C.B.R. Workshop Handbook 1:

HANDBOOK FOR THE C.B.R. BEAD IDENTIFICATION WORKSHOP I

20 EASY STEPS TO IDENTIFYING MOST BEADS IN MOST COLLECTIONS

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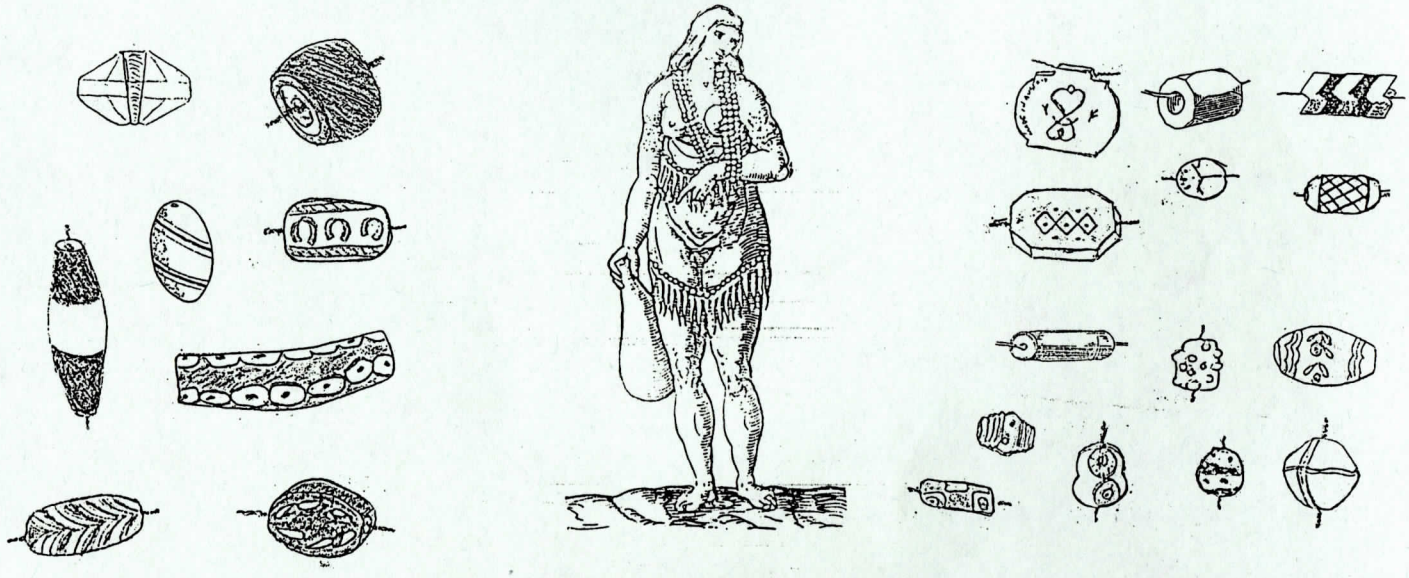

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PART ONE: ORGANIC MATERIALS

SHELL

One of the oldest bead materials, and often the oldest surviving, shells are produced by living molluscs, the second largest order in the animal kingdom after insects. Shells are often worn whole to take advantage of their natural colors and shapes. When so used, we want to know how the shell was pierced [see Box 1].

Shells may also be treated as raw materials, in which case they are cut up, sometimes beyond recognition. Some clues exist, however, that tell us something about the original shell. So-called "mother-of-pearl" (nacre) is found in many shells of fresh and salt water molluscs. Large, thick beads can only be cut from giant clams, the hinges of large bivalves (clams, cockles and the like), or the columella (supporting column) of large univalves (snail-like molluscs) such as conchs and whelks [see Box 2].

An important beadmaking technique is known as the "heishi method." It is world-wide and dates back some 20,000 years. Flat material is chipped into crude circlets [Box 3A], which are bored [3B]. When many are done they are then strung and ground together [3C]. This makes them all the same diameter (a test for the method) and they interlock [3D].

Box 1

PIERCING WHOLE SHELLS

Gouging or Hammering - easy, but not neat

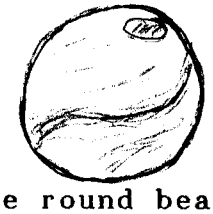
Grinding - neat but takes time

Scratching - very labor intensive

Sawing - also labor intensive

Common solution - a combination: hammer and grind smooth or grind thin and gouge

Box 2



Large round bead cut from columella

Box 3

A

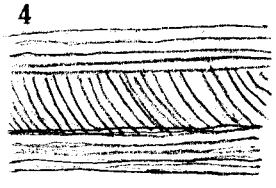
B

C

D

The Heishi method: chip, bore, string and grind together to make fine disc beads.

Box 4



The "grain" of shell (use lens)

Box 5

MAJOR SHELL BEADMAKERS

Cebu, the Philippines
Veracruz, Mexico
Rameswarum, India
Carita, Indonesia
San Domingo Pueblo, NM
Pacific islands: Fiji, Tahiti, Hawaii, etc.

A critical point is to be able to differentiate cut shell from other white materials. Look with a lens for two regions of parallel lines interrupted by diagonal lines [Box 4].

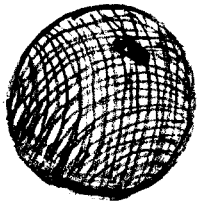
I V O R Y

Ivory is cut from the teeth of some animals, but "true" ivory is only from elephants. The ivory trade has recently suffered a world-wide ban because of the alarming destruction of the elephant herds of most African countries.

We support the ban. Though it has put many people out of work, especially in Hong Kong, it has saved the lives of many elephants. The price of ivory has dropped to almost nil, but it is still legal to trade old ivory within the U.S.A.

Elephant ivory is easily distinguished because it has a distinctive grain made by diamond shaped pores filled with a gelatinous substance which makes crisscrossed lines (the lines of Retzius) across the dentin and makes the material easy to cut [Box 1]. To find the grain use a lens and turn the bead around to see it. Along the length of the bead there will be parallel lines.

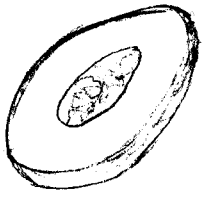
Box 1
The grain in elephant ivory



The lines of Retzius

Another common ivory in America is from the walrus, in which the smooth dentin is broken in the center by blotched lines; the tooth has an oval outline [Box 2] (Reduced in size)

Box 2



Walrus ivory

Box 3 MAJOR IVORY CUTTERS
Hong Kong (Japan #1 market)
Abadjan, Ivory Coast
Benaras (Varanasi), India

B O N E

We all have bones and we all know what they are, but how many people ever *look* or *think* about what such common substances look like? This book and workshop were designed to help you LOOK and THINK about beads.

Bone is hard and white. It is not as nice a material to cut as ivory. It will usually have some striations due to blood vessels [Box 4].

Box 4

Typical Bone Bead

The bead in Box 4 is made from a long bone. If it is light and hollow, it is probably a bird bone.

Vertebrae of fish and other animals make good beads. But don't forget that fish vertebrae easily loose their spines (ribs) and the thin center is easily pierced naturally.

Box 5 DEM DRY BONES

Wherever the Aztecs of Mexico went small bone beads simply shaped as human skulls are found. They are made from the joint ends of mammal bones; are they human bones?

Wearing human bones is not uncommon, but usually in mourning, not as trophies.

On a lighter note, in the Mountain Province of Luzon, the Philippines the Bontoc catch and eat pythons. The center third of the vertebra is then cleaned and strung to be worn on the heads of the women. They wear these beads to prevent them from being struck by lightening when they are out working in the rice fields.

Come to think of it, I have never heard of a Bontoc woman being struck by lightening. Have you?

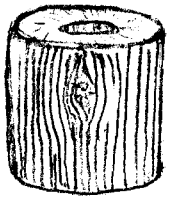
C O R A L A N D D Y E D B E A D S

Now that you have begun to look at beads, the next few steps will be to learn some simple tests to tell you what kind of bead you have. We start with an old favorite - coral - and a problem often encountered with it: "Is it dyed?" [Box 2]

Coral is a structure produced by "colonies" of animals individually called "polyps." They extract minerals from sea water to form these structures. The most common mineral in most corals is lime.

Precious red coral (*Corallium rubrum*) is a lime coral which is very fussy about where it lives. The Mediterranean is - or was - its ideal home. From Roman times to the the present we have abundant records of several different ports along the sea where the coral was brought in and cut into beads. For centuries, indeed for millennia, India has been the greatest market for this coral, but it has been loved from Mexico to China as well.

Box 1
The "Grain" of Coral



Growth lines diverge where a branch grew

Box 2
HOW TO DETECT DYING

A simple, common liquid should be the first chemical in your bead lab -- nail polish remover. Be sure you use the type with ACETONE; it is a nearly universal solvent.

Put a few drops on cotton or white cloth and rub the bead with vigor. Nearly any dye will stain the cloth very quickly. DON'T BREATHE THE FUME

The other major type of coral is called "horny coral," as it is made of a keratin-like [see page 6] substance. Black coral (*Antipathes spp.*) is of this type. It is shiny and somewhat flexible. Golden coral is another related type of horny coral.

All corals used primarily for beads and jewelry are threatened by a combination of over-exploitation and polluted waters. There is of yet no ban, but one should buy coral in small amounts and with caution. When coral is first brought up it is covered with a skin-like "coenosarc," often called the "bark." This is cleaned before the material is worked into beads.

Box 3
MAJOR CORAL PRODUCING CENTERS OF THE WORLD

Precious Coral:	*Horny Coral:*	*Other Types:*
southern Italian ports	Veracruz, Mexico	Cebu, Philippines
ports of Tunisia, Algeria, and Morocco	Cebu, the Philippines	(many types, often colored with dye)
	Hawaii, USA (golden)	

P O P Q U I Z (Didn't expect this, did you?)

1. How do you tell shell from other materials [page 2, box 4]
2. How do you make fine disc beads easily? [page 2, box 3]
3. What is the grain of ivory called? [page 3, box 1]
4. Who wears snake bone beads on the head and why? [page 3, box 5]
5. What common chemical helps to detect dyed beads? [page 4, box 2]

5 right - keep going 4 right - doing OK 3 right - hmm 2 right - uh-oh
1 right - read again 0 right - read for the first time

PEARLS, JET AND THREE MORE TESTS

JET

Jet is a form of coal which is thought to be made from the woody parts of ancient plants. It is light-weight and will cut and polish well and has long been a favorite bead material. It is soft to the touch and feels soft when knocked against your teeth.

Box 1
The "Teeth Knock" Test: Useful to divide materials quickly into hard (glass, stone) and soft (jet, amber, plastic). Try it with the things you already know.

Two reliable tests for jet exist. One is the hot-point test [page 6, box 1]. The other is the streak test [Box 2], which is also useful for other materials.

Box 2 THE STREAK TEST

You need: an unglazed tile (the back) or ceramic (e.g. the bottom of a cup). Drag the bead hard across the surface and note the color of the streak, often quite different from the original material.

	Color	*Streak*		*Color*	*Streak*
jet	black	brown	hematite	silver	red
gold	gold	gold	limonite	dark	yellow
pyrite	gold	black	quartz	many	none

Many hard minerals give no streak, others give the same color as the specimen.
Pyrite is "fool's gold."

MAJOR JET PRODUCERS

Whitby, England - Neolithic and Victorian times
Galicia, Spain - Renaissance, taken to the Americas
Turkey - Lycia in the west in Roman times; Erzurum in the east in modern times

PEARLS

Pearls are made by molluscs, as are shells (page 2), but they and some shells have layers laid down in small plates which reflect light with a play of color or pearlesence. Mother-of-pearl is properly called nacre.

Many molluscs make pearls to cover some irritant. Some are free; others attached to the shell (blister pearls). Cultured pearls are made by forcing a ball of nacre into into an oyster shell so more nacre will be deposited on it. Colored pearls exist; Tahitian blacks grow quite fast. Look inside the hole for evidence of dying.

Pearls are among the most precious gems, and there have been many attempts to imitate them. "Roman" pearls (made in Paris 17th to 19th C.) were made of hollow glass beads into which "essence of orient" was blown onto the sides and the bead filled with wax. Plastic is a common imitator, but is light. Glass coated with essence of orient makes the best imitations, especially those made in Spain (Majorca) and Japan. Fresh water pearls include those of *Unio* and the Japanese cultured "biwa" pearls.

Box 3 TESTING FOR PEARLS

Rub the pearl very lightly against your front teeth. If it is real (natural or cultured) it will feel gritty. If it is perfectly round the chances are good that it is cultured.

The word for pearl has become the generic work for "bead" in all these languages:

Greek/Latin (margarite)
French (perle)
German (Glasperle)
Dutch (perle)
Italian (perla)
Hindi (moti)
Tamil (mutu)
Malay/Indonesian [usually in the plural form] (manik-manik)

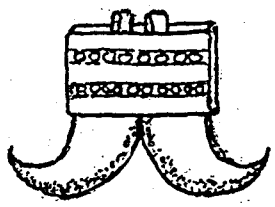
K E R A T I N A N D T H E H O T - P O I N T T E S T

Keratin is a protein, one of the building blocks of animal life. It is found in our skin, and collects when there has been a wound, making scars. It is also the material which makes up our hair and nails.

Our nails are a perfect example of this remarkable substance. It is soft (2.5 on the Mohs scale; see box 1, page 8), yet tough. It is pliable and water-resistant. It grows in fibers (such as hair), and has a tendency to chip and crack in plates.

The number of animal products made from keratin is impressive, and among those used for beads we note bird beaks, hair, feathers, porcupine quills, claws, hooves, rhinoceros horn (which is actually agglutinated hair), true horns, and "tortoise shell."

Several of the animals which provide keratin products used as raw material for beads, including the rhinos and the hawksbill turtles (the source for "tortoise shell"), are on the endangered list. Caring collectors will forgo the pleasure of owning such materials, unless it can be proven that the pieces are antique.



Kathla amulet, India, traditionally made of two tiger claws.

Box 1

THE HOT-POINT TEST

One of the most useful tests for bead materials, the hot-point test must be carried out with all caution.

YOU NEED: A heat source (even a candle will do) and a well insulated metal point (an ice pick, long knitting needle, etc.)

YOU DO: Heat the tip of the point until it is red-hot. Jab it in an inconspicuous place on the bead being tested. Cup your hand to bring the fumes to your nose to smell.

YOU DON'T: Disregard basic fire safety rules nor inhale the fumes directly.

The hot-point will melt a bit of many bead materials and the odor or the resulting fumes can be a good clue to their nature. For example:

Material:	*Smells Like:*
keratin	burning hair
jet	coal
amber	pine wood
bitumen	tar
myrrh	balsam

Shell, bone, coral, ivory and inorganic materials do not react. Plastics have many smells, some of which duplicate nature; amber hair, coal, etc.

Box 2 T H I N K A N D T H I N K A G A I N

Remember, we want to learn to LOOK and THINK about beads.

Returning from a research tour in Mexico, my hostess in the Southwest took me to a very plush house to examine beads that had been sold as tortoise shell. One look told me they were plastic.

"But, how can you tell so quickly?" the distraught owner asked me.

"Look how thick these barrel shaped beads are," I replied. "Did you ever see a turtle/tortoise with such a thick shell?"

A moment of reflection would have saved the poor lady $600.

A M B E R

This is the one everyone in the workshop waits for; many consider it worth the price of admission.

Amber is the fossilized resin of ancient trees. The youngest true amber is 20-25,000,000 years old, while some is ten times as old. If, when the sap ran out of the tree it stayed in the sun, the bubbles were driven out and the material was clarified, making a translucent amber. If many bubbles remained in the resin, the amber is an opaque yellow or even white. Which of these types are better? They are equally scarce, and local preferences choose the clear or the cloudy.

Amber is found in small amounts in many parts of the world. The largest concentrations are around the Baltic Sea, which has been a source for millennia; the Dominican Republic is the second major producer today; Burma (Myanmar) and Mexico are the other important sources, historically and today.

We get our word "amber" from the Arabic, the Greek name was *elektron*, from which "electric" comes, due to its property of building up a charge of static electricity.

There are a number of tests for amber. Among them are:

Static electricity: rub the bead against wool or silk; it will pick up tiny bits of torn paper or hairs.

Inclusions: these may be insects, lizards and frogs, spiders and centipedes, shells, and parts of plants, even mushrooms.

Smell: like pine with the hot-point test (page 6, box 1) or even when rubbed vigorously against the heel of your palm.

Feel: many people say this alone is enough; for some it is.

But, if God made

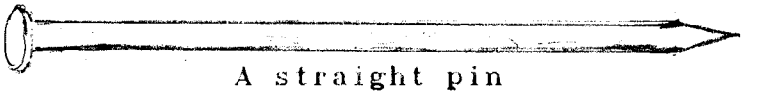
A M B E R,

the Devil made ⟹ P L A S T I C

Plastic beads, understood for what they are, can be interesting in themselves. Relatively simple to make these days, plastic beads made in many developing countries mimic old styles or represent a sort of industrial folk art.

Plastic enclosures and treatments can duplicate static electricity (remember your comb?), inclusions (ever see a watch in acrylic?), smell (pine oil fillers), and feel (unless you are very sure).

However, there is one sure-fire test. Unfortunately, it involves a very expensive, high-tech product, namely:



A straight pin

Jab the bead lightly near the perforation. If it is a natural resin (see Box 1 for copal) it will chip or flake. If it is plastic it will simply scratch or do nothing. Try it; it works.

Box 1 OTHER AMBER PROBLEMS

Copal: a natural, semi-fossilized resin. The name comes from the Aztecs of Mexico; East Africa, China and Korea are other suppliers. Chips and tests like amber ***except*** that it does not build a static electric charge.

Ambroid: made industrially by fusing small amber chips. Passes all the tests. Has distinct clear and opaque layers, often like little clouds.

Sun spangles: lacy, oval inclusions made when amber is artificially clarified with heat. Especially popular a century ago.

PART TWO: STONE BEADS

The term "stone" is a popular one, referring to both minerals and rocks. Minerals are the building blocks of the Earth. They are composed of definite chemical formulae, some as simple as a single element (diamonds are made of carbon; native gold or copper are other examples), and some have very complex compositions. Rocks are made of two or more minerals, not necessarily in a standardized composition.

The sections which follows will not identify most minerals and rocks. To do so is not terribly difficult, especially if you understand a few simple characteristics and know how to test for them. Some tests are beyond the scope of this work, but the vast majority of stone beads in any collection will fall within these simple categories. For more help in identifying the more unusual stones used for beads, refer to the books in the Home Bead Library section on page 21.

Some Basic Tests for Stone Beads

Box 1

THE MOHS HARDNESS TEST

An ingenious test devised over 150 years ago, it ranks materials by their ability to scratch or be scratched by another material: the higher the number, the harder the material; higher numbers will scratch lower ones

Standard list:	*Other things:*
1. Talc	
2. Gypsum	
	2.5 Fingernail
3. Calcite	3 Copper/penny
4. Fluorite	
5. Apatite	5 Pen knife
	5.5 Glass
6. Feldspar	
	6.5 Steel file
7. Quartz	
8. Topaz	
9. Ruby, Sapphire	
10. Diamond	

Hardness is abbreviated "H." It is your first line of testing for unknown stones.

Box 2

OTHER TESTS

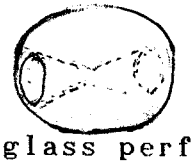
There are a number of complex tests for stones, but very often the simplest ones will be sufficient to help you identify them. These include the Mohs Hardness test (this page, box 1) and the streak test (page 5, box 2) and any test for dying (page 4, box 1).

Other ways to help identify stones is to note their luster (metallic, glassy, matte, etc.), their color (this can be quite variable), their fracture (how a piece looks when broken), the crystal system (not often seen on beads), and any inclusions or associated minerals.

A few stones have been widely used for beads, and we concentrate on them here. For others, experience and further reading are invaluable.

OLD STONE BEADS

Older stone beads are usually made of soft stone by early techniques. Perforations shaped like hourglasses and considerable wear at the ends of the beads are hints that the bead is of some age.



Hourglass perf.

End wear

THE MOST IMPORTANT MINERALS FOR STONE BEADS OF ALL TIMES

1. The Most Important Soft Stone Bead Material: STEATITE

Steatite, also known as soapstone, is not very attractive. It is opaque, usually black or white (but sometimes gray, green, or red). A massive form of talc, it is very soft and can be scratched with the fingernail. Why, then, is it such an important bead material?

The secret of steatite is that when it is heated it becomes quite hard. Properly treated, it will become as hard as glass or even agate.

Though there are a few similar stones, the chances are excellent that if you have an opaque bead which is fancily carved, but not otherwise distinguished, it is made of steatite.

2. The Most Important Hard Stone Bead Material: QUARTZ

In contrast to Steatite, quartz is a hard material in the natural state. The quartz group consists of several different "species," which are detailed on the next page.

The use of beads of the quartz family goes back some 8000 years. As soon as it was learned how to drill such hard stones, quartz beads were being made. The beauty of their luster, their colors and the strength of the material have made them universally favorite bead materials.

Quartz is also the most common mineral on Earth, making up the sands of our beaches, and a major component of the most important rocks. Its modern uses include being the main ingredient in glass and computer chips.

Box 1 DRILLING STONE BEADS

Drilling is a most imporrtant step in making stone beads. Most beads are drilled from both sides (A); if drilled from only one side, the far end will chip out (B), and usually indicates a simpler technology. Rub a pin along the perf wall to feel the joint.

A B

THE FOUR FAMILIES OF QUARTZ

By far the most important mineral for beads, quartz is virtually universal, comes in an almost unending variety, and is durable and beautiful. There are hundreds of varieties of quartz, each given names, some of which are pure whimsy and used only in limited cases. It is important, however that you be able to identify the four major members of the quartz family:

CRYSTALLINE QUARTZ

Forms large crystals
Generally translucent to transparent
Hardness is 7
Examples: Rock crystal* (clear)
Amethyst (purple)
Rose quartz (pink)
Milky quartz (white)
Smoky quartz (gray or brown)
Citrine (golden)

* "Crystal" for stones means a regular repeating arrangement of atoms. For glass, (cut crystal) it refers to lead glass.

CHALCEDONY (AGATES)

Crystals invisible to the eyes, aligned in a fibrous manner
Somewhat translucent
Usually with a banded structure
Hardness is 6.5
Examples: Chalcedony (white/blue)
Agate (banded or with moss-like inclusions; variable)
Carnelian (red/orange)
Onyx (strongly banded white/brown or white/black)
Prase (green)
The variety of these stones and the multiplicity of names are almost unlimited.

JASPERS

Crystals invisible to the eyes, aligned in a granular manner
Virtually opaque
Hardness is 6.5
Examples: Flint, also called chert (white or black)
Jasper (any pleasing color, simply named red, green, yellow, etc.)
Bloodstone is green jasper with flecks of red carnelian
Jasper is tougher than agate; in ancient times it was used to drill holes into agate beads.

OPAL

Crystals only recently confirmed form tiny balls
Opaque
Hardness 5.5 to 6.25
Examples: Common opal is white and without play of colors
Precious opal is white, black, red (fire) and displays the characteristic play of many colors
Because of its softness, opal is rarely used for beads. If the colors fade, place the stone into water for some time.

QUARTZ BEADMAKERS OF THE WORLD

Because of their popularity, quartz stones have been made into beads by many people in many places throughout the ages. Of them
CAMBAY (KHAMBAT) INDIA is the oldest and largest industry.
IDAR-OBERSEIN GERMANY is Europe's largest and a major exporter.
Some other stone beadmakers: Jaipur (India)/Sukabumi, Pacitan (Indonesia)/Iguala (Mexico)/Canton (China)/Taipei (Taiwan)/Hong Kong.

A L T E R I N G S T O N E B E A D S

We seem never to be satisfied with what we have. Despite the natural beauty of stones, especially of the quartz family, people have been figuring out ways to modify them, altering their colors, adding designs or changing their lusters. The majority of people are surprised to learn that some of the most common stones have been altered. In the world of precious stones this has become big business (and also big fraud and big controversy). In the bead world, some of these practices are very old and widespread and are such a part of the trade that no one gives them much thought.

HEAT PROCESSES: The red of carnelian and the golden color of citrine are made by heating the stones. Gray or brown chalcedony which contains iron turns red when heated. Iron is found naturally in the stones cut in Cambay, India, but the Germans must add iron to the particularly porous stones which they import from Brazil. Citrine is made by heating low-grade amethyst or smoky quartz. It is unusual to find either red carnelian or golden citrine in nature.

GLAZING: Popular in ancient Egypt and Persia, soda and copper (for a blue color) baked onto steatite formed a glaze, the first artificial glass. Rock crystal was also commonly glazed with soda, sometimes with copper added. Two processes were used, one in which a brilliant shiny coating resulted, and the other making the stone milky white.

DARKENING: This is usually done by soaking chalcedony in honey or sugar water over a low heat for a few weeks. The more porous layers absorb the sugar, but just at the surface. Heating the stone caramelizes the sugar, making the layers brown; putting it into sulfuric acid carbonizes it, making them black. Virtually all onyx -- again, very rare in nature -- is treated this way.

WHITE LINES: This is commonly called "etching," but involves an alkali, not an acid. Usually soda mixed with something to stiffen it is drawn on the bead in patterns. After heating a short time the soda penetrates under the surface leaving an indelible, smooth white line. More recently, acid is used to etch grooves, which are filled with a white paint-like material.

COMBINATION: A stone is given a pattern by putting a resist on the surface before the darkening process. This prevents the sugar from being absorbed and leaves undarkened areas. Afterwards, white lines are added by the soda-etching method to those areas. Dzi beads were made this way.

OTHER METHODS: The Germans use highly porous Brazilian chalcedony/agate and have worked out many ways to color it any hue you like.

The ancient Pumtek beads of Burma (Myanmar) are made on opalized (fossilized) palm wood, probably by a method similar to the darkening of onyx. Imitations in this century were made on a finer grained opalized wood by a different method involving two washes, one white the other dark.

Many soft stones, including alabaster (hydrated gypsum, but misleadingly called "onyx" when strongly banded by the industries of Mexico, Egypt and Pakistan) and steatite are commonly dyed. These are easily detected (page 4, box 2).

HOW TO DATE STONE BEADS: TECHNOLOGY

Dating stone beads is not easy. Many shapes, including the round oblate, the barrel, and others are nearly universal. Moreover, the methods used for making beads change slowly or have not changed at all over the centuries. It is quite possible to have two beads of the same shape made by the same techniques that are more than 2000 years apart in age. Nonetheless, there are hints that can help date stone beads.

Box 1

THE MATERIAL

In the Late Old Stone Age stones were rarely used for beads; those that were, were the soft ones such as jet or limestone. The New Stone Age used these and some harder stones, but quartz beads were very rare until some 3000-4000 years ago. For identifying older stone beads, see the bottom of page 8.

Box 2

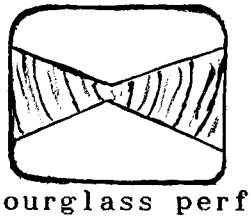
THE DRILLING METHOD

The perforation is always one of the most important parts of a bead to study. Before the introduction of diamond drills in India more than 2000 years ago (Rome and and China got their diamond drills from India), stone beads were drilled with softer materials.

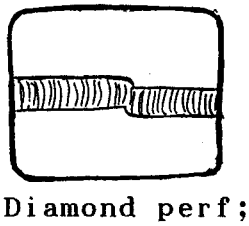
Soft stones such as steatite can be drilled with a stick and an abrasive. The hole narrows as the stick is worn away, creating an hourglass shaped perforation.

Other stones and some metals were also used as drill tips or bits. Stone bits often formed hourglass perforations, too, if the drill tip were tapered. A few deep grooves inside the perforation show that a stone drill was employed.

Diamonds, usually two mounted at the edges of the bit, give a thin, straight perforation with fine close striations.



Hourglass perf; wood or stone



Diamond perf; Christian Era

Box 3

POLISHING BEADS

The surface finish of a stone bead is called the polish. Beads may be polished by hand, rubbing laboriously against fine grained stone, copper, teak, bamboo and the like. These beads may have a high polish, but striations remain on the surface and depressions do not get a polish. The edges of facets will be quite sharp and distinct.

Polishing is also done by putting the beads into a container with abrasive dust and water to tumble them for a couple of weeks. A high polish results, all parts of the bead get polished, and no striations are left. The facet edges are then rounded off.

The polishing method used has some dating value. The Indians began to tumble round beads some 2500 years ago. But until about A.D. 1000 faceted beads were always polished by hand. The Germans always hand polish their beads. In Pacitan, Indonesia, beads are polished on bamboo; in Iguala, Mexico, beads are hand polished on a lap wheel.

Remember, these hints for dating stone beads are only approximations. Minor beadmaking sites in the Old World and beadmaking industries in the New have applied different techniques at different times. Some of these are primitive, but that does not necessarily make the beads old.

HOW TO DATE STONE BEADS: SHAPES

As with beadmaking technologies (page 12), dating beads by shape can be risky, because some forms were popular for thousands of years, and a modern beadmaker can always make an old shape. Neither shape nor technology alone can definitely date stone beads, but experience in judging both shape and technique, can give an idea as to age. The beads shown here are from India and are of carnelian and agate; all of them were widely exported.

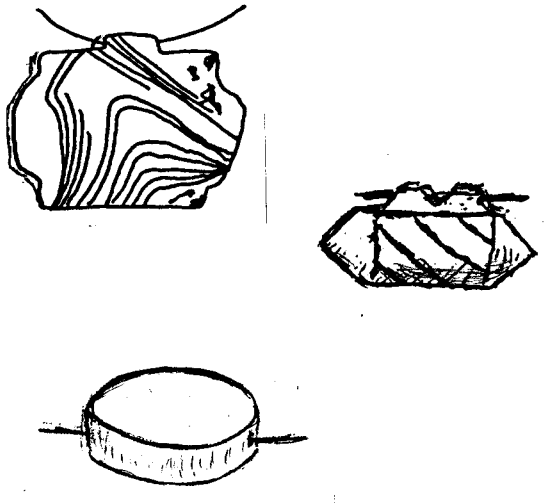
Bead shapes are described by noting the cross-section first, and then the profile or outline. Round beads are usually called oblates. A tabular is a flat bead perforated through the side (like a pierced table top).

ELLIPSOIDAL BARRELS

These beads have an elliptical cross-section and a barrel outline. They were very popular ca. 2500 to 500 B.C. Usually made of agate.

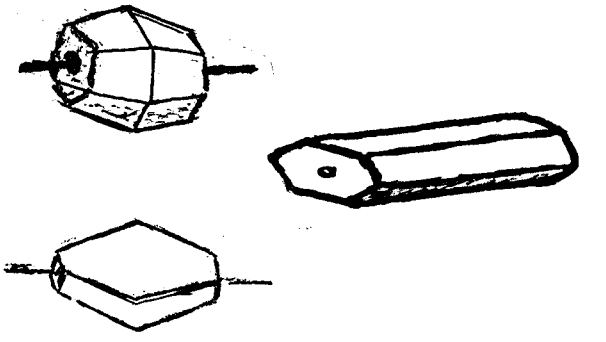
MEDIEVAL PERIOD BEADS (ca. 7th to 14th century)

The unusual flat agate pendant and the charm case shaped bead were Muslim amulets. The round tabular began as the core for a finger ring; popular in Persia.



EARLY HISTORIC PERIOD BEADS (ca. 500 B.C. to A.D. 500)

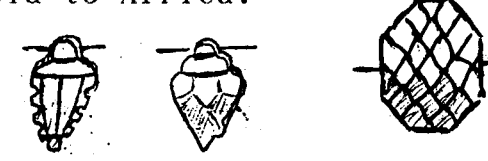
Short hexagonal bicones, hexagonal and octagonal tubes with flattened cross-sections and diamond tabulars were popular in India and abroad.



Around A.D. 200 hexagonal and octagonal tubes were no longer flat in section, but regular.

SOME LATER BEAD SHAPES (ca. 17th to 20th century)

Multifaceted beads were popular in Europe; the pendants were sold to Africa.



PART THREE: GLASS

Glass has long been the most important bead material. This is because of its beauty, its durability, and its versatility. In terms of beads, there is nothing like glass. First invented in the Middle East around 2500 B.C., the Indians and Chinese learned how to make it, probably independently, only around 1200 B.C.

Surprisingly enough, glass is not a solid material, but a state of matter sometimes called a "super-cooled liquid." Most metals and metalloids will become glassy, but by far the most important ones are silica (from quartz, usually sand) and lead.

The major ingredient in most glass is silica, which needs a very high temperature to melt. So, a *flux* is added to bring this temperature down; the flux is usually soda or potash. If there is no lime, the glass will be water soluble (water glass); it seems ancient glassmakers did not know this, and lime was added by accident as an impurity in the sand. Lead makes glass heavy, brilliant, and soft. Other ingredients are added to give colors (see box) or to opacify the glass. Colors in glass can often give useful hints on the the dating of the beads.

Box 1 MAKING GLASS

Glassmakers mix a fairly clean sand and some ash (often prepared from the ash of the wood burned to make fuel) and heat them in an initial furnace. A hard dark mass called *frit* results. This is broken up and mixed with *cullet* or scrap glass and the *colorants*. This liquefies almost magically, and molten glass is the result. After objects are made from glass they usually need to be cooled down slowly or *annealed*, to prevent them from shattering later.

Box 2 GLASS COLORANTS

A master, varying the amount of air entering the furnace, can produce almost any color with just iron (green, blue, yellow, black) or copper (blue, orange, both opaque and dusky ruby red). Other old colorants are cobalt (deep blue), manganese (violet, black), tin (an opacifier, white) and antimony (an opacifier).

The beautiful wine ruby (translucent) red was made with gold from the late 1600s. The garish modern ruby and opaque red since 1891 is colored with selenium.

Soft variable yellows were colored with sulfur; cadmium sulfite gives bright Imperial yellow, introduced ca. 1860. From the early 1800s the Czechs made greens, yellows, and oranges from uranium.

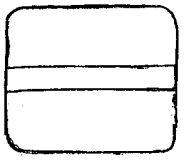
The sparkles in aventurine glass (goldstone) are copper crystals; the process was invented in 1677 by Vicenzo Miotti in Venice.

Black glass is usually deep green (iron) or violet (manganese).

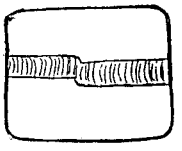
Box 3

IS IT A GLASS OR A STONE BEAD?

Glass often looks like stone, but there are easy ways to tell them apart. Glass has bubbles, which are rare in stones, and they are aligned according to how the bead was made (see following pages). Glass beads also often have an easily seen structure. Also see if the bead has been drilled, as very few glass beads are. Rub a pin along the sides of the perforation. The joint usually found in stone beads (page 9, box 1) can be detected this way.



Glass bead

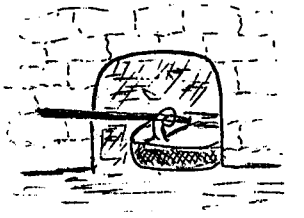


Stone bead

WOUND GLASS BEADS

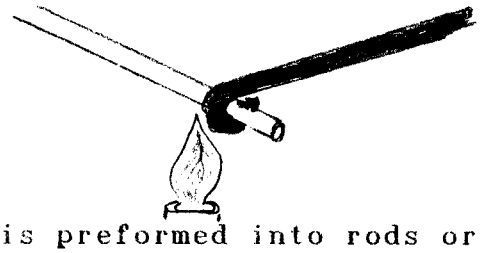
The oldest and most common way to make a glass bead is to twist some glass around a metal *mandrel*, that is a rod or wire. This is known as *winding*, and beads made this way are called *wound*. There are several ways to wind beads as the boxes show, but *all wound beads share one characteristic: the fabric of the glass, including any inclusions such as air bubbles, are oriented around the perforation.* Wound beads are very common, and made around the world. It is the most traditional way to make glass beads.

Box 1 FURNACE WINDING



Glass is heated in a crucible in the furnace. An iron rod called a mandrel is dipped into the glass and with a quick twist the glass bead is built up. While still hot it may be shaped with paddles and other tools or other glass added for decoration. Annealing follows.

Box 2 LAMP WINDING



Glass is preformed into rods or sticks called canes. Workers melt them at a small heat source, traditionally a lamp (hence the name). The glass is then wound around a wire or other thin mandrel. While still hot, the bead may be shaped or given decorations with other colors of glass canes. These beads can be annealed in the lamp flame.

Box 3 SOME IMPORTANT WOUND GLASS BEADMAKERS

Venice, Italy - lamp-winding, few perforation deposits.

Bohemia (Czechoslovakia) and its successors (New Gablonz Germany, Benaras, India) lamp-winding, finely shaped, white deposits

Japan (and Korea) lamp-winding, white deposits.

China (many places) lamp-winding and similar processes, deposits may be beige or white; furnace-wound beads were also made.

Mid-east (Hebron; Gorece, Turkey; Cairo; Uzbekistan; Afghanistan are all related furnace-winders.

Purdalpur, India and Hyderabad, Pakistan make furnace-wound beads with black perforation deposits.

Beads are also wound near Jombang, Indonesia (lamp-winding - light yellow asbestos deposit); Bida, Nigeria (black deposits); the Royal Forest of Germany, formerly in Paris, and by several American craftspeople. The French, German and Americans use lamp-winding, but often remov any perforation deposits.

Box 4 *LOOK INSIDE*

The inside of a wound glass bead can tell something about how it was made. Deposits are important clues.

A black film is often left when a bead is furnace-wound; it is iron oxide from the mandrel.

A powdery deposit may be left when a bead is lamp-wound because the operation requires a separator on the wire to remove the finished bead. A white powder (kaolin or some mixture) is used in Japan and Bohemia and related industries. The Chinese use both white and tan or beige clays on beads. Venetian beads usually have no deposits.

Unwind; Buy a Wound Bead!

DRAWN GLASS BEADS

The other important way to make beads is by *drawing*. This is so called because it begins with a tube of glass which has been pulled or drawn from an initial *gather*. The tube is then sliced into short segments, which are packed in some refractory powder and stirred or tumbled over heat to smooth off the sharp edges. Decorations usually consist of longitudinal (or twisted) stripes and/or multiple layers of glass. Drawing is a semi-industrial process which can make many similar beads rather quickly. Many famous beads, including glass "seed" beads and chevrons are drawn beads.

Drawn beads are distinguished because the fabric and inclusions, such as (usually elongated) gas bubbles are aligned parallel to the perforation.

The history of drawn beads is in several stages. Indo-Pacific beads (Box 1) dominated Asia and Africa for some 2000 years. Around the Mediterranean drawn beads were a minor art during Roman and Early Islamic times. When Venice figured out how to draw beads around 1480, it laid the foundation for that state's dominance of the world bead trade.

Box 1 INDO-PACIFIC BEADS

The most important trade beads of all times are the small monochrome drawn beads called Indo-Pacific beads because of their wide distribution. These beads were first made in southeast India several centuries B.C. Later beadmakers migrated to other places, and we now know of ten places in India, Sri Lanka, Thailand, Malaysia, Vietnam and Indonesia where these beads were made.

Indo-Pacific beads are found in noble tombs in Han China and royal tombs in ancient Korea and Annam, often in great numbers. They were taken to Persia, then to Egypt, across North Africa, through the Sahara, and into the forest zone of West Africa long before any Europeans visited that region. In the Philippines from ca. A.D. 1 to 1200 they account for no less than 66.2% of all beads excavated from all archaeological sites.

The key to this industry has been the unique way the tubes were drawn (see Box 3).

Box 2 DRAWN BEADMAKERS

Venice, Italy has long been famous for its drawn beads. Defectors went to Holland (17th century) and elsewhere in Europe to make more.

Some Czech-made beads are drawn, but the technique is minor there.

Beads are drawn by hand at Purdalpur, India; near Lyons, France and by some modern American beadmakers.

In Papanaidupet, India, the time-honored *lada* method is still in use (see Box 3).

Small beads for beadwork ("seed" beads) are machine-made in Venice and Bohemia, Japan and Korea, and most recently at Benaras (Varanasi) India.

Box 3 HOW THE TUBES ARE DRAWN

The key to making drawn beads is to draw a tube. A glass gather is made hollow (with a blowpipe, forming a capped cup or opening the glass with a tool) and pulled out by one man (anchoring one end and walking away) or two men drawing it out b[illegible]. [illegible]ds were made by continually [illegible] furnace on an iron tube (l[illegible]rd) Danner machine, inve[illegible] tubes.

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OTHER GLASS BEADS

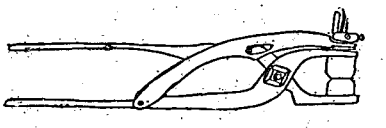
There are many, many ways to manipulate a bit of glass into a bead. Over the centuries, glassworkers have tried almost every imaginable technique to make beads. Some of them, such as winding and drawing, became standard in many places. Others were used only for a short time in a very few places. Still others occupy a middle ground, as they are relatively minor techniques, whose products are widely collected. We cannot discuss all minor beadmaking techniques here, but a few are important to recognize.

Box 1 THE BOHEMIANS (CZECHS) AND MOLDED BEADS

Wound beads can be pressed or spun in a half-mold to give them a special shape, but true molding of beads was a development of the Bohemians (or Czechs) in northern Czechoslovakia. The original molds were hand-held tong affairs into which a bit of hot glass from a cane was placed. The mold was shut and a pin stuck through to perforate the bead. Later, a machine was made that could mold a number of beads at a time. *Molded beads are distinguished by a seam either protruding or ground off and sometimes visible as an interruption of the design of the bead.*

Czech glass beadmakers began work as garnet cutters. Their training at the grinding wheel served them well when working with glass beads. Many Czech beads are ground, some only to remove the mold seam, some to decorate the bead and others to facet the bead (including the hexagonal drawn tubes with the 12 corners ground off; mistakenly called "Russian beads" by some).

In addition to the Czechs, molded glass beads are made in Austria and Germany, mostly by emigrants who fled Communism in Czechoslovakia.



Czech tong mold

It is possible to grind glass and drill it, treating it like stone. This is an old, but not widely used beadmaking technique.

Grinding is also used to "facet" small drawn "seed" beads; two facets along their length makes the so-called "three cut" beads.

Box 2 PROSSER BEADS

These beads and the related "China buttons" are made of powdered ingredients by a machine that exerts intense pressure which vitrifies (turns into glass) the bead. The machine, invented in the 1830s by Thomas and/or Richard Prosser, was improved upon by J.F. Bapterosses of France, who began making beads in 1864. Prosser beads were also made in the U.K., Austria, Germany and Czechoslovakia, which along with France was the leader.

Prosser beads have thin, often hidden seams and pitted areas on one end. They include cylindrical "tile" and interlocking beads.

Box 3 POWDER-GLASS BEADS

Glass crushed to a fine powder is formed in a mold or by hand (with some adhesive added) and then is fired to form beads. The beads have a grainy surface, though some are very well made.

Primarily found in West Africa, among Malian women and in many villages in the Krobo and Ashanti regions in Ghana, the method was also used in the 1930s in Borneo and by Native Americans in the 18-19th centuries. In West Africa the craft is centuries old, and old powder-glass beads, such as Bodom and Akosu are very valuable.

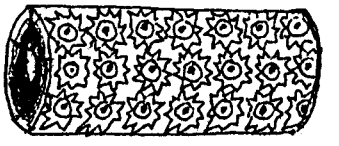
CHEVRONS AND MILLEFIORIES

Without a doubt, some of the most beautiful and popular glass beads are those of several colors with patterns of stars, flowers or other designs. These beads are not painted. Rather, glass is decorated with other glass. It is a mystery to many how these beads were made, but it is really not that difficult to understand.

In one method, the glass master (*gaffer*) begins with one color of glass (a *gather*) on his rod (*punty*). Onto that color he puts other glass colors, layer by layer. If a star/flower is desired, he can stick the gather into an open mold, forming corrugations along the side of the gather. He may also add stripes of glass (*canes*) along the sides of the gather. His last layer, the outermost, is smoothed by running the gather along a flat, fireproof board (*marver*).

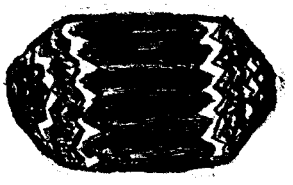
Now our gaffer has a fairly large cylindrical gather In cross-section it shows all the glass layers he has added, including any molding done and any other glass canes he added. Then the whole gather is drawn out, just as a glass tube is drawn out for drawn beads (page 16). This process does not distort the pattern in cross-section; it is preserved, but by being drawing out the whole gather and the pattern are reduced in size.

Once the cane (and now it is a fancy or a mosaic cane) is drawn out, it is cut into thin slices, each of which preserve the pattern the gaffer built up. These slices (*murrine*) are put onto the surface of a bead, usually a lamp-wound bead. If it is covered all over with flower-like designs it is properly called a "millefiori" (a thousand flowers). Other designs are better simply called "mosaic beads."



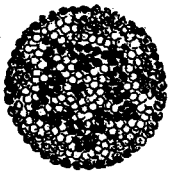
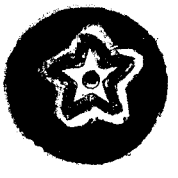
Venetian Millefiori

Now, one variation in this process is to make a tube rather than a solid cane of glass. The tube will also have a pattern along its length, but the center will be hollow instead of solid. This tube can then be cut into beads, and the ends will show the same pattern that the gaffer built up. The most important beads made this way are chevrons, with corrugated layers that are ground at the ends to expose the layers. The oldest chevron beads have seven layers in red, white, and blue, and the ends are faceted (rather than rounded). These were made in Venice from about 1480 to 1580.



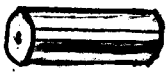
Chevron bead (7 layers)

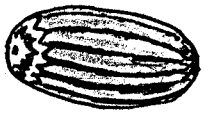
DIFFERENT WAYS TO MAKE MOSAIC CANES

Bundled canes (Venice before W.W. I) joining individual canes	Molding (as described above) after W.W. I: note connected designs	Hot-strip (Indian) strips added when hot; design not connected
		

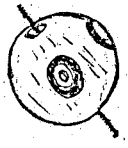
VENETIAN BEADS TIMELINE

1480 First drawn beads: opaque red, often with translucent green cores; blue beads with "sugarcane" surfaces
First chevrons (7 layers, faceted)

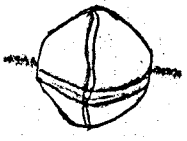




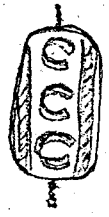
1580 Chevrons with fewer layers, more color combinations, round ends
1580-1600 Flush eye beads; drawn beads with two or three fancy cane slices
1580-1650 Blue/white/blue drawn beads are popular
1580-1890 Drawn whites with clear coats



1645 Earliest lamp beads



1677 First aventurine



1750 Lamp-wound beads gain importance; early ones mostly in sulfur yellow, black, dull green, opaque red; bicones, short cylinders; designs often broken circles/eyes

1830 Drawn and wound beads with white or yellow cores/translucent red coats (cornaline d'Allepos)

1860 Great improvements in glass and machines; "seed beads" regular in size, color; lamp-wound beads in many new styles. Yellow core gone from cornaline d'Allepos

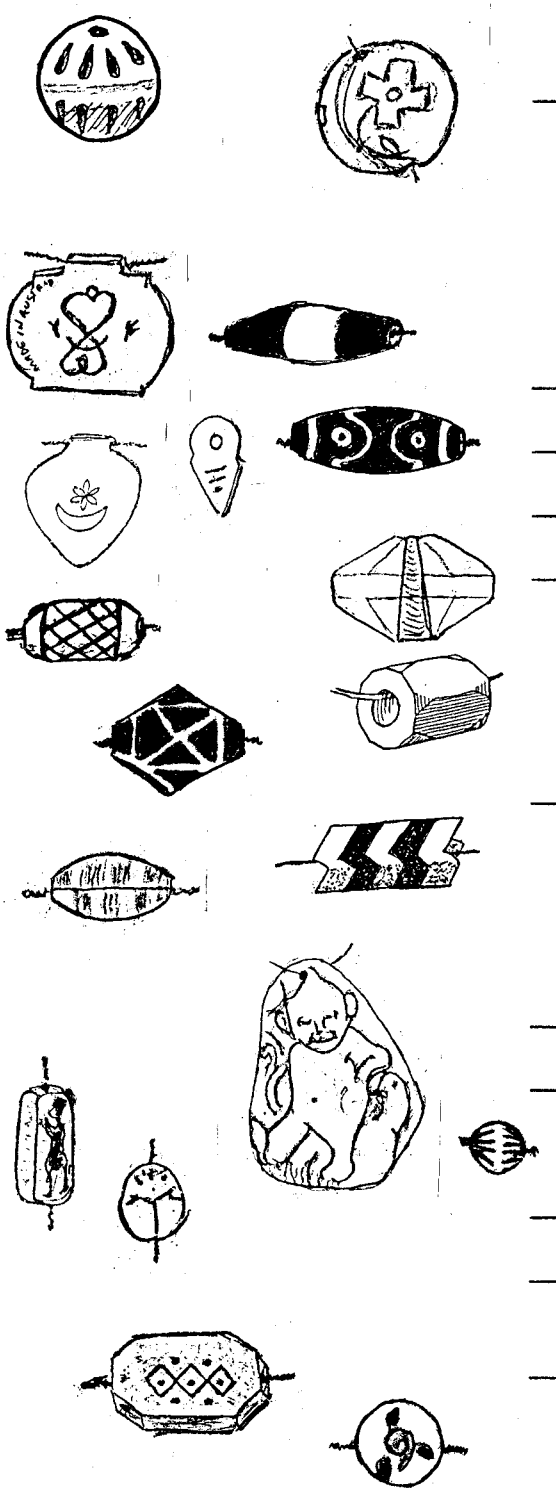
1890-1935 Peak of millifiori production

1920 Styles change, glass often garish; work not as fine

1950 Styles change, now very simple as labor becomes more expensive

Dates approximate, but reasonably accurate

B O H E M I A N (C Z E C H) B E A D T I M E L I N E



1715 First modern beads produced; made of ruby red glass, they imitated garnets

1730? Tong mold invented; most beads from now on are molded

1787 First bead factory in Jablonec

1800 Production rises dramatically; beads imitate other beads and materials

1810 First blown beads; both free-hand and in simple molds

1820-1890 "Vaseline beads" (uranium green) etc. molded with conical holes; faceted carnelian imitations (straight perfs from ca. 1880) Also cornerless hexagonals, mostly blue drawn hexagonals, with the 12 corners ground off

1860 Blown faceted beads popular; "French jet" (faceted black glass)

1895 Secession (Art Nouveau) influences bead styles

1904 Imitations mostly stopped; beads made to appeal to world markets

1922 Carter opens Tut's tomb; starts "Tut Craze"

1925 Art Deco becomes leading style

1938-1955 Invasion, Communism, decline

1991 Freedom; expect a great renaissance

Dates approximate, but reasonably accurate

R E S O U R C E S:

1. YOUR HOME BEAD LABORATORY

a. Magnifying glass -- the better you see, the more you understand.
b. Acetone (fingernail polish remover) and a white cloth or some cotton -- for testing if a bead is dyed: see page 4, box 1.
c. Unglazed porcelain -- for the streak test: page 5, box 2.
d. Iron point with handle (e.g. ice pick) and a small flame (candle will do) -- for the hot-point test: page 6, box 1.
e. Straight pin or needle -- for amber: page 7; also to detect joints in stone bead perforations: page 9, box 1; page 14, box 2.
f. New penny or copper tube; piece of plain glass; pen knife blade; hardened steel file; -- kit for hardness test: page 8, box 1 [remember, your fingernails can also be used].
g. Your teeth -- teeth-knock test, page 5, box 1; pearls page 5, box 3.

But remember, your most important tools are your brain and experience.

2. YOUR HOME BEAD LIBRARY

The following books are a starter bead library. There are many other good books on some of these subjects, and several editions of some listed.

General:

Peter Francis (1982) *Handbook of Bead Materials*. Lapis Route, Lake Placid.
Peter Francis (1989) *The Bead Dictionary*. Lapis Route, Lake Placid.

Shells:

Robert T. Abbot (1962) *Sea Shells of the World: A Guide to the Better-Known Species*. Golden Press, N.Y.
S. Peter Dance (1974) *The Collector's Encyclopedia of Seashells*. McGraw-Hill, New York.
Jerome M. Eisenberg (1981) *A Collector's Guide to Seashells of the World*. Crescent Books, New York.

Stones:

Max Bauer (1968) *Precious Stones*. Dover Publications, New York (2 vols.).
Frederick H. Pough (1960) *A Field Guide to Rocks and Minerals*. Houghton Mifflin, Boston.
John Sinkankas (1965) *Mineralogy*. Van Nostrand Reinhold, New York.

Glass and Glass Beads:

Peter Francis (1988) *The Glass Trade Beads of Europe: Their Manufacture, Their History, and Their Identification*. Lapis Route, Lake Placid.
S.Barrington Haynes (1959) *Glass Through the Ages*. Penguin, Harmondsworth.
Woldemar A. Weyl (1959) *Coloured Glasses*. Dawson's London.

3. NETWORKING AND FURTHER SOURCES

As of early 1992, there were 20 Bead Societies in the U.S. Check the Yellow Pages for Bead Societies and Bead Shops all across the country.
Always recommended is *Ornament*, P.O. Box 2349, San Marcos CA 92079-9806.
To keep up with the latest in bead research and for the most reliable books on beads: Center for Bead Research, 4 Essex Street, Lake Placid NY 12946.

H A P P Y B E A D I N G !