, full of bubbles or "seed." The beads themselves are not very uniform in shape.

INDO-PACIFIC BY-PRODUCTS

In addition to the basic Indo-Pacific beads, the beadmakers, either from a desire to broaden their market or to eliminate boredom, made other beads using the tubes as a raw material. The most common were large (one cm. or wider) pinched beads (see page 11). Beads with collars (small bits of extra material around the apertures) were a speciality of Arikamedu in the early centuries. Tubes were also pressed into various faceted or biconical shapes and some centers drew the tubes out so they would have square sections. A few centers made striped drawn beads as well.

These special beads were not made by all Indo-Pacific beadmakers, but represent the industry in one or two places. Short of glass analyses, not many other hints exist to help us identify the precise origin of given Indo-Pacific beads. Some centers made some colors and not others. Arikamedu, for example, did not make orange but made a lot of violet beads, which were rare elsewhere. Takua Pa (Thailand), in the Srivijayan period did not heat their beads very long, and most have squared rather than rounded profiles. Srivijaya made thin tubes in different colors, which are rare at most other beadmaking sites. Still, it is very difficult to say with precision where a given group of beads may have originated, since the group itself may contain beads made at different centers.

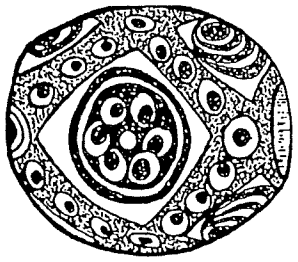
The Indo-Pacific bead story tells us much about the study of beads. Investigations began on small, rather uninteresting little beads. Soon it became apparent that they were widespread throughout the Old World and lasted very long in chronological terms. As work continued into these little beads, a whole new understanding of the movements of crafts and ideas throughout much of Asia for a considerable long period became clear. The ramifications of this widely spread industry are only beginning to be understood.

CHINESE GLASS BEADS, Part I

For a long time it was assumed that the Chinese never made many glass beads and certainly did not export them. We now now this is totally wrong. The Chinese began making glass before 700 BC, about the time that India did; they probably came to glass through their superior metallurgy.

The earliest Chinese glass beads imitated jade, and contained high amounts of **lead** and **barium**, the latter helping to opacify the beads to give them a jade-like quality. By the time of the **Late Zhou** (473-256 BC) China was making spectacular beads, often large and with very complex eye designs.

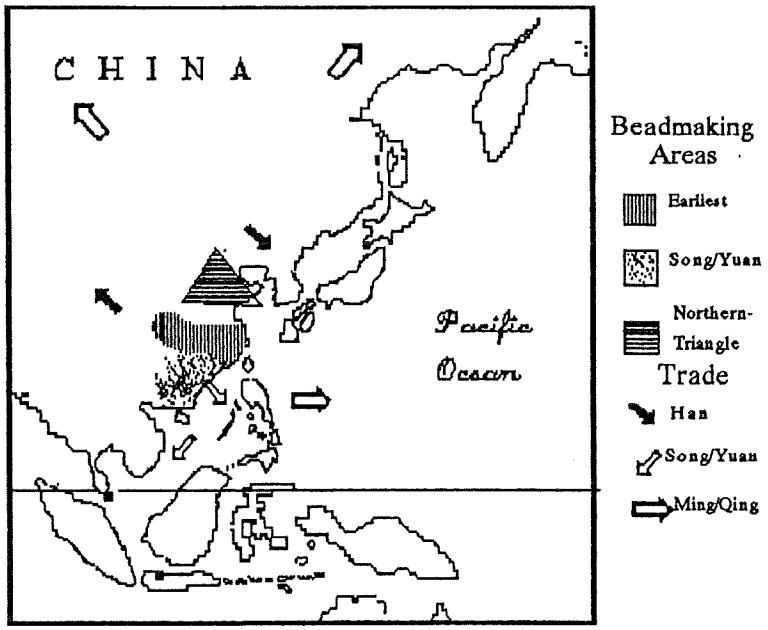
During the **Han** Period (202 BC - AD 200) beadmaking declined; the glass was not as good and the designs were more simple. We know little about the beads from the next few centuries, but by the time of the Tang (618-906) and the Northern Song (960-1127) beadmaking was on the rise again.



Elaborate bead of the Late Zhou Period

However, it was not until the **Southern Song** (1127- 1279) that China began exporting beads in earnest. The Mongols literally drove half the Chinese population into the six southern seaboard provinces. By the time the Song dynasty fled from the northern capital of Kaifung in 1127 to the southern capital of Huangzhou, the Chinese began looking to the sea. They built the world's first permanent navy and took over much of the Asian trade from Srivijaya, which had been the intermediary until then. Southeast Asia was then flooded with Chinese beads.

The most common of these were tiny little wound beads so often with peaks of glass at the ends they are called "**coil beads.**" At site after site they replace the similarly small, monochrome Indo-Pacific beads. They must have played essentially the same decorative role, and their similarity to Indo-Pacific beads has often led to confusion between them. An interesting phenomenon about the coil beads is that at many places one color tends to dominate.

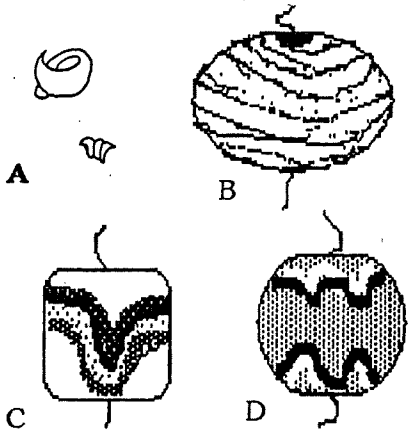


Chinese Glass Beadmaking and Trade

Along with coil beads come other distinctive types.

There was a variety of polychrome beads, most often with colorful lines combed into waves; these include later imitations of European chevrons after they reached the area. Copper ruby red glass beads were a speciality, as we noted on page 8; China was the only place in the world these were made. Turquoise or white glass beads made by winding many thin layers of glass are another common type. All of these were wound, most at a furnace, but the coil beads were made by heating glass over an open pit and letting it grip onto a thin wire. All are heavy in lead (to test for lead, see page 8).

During the **Yuan** or **Mongol** (1260-1368) and **Ming** (1368-1644) dynasties Chinese craftsmen were more and more restricted by the throne, and many left China to seek their fortunes elsewhere. At least two beadmakers joined this exodus. We know coil beads were made in the 14th century in what is now Singapore. We also know that around 1600 Chinese living in Banten, Java, were making cobalt blue barrels for export to Borneo; they have been found in the Philippines and are the valued heirloom beads of the Kelebit of Borneo.



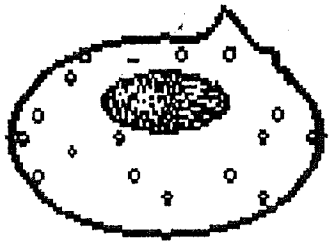
A: Coil beads. B. Multi-wrapped bead. C and D. Polychrome types; C is 15th century, D is a wound chevron.

CHINESE GLASS BEADS Part II

During the height of Chinese glass bead production, a second center of beadmaking developed in Shandong province. The best known place of production is **Boshan** in **Shandong** province, but we know of several beadmaking centers within the **"Northern Triangle"** bounded by Beijing, Zhangzhou and Yantai (Chefoo). Some are still in existence, and some of the old classic beads, such as lead heavy coil beads, are still produced.

But the industrial activity of Shandong, with its rich mineral resources, was increased with inventions of using coal in furnaces and hydraulic bellows. These helped this region become the leading beadmaker. What distinguished its production was that the glass was made without lead.

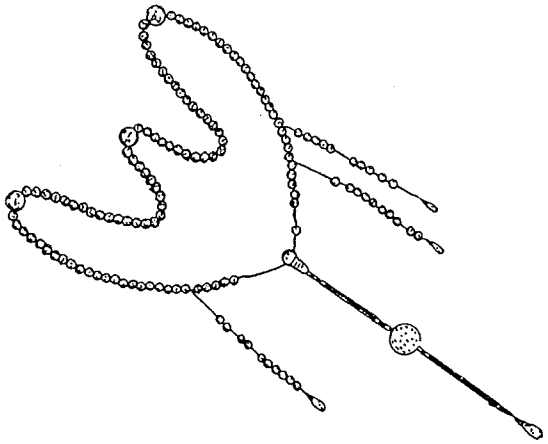
The beads made in this "Northern Triangle" became the ones we think of as typically Chinese with large holes often containing a light perforation deposit, bubbly glass, not very regular shapes and peaks at the end indicating that the glass was wound as it was cooling down.



Bead typical of the leadless variety. Note the large hole, bubbly glass, imperfect shape, peak of glass at the end and perforation deposit.

DISTINCTIVE GLASS COLORS

At the beginning of the **Qing** dynasty (1644 - 1911) two long-lived Emperors, Kang Xi and Cheng Lung, patronized all the arts, including glassmaking. Kang Xi set up an Imperial glass factory in Beijing and Cheng Lung's reign is noted for experimentations in the colors of pottery glazes, which is glass. In addition, during this dynasty, controlled by the outsider Manchus, all Chinese officials and army officers, their wives and children had to wear special necklaces of "court beads" modeled after Tibetan rosaries.



Court chain of the Qing Dynasty

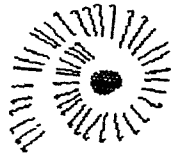
As a result of these influences, two important things happened. One was that the colors of Chinese beads became much more interesting and many were distinctive to China (though the Czechs managed to copy many of them). These "Peking glass colors" are so named because they were developed in the capital or at least under the patronage of the Emperor.

The other result was that while China continued to export beads which were as poorly made as ever, they also produced beads of better quality, with small holes, much better glass, in regular shapes and no peaks of glass at the ends. After the 1911 Revolution the Chinese destroyed reminders of the hated Manchu; they cut off their pigtails, a symbol of submission, and they broke up the court necklaces to sell the beads individually. Most any collection of Chinese beads will have both poorer quality export types and the better quality court beads.

Exporting became more important. China supplied beads to the Russians and others for the Alaska trade. They also sold their glass beads to the Spanish in Manila, who took them back to Mexico. Hence, many heirloom and older beads along the American West Coast, including the so-called "Chief bead" and "Padre bead" (both are the same turquoise bead) and heirloom beads in isolated villages in Mexico are Chinese in origin.

The Chinese never lost their love of imitating jade and other precious stones in beads, and they produced a number of these imitations, some of which were worked as though they were precious stones. They also produced some wound imitations of dZi beads.

One particular type of decoration only found on Chinese beads is a mosaic effect which, when looked at closely, resembles a starburst of fireworks. It may have been made by putting colored canes of glass onto a flat plate of clear glass, rolling this up and slicing it , something like a jellyroll. These "jellyroll" mosaics are quite distinctive. We do not know when they were first made, but production continues to this day.



Chinese "jellyroll" mosaic

There has been a debate about the origin of some long drawn tubular beads with unreheated ends found on Chinese curtains, Chinese export sewing baskets and objects once belonging to the Emperor. They are also known in Japan and were shipped from here. It seems likely that the Japanese began making these beads (the silvering inside was introduced to Asia by the Japanese), but that many were produced in China. We know that the Japanese controlled several Chinese beadmaking factories even before they invaded the country. We also know that the Japanese repackaged glass beads made in Korea and sold them to the world with "Made in Japan" stickers on them, and that, in fact, they still do.

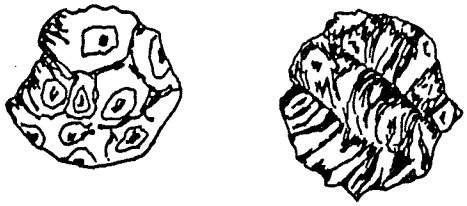
SOUTHEAST ASIA

Although not home to one of the great beadmaking traditions (except the Indo-Pacific beads), Southeast Asia is of great interest to the bead world for several reasons. For one, it is the crossroads of trade between the West and India on one hand and China on the other. For another, it is an area where beads have long been appreciated. Not the least, it has a growing number of people interested in beads.

By looking at data from this region we can learn a great deal about the international bead trade. The Philippines, in fact, is the only country in which there is a register of all kinds of beads found in archaeological sites which allows us to study the trade statistically. Up until AD 1200 Indo-Pacific beads dominated the region. Middle Eastern beads were imported and though a few got to the Philippines, most ended up in the more advanced and closer trading centers in Malaysia, Thailand and Indonesia.

After 1200 Chinese beads flooded the region and continued to be the dominant types even for centuries after Europeans began visiting. European beads took the lead only by the 17th century or later in some places.

One intriguing thing about Southeast Asian beads is that there are several types probably or certainly made there. In some cases we can reconstruct their production.



Moasic beads from Sungai Mas, Malaysia, possibly made there.

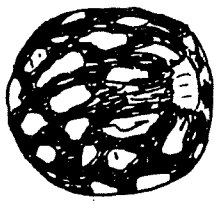
From the 7th to the 10th centuries there are three archaeological sites -- Takua Pa, Thailand; Sungai Mas, Malaysia; and Srivijaya, Indonesia -- with evidence for beadmaking or broken beads in such quantity that it looks like beadmaking was carried on there. At Sungai Mas there are two types of mosaic beads in large quantities and a few mosaic plaques which match the beads. At Takua Pa false gold-glass beads, with am amber coated outer tube and a white inner tube were made. There are many broken examples of a distinctive wound stratified eye bead. At Srivijaya (Palembang, Sumatra) there are bead wasters and glass plaques for folded beads and pierced and folded beads.

All of these bead types are non-Asian. All these techniques are typical of the Middle East. The raw materials (the mosaic plaques and possibly the tubes for the false gold-glass beads) are also typical of the Middle East, and it appears they were imported to these sites to be made into Middle Eastern style beads to be sold locally. Did someone from the Middle East settle at these places (all of which were part of the Srivijayan kingdom and all of which made Indo-Pacific beads) or did Southeast Asians learn the techniques while abroad and bring them home? We will probably never know, though the former seems more likely.

A little later, we find related but different sorts of beads. They are often more spectacular than the ones we have just discussed and are popular with collectors. We still have details to learn, but it is clear they were made in East Java, in the eighth or ninth century. The only confirmed manufacturing place is Jatiagung, but the "Java mosaics" were not one of their products.

East Java Mosaic, Indonesia ca. 8th-9th centuries.

The chronological and geographic position of East Java is important. It was just outside the reach of Srivijaya, which was making beads with the help of Middle Eastern beadmakers. At least some raw materials from the Middle East were probably used for these beads, but the actual beadmaking seems to be completely indigenous if for no other reason than the beads were made in techniques unknown elsewhere.



Eye bead with green-blue background, probably made in Jatiagung, East Java, 8th-9th centuries.

The best known of these beads are **"East Java mosaics,"** large colorful mosaic beads made on mostly wound cores by adding very thin slices of canes (because they were rare and expensive?). Another type has a greenish-blue surface with white dots for eyes. These beads, made at **Jatiagung** in the western part of East Java, have strange cavities in their perforations as a result of their (still not understood) manufacturing process. Other types of beads include **"big yellows,"** generally quite large and monochrome, beads with twisted multicolor stripes, and large beads with multicolored combed designs (called **pelangi** or "rainbow" by local collectors).

All these beads are rare outside East Java. Production lasted only a few centuries. The East Java mosaics are sometimes called "Majapahit" (more properly Mojopahit) beads, but there are earlier than this kingdom; not one was found at the Mojopahit capital of Trowulon, founded in 1392.

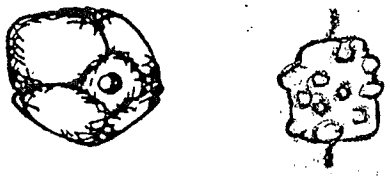
OTHER EUROPEAN GLASS BEADMAKERS

Workshop I concentrated on the glass beads of Venice and Bohemia, the leading beadmakers of our time. However, there are other industries elsewhere in Europe which are part of the bead story, and in some cases a much larger part than had been assumed.

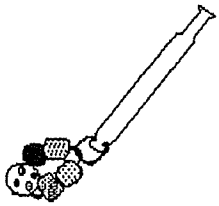
To cite one example, beads imported to the West African country of Ghana in the 1930s were dominated by products of Venice and Bohemia, yet about 10% of the imported beads came from France and about the same amount from Germany. Though minor, some of these other beadmakers are of considerable interest.

HOLLAND

The Dutch, as is well known, made beads especially from ca. 1600 to 1750. Many were drawn beads identical to contemporary Venetian products (green hearts, chevrons, etc.). In the latter period wound beads, especially twisted squares and mulberries were made. There are a lot of beads on the market popularly called Dutch -- few of them actually are.



Wound Dutch beads, ca. 1680-1750



English lace bobbin with spangle of beads

ENGLAND

Although England tried to get into the bead business early, it did not succeed very well. There are few notices of beadmakers, but the beads they made are not identified. The most interesting English glass beads were made by itinerant tinkers who lamp-wound beads to sell to women to put on their lace bobbins (only English lacemakers use beaded spangles to distinguish the bobbins and prevent them from rolling around).

FRANCE

Another early beadmaker, the French, conquered the world with **"Roman pearls,"** made between about 1650 and 1850. These were hollow beads coated on the inside with guanine from fish scales and filled with wax. Their fragility has meant most have been broken; when found today they have usually lost their wax and often much of the guanine.

The French became rivals to the Czechs in the making of Prosser beads, especially the **Bapterosses** company in Braire, which began making beads and improvements to the machines in 1864. Drawn beads have been produced around Lyons for a century or more, some of the producers originally coming from Venice. Among the drawn beads are some distinctive chevrons with only a few layers and unusual color combinations.

There have also been a number of smaller houses making lamp-wound beads for the fashion industry. The largest of these was **Rousellet,** which employed 800 people in the 1920s. It no longer makes (but still sells) beads. A couple of other small houses survive.

GERMANY AND AUSTRIA

The story of glass beads in these two countries is related and often intertwined with Bohemia. The Germans made glass beads for export for some time, chiefly in Bavaria and especially in the Royal Forest region, centered at **Warmensteinach.** One early German trade bead (though we do not know its precise origin) is a popular round annular (mistakenly called Dogon and Dutch and whatever). Before about 1850 they were made in a gray blue or amber color. By 1860 the blue became brighter and by 1880 clear and green ones also appeared. Production ended in the 1890s.

In 1895 **Daniel Swarovski** left his father's glass bead cutting business in Bohemia and settled in the tiny Austrian village of Wattens because he had invented superior ways to cut glass and he wanted to keep the secret from other Bohemian beadmakers. His business grew into an international empire with a billion dollar a year sales and control over, among other things, America's Zale's Jewelry stores. Swarovski (lead) crystal is world famous for its pure glass and its precise cut.

Following the Communist takeover of Czechoslovakia, many beadmakers migrated elsewhere; specifically, the Germans among them were expelled. Some settled first in Warmansteinach, where they revitalized the industry, introducing molding techniques to the wound techniques used before. Others went to **Gmünd,** a German jewelry center. Eventually both groups settled near Kaufbueren in a suburb named **Neu Gablonz** (New Jablonec) with the backing of Daniel Swarovski. Still others went to Austria: **Vienna** (including a company called Neu Gablonz) and **Krimsmünster.** These three places are still making beads. The molded ones are hard to distinguish from one another, though subtle differences do exist.

OTHER GLASS BEADMAKERS

Not long ago it was thought that there were very few glass beadmakers in the world and that nearly all glass beads of recent date were made in Venice. We know now this is far from the truth. There are many other glass beadmaking industries, some large and some small, some old and some new.

NORTH INDIA AND PAKISTAN

The Harappans, who built the first Indian civilization (the Harappan or Indus Valley Civilization, ca. 2500 to 1700 BC), were masters at beadmaking. They did not produce glass, but experimented widely with stones, decorating them and making new materials, including various faiences from them. Some of their faience is virtually identical to glass. After the Aryan invasion forced the Harappan people eastward and southward, we find a wide variety of interesting faience beads in their later cities, including some with glazes so thick that they really needed no core.

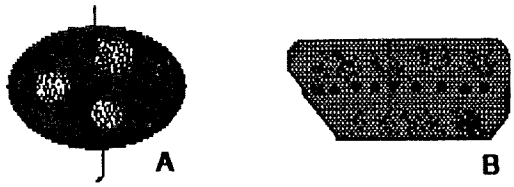
The first glass, in the form of beads and bangles, appeared at the juncture of the late Harappan and succeeding "painted gray ware" period. It may well have been locally invented, probably as an outgrowth of faience making.

Beadmaking subsequently spread around India, with different regions producing different beads. As we already know, South India is home to Indo-Pacific beads, but North India has made beads for an even longer time. North Indian sites of a few centuries BC and AD have many glass beads, not a few of which imitate blackened etched carnelians.

A century or so ago there were some 60 villages mostly in the north where beads and bangles (technically closely related to wound beads) were made. The history of Indian glass beadmaking is similar to the story of Indian industry as a whole. It suffered its first setback when England insisted that nearly all beads had to be made in England or brought on English ships. The death blow was early in this century when the English realized that they were quickly impoverishing the once wealthy India. The policy was to centralize production, in the case of glass at **Firozabad**, Uttar Pradesh. This drove the stake into the heart of the village-based bead industry, just as similar policies runied the once famous textile, steel and other industries of the subcontinent.

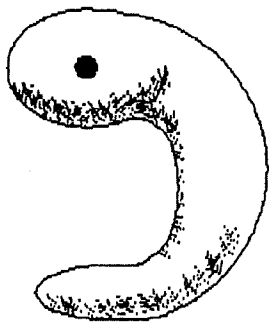
Today there is only one traditional glass beadmaking village. **Purdalpur,** Uttar Pradesh, became the center for beadmaking after Partition in 1947. Since North Indian beadmakers had been Muslims since about 1700, half went to Hyderabad, Pakistan, where the government set up a glass factory and settled the beadmakers. In India, beadmakers from other villages migrated to Purdalpur, where beads of many types (long drawn beads for curtains, millefiories, lamp-wound and furnace wound styles) are now made. One special decoration, made by rolling a hot wound bead over an iron plate with depressions which hold finely powdered glass, is distinctive to this industry and can be dated back 1500 or so years.

The center of the Indian glass industry remains Firozabad, where most bangles and raw glass for beads are made. They also make silvered mold-blown beads, having been taught by the Japanese.



Two North Indian beads. A: powder-glass decoration. B: an old traditional shape.

In **Benaras (Varanasi)**, U.P. a Czech couple taught Czech-style lamp winding and glassmaking in 1941. Benaras continues to make glass beads (though not glass). Benaras and especially Purdalpur (as well as neighboring towns cashing in on the boom) have recently been making beads which resemble the increasingly scarce European trade beads, including combed feather beads, white- and yellow hearts, molded mulberry beads and progressively sophisticated imitations of chevrons. They are improving all the time, but the wound beads are usually spotted from their perforation deposits, the original mulberries were not molded, and Indian chevrons have not (yet) reached the perfection of Venetian ones.



A Gokuk (Korean) or Magatama (Japanese)

JAPAN

The Japanese had a flourishing bead industry in the Nara Period (8th century), which was revived in the Edo Period (1615-1867) when beads were made especially as ojime for the inro pouch. After Japan was opened to the West in the 1850s production increased and broadened. The Japanese imported techniques from abroad and began to market their products aggressively.

Today they are the biggest producers of "seed beads," and famed for the delicia (called "delicious" by some Americans) beads of tiny size and wide holes. They are also the chief producers of foil beads, which the Europeans stopped making some time ago. Other beads are made both by winding and molding, and their styles are often distinctive. We still have much to learn about Japanese bead production (see Korea, next page).

AND STILL MORE GLASS BEADMAKERS

KOREA

Except for limited production of glass Gokuks during the early centuries AD, Korea was not a glass beadmaker. Glass beads in royal Korean tombs were imported: Indo-Pacific beads, gold- and silver-glass beads and some no doubt from China.

In 1927 the Japanese took five Korean lads to Japan to teach them how to make beads. Since their return in the 1930s Korea has been a player in the glass bead game. Initally, the beads were sent to Japan, packaged there and marked "Made in Japan" to be sold to the world. This is still going on.

There are about a dozen small factories making glass beads often indistinguishable from Japanese beads. There is also a factory making drawn beads at Seoul. Some of their output is sold through Japan, but they are becoming more conscious of their own export potential.

Wound beadmaking in Korea follows the system learned in Japan, which can be documented back several centuries. Prepared canes are heated at a lamp and the glass dripped onto a wire, which can be twirled to give the beads a round shape and then moved aside (being attached to pullies and a weight) to make room for the next bead. After a meter or so of beads is made on the wire, it is detached and the beads taken off with the aid of a perforation seperator.

OTHER BEADMAKERS IN ASIA

Taiwan is bginning to make glass beads, though the economies of working in China are making it increasingly easy to use Chinese beadmaking. One bead to look out for is a blue cornerless hexagonal ("cut blue"), imitating the 19th century Czech favorite. One difference with the Taiwanese beads is that they are tumbled.

Near Jombang, East Java, and Solo, Central Java, **Indonesia**, beadmaking was begun in the early 1980s. The beads are often attractively combed and distinguished by asbestos used as a separator (though I hope not after my warning). These beadmakers are becoming increasingly skilled at imitating Venetian trade beads as well as ancient beads found in Indonesia. While Thailand has long been known to be a source of faked antiquities, the Indonesians have found that faking beads can be lucrative.

AFRICA

Powder-glass beadmaking does not require the manufacturing of glass. The only traditional glass beadmaking on the continent outside of North Africa is done by the Nupe in **Bida**, Nigeria. They have been making wound beads and bangles for a long time, though where they learned to do so is not known. They used to make their own glass from the local sand, which produced a dark green or black-brown color. Today they recycle bottles to make more colorful, but still simple beads.

Around 1990 a Moroccan purchased a Prosser bead machine in France and took it home to a small town near **Casablanca**, Morocco. Nearly the whole range of Prosser products are being produced, with emphasis on interesting colors which are to be aimed at the fashion industry.

LATIN AMERICA

A few years ago some Americans started having glass beads made around **Guadalajara**, an important Mexican glassmaking center. They produced "cut blues" (cornerless hexagonals) distinguished by having been ground at the corners before the beads were cut off the hexagonal tubes (the effect can be seen on some beads). Later ones were also distinguished by being made with clear cores.

Arte Murano, near Caracas, Venezuela, was settled, as its name indicates, by glassmakers and glassworkers from Murano in Venice. They once made millefiori beads, but the immigrant master who did this has passed away and this work has ceased.

U.S.A.

An attempt was made at Jamestown, Virginia, to set up a glass bead factory. John Smith requested Polish and German glassworkers and a few beads were made, as some samples were sent to England. But the operation soon closed. A second attempt was made in 1621 with Italian beadmakers, by an attack by Native Americans in the next year closed the project forever.

The studio glass movement, developed through the inventions and processes of Dominick Labino and Harvey Littleton, helped to demythologize glassmaking and -working. By the early 1970s Dudley Givberson of Joppa Glassworks in Warner, New Hampshire and Tom André of the Tomato Tree Studio in Washington state (he is now independent and working in Clear Lake, WA) began their careers making drawn beads.

Today there are many glass beadmakers in the US making both drawn (including chevrons) and lamp-wound beads. The scene is changing fast, and other sources are better for learning about them than here. The Center played an early role in the documentation of these beadmakers, as it was realized that many of the clay beadmakers of the 1960s and 1970s had passed out of business without any record of their work. The glass beadmakers have fared better.

And none of us know who is going to be making what beads tomorrow.