

The World of Beads Monograph Series: 7

THE GLASS BEADS OF INDIA

PETER FRANCIS, JR.

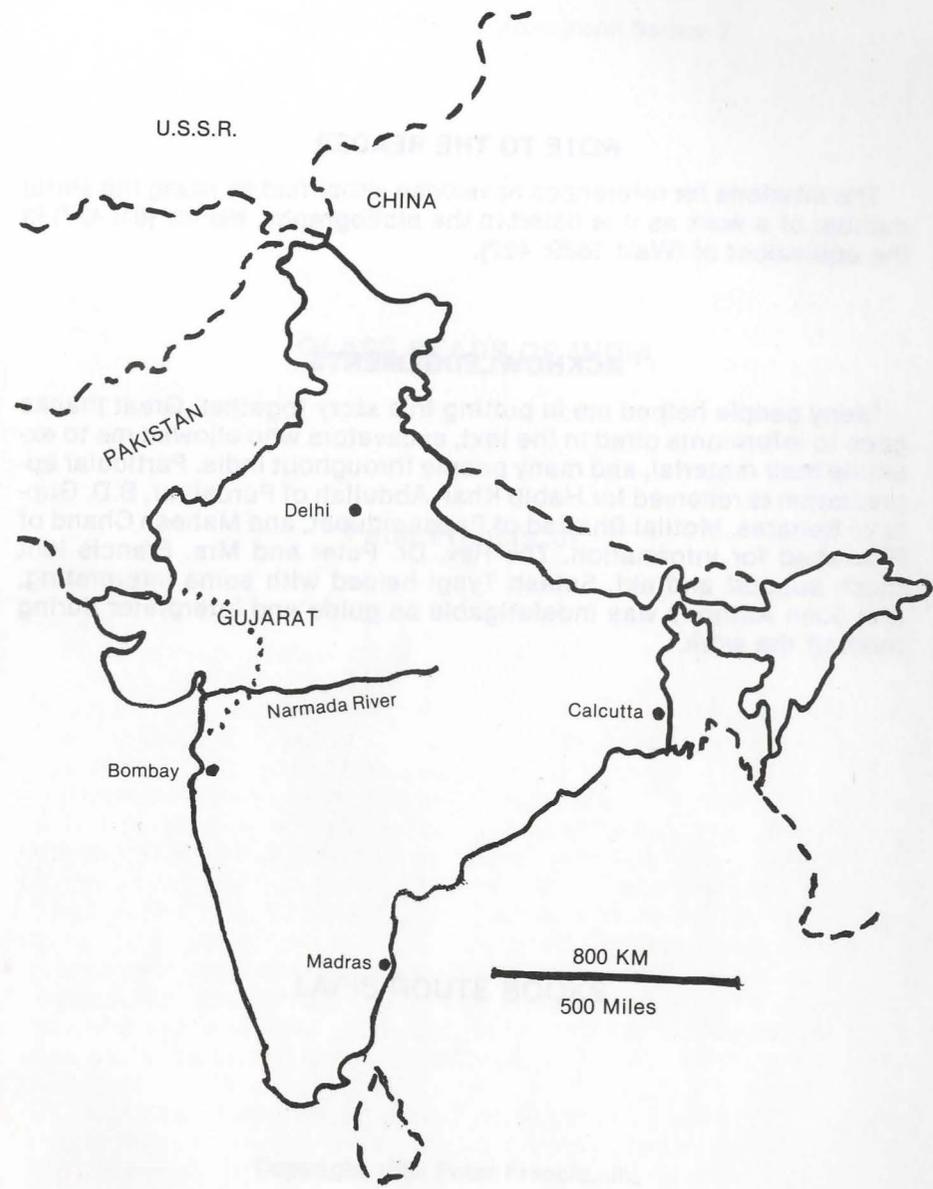


LAPIS ROUTE BOOKS



COLOR PLATE I

- Row 1: Drawn tubes, Arikamedu, ca. 1st c. AD.
 Row 2: Beads made from tubes, Arikamedu.
 Row 3: Some ancient Indian glass beads. 1) Arikamedu. 2) Small red beads melted together while being heated, Arikamedu. 3) Collar bead, Arikamedu. 4) Blue drawn bead, Kolhapur. 5) Blue drawn melon, Kondapur. 6-7) Small orange drawn beads from an unknown beadmaking center.
- Row 4: Bangle pieces. 1) Kolhapur, ca. 14th c. AD. 2) Kondapur, ca. 1st c AD. 3) Kapadvanj, early 20th c. of decorated "country glass." 4) Purdalpur, 20th c. AD, older piece of "country glass."
- Row 5: Drawn tubes from Papanaidupet.
 Row 6: 1) Small beads from Papanaidupet in a baby bracelet bought at a village market. 2) A strand of the smallest beads made at Papanaidupet. 3) Broken pieces of tubes as yet unheated, Papanaidupet. 4) Section of necklace showing the chain stranding method used at Benaras.
- Row 7: Tubes of silvered beads, Firozabad. Last one is from fringe, ca. 1940.
 Row 8: Benaras beads. The first two are domed double spacers.
 Row 9: Benaras beads.
 Row 10: Benaras beads.
 Row 11: Benaras-style beads made in Purdalpur.



Map 1
INDIA

NOTE TO THE READER

The citations for references have been simplified by using the serial number of a work as it is listed in the bibliography. Hence (61: 427) is the equivalent of (Watt 1889: 427).

ACKNOWLEDGEMENTS

Many people helped me in putting this story together. Great thanks goes to informants cited in the text, excavators who allowed me to examine their material, and many people throughout India. Particular appreciation is reserved for Habib Khan Abdullah of Purdalpur, B.D. Gupta of Benaras, Motilal Bhattad of Papanaidupet, and Mahesh Chand of Firozabad for information. The Rev. Dr. Peter and Mrs. Francis lent much support and aid. Satash Tyagi helped with some interpreting, and John Anthony was indefatigable as guide and interpreter during most of the work.

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Glass is the outstanding bead material, used constantly since the third millennium BC. The great variety of glass beads illustrates what a versatile medium it is. Bead investigators have recently shown that glass beadmaking was not confined to as few centers as was once supposed. Nonetheless, we still identify a few major glass bead centers: Syria and Egypt from pre-Roman to Medieval times, Venice since the Renaissance, Bohemia since the Industrial Revolution, Japan in this century, and China, whose exact details yet elude us.

Now we must recognize the starring role played by India, for India, too, is one of the "superpowers" of glass beadmaking, and has been for the last 2000 years. Despite recent setbacks, India is poised to regain its key position in the commerce of glass beads.

Our story is complex; we are dealing with a large nation, and an intricate subject. To unravel the story of glass beads in India, we shall consult three sources of information, each with advantages and each with limitations. They are: archaeological finds, historical records, and the observations of the author.

Archaeology provides data on glass beads in the past, but suffers from two handicaps. One is that India is underexplored and underexcavated. The other is that even when beads are found, sufficient interest is not paid to them. This requires re-examination of the excavated material, but even this is not always helpful as we are too often deprived of waste beads and glass scraps necessary for a reconstruction of ancient beadmaking processes.

Historical sources, British and Indian, appear from the beginning of the 19th century. This data also falls short of our hopes, for beadmakers were rarely documented, nor were the beads they made recorded.

Our third source is relied upon most heavily: the observations of the author from visits to ancient sites, recently reported centers, and living beadmakers. This work could not have been done without the active cooperation of museum and university personnel and the beadmakers themselves. These observations are subject to the author's limitations of time, money, and endurance; any lapses in accuracy are his responsibility.

Indian Glass Beads in the Archaeological Record

Glass was invented in the Caucasus or Mesopotamia before 2500 BC. The first Indian civilization did not make glass, though contemporary Egypt and Babylon did. The nearest to glass found in the Indus Valley or Harappan Civilization was "vitreous paste" (37: 496), made in slabs, perhaps for glazing pottery (47: 20), the world's first glazed ceramic (39: 574).

The earliest Indian glass finds are from the north, associated with Painted Grey Ware ceramics, believed to be products of the invading Aryans. At Baghwanpura, Haryana, excavated by J.P. Joshi and dated by him to ca. 1000 BC, were several heavily corroded pieces of blue bangles and two well-made unweathered black-and-white tabular eye beads (pers. observ.). Amber and black bangles at Hastinapura (34: 15) and beads at Alamgirpur (28: 54) are also early finds. Dating of this material is in flux. Hastinapura glass, once dated to 800 BC, is now considered several centuries more recent (35: 64).

In the south, glass beads and bangles appear first at Maski (58: 113) and glass objects from Megalithic tombs at Paiyampalli (11: 34). These dates are also not secure, but they appear not to be much later than Aryan settlements in the north. Except for Maski, early glass in India is always associated with iron.

A great deal of glass has been found at the once wealthy trading center and university town of Taxila (near Rawalpindi, Pakistan) from the 6th century BC on. The beads have been studied by the excavator (40: 729), and two bead authorities (5; 15: 3). Marshall, Beck, and Dikshit were chiefly interested in whether the glass was imported, and hardly discuss where or how the Indian beads were made. Thus, Marshall thought red beads were made at Taxila because they were common, but less abundant colors were imports (40: 742). We are left with an impression of prolific and industrious beadmakers, but no specific information. Waste glass and perhaps a crucible were found at Durgai, near Taxila (33: 24), but such slight finds do not suggest that all the glass beads of Taxila were made there.

Kopia, Uttar Pradesh (U.P.), was an ancient glassmaker. In 1949 M.M. Nagar found many tiny beads, some pendants, and glass slag, including a block of 120 pounds (55 kg). He believed that the beads were identical to some found in a casket of a near-by stupa from the fifth century BC (33: 27; 47: 73). Dikshit found a Kushan coin that led him to date Kopia much later, to the second century AD (15: 153). Excavation is clearly needed, as many writers have pointed out.

Glass beads were no longer a scarce commodity by the second century BC, and are found at nearly all Indian sites. Their variety is impressive, and it is clear that there were several places making different sorts of beads at this time.

In the north many beads were found at Kausambi and Ahichchhatra (ca. 250 BC - 450 AD), and are now displayed at the Allahabad Museum (pers. observ.). Many glass beads were made to imitate stone beads, especially agate, onyx, and etched carnelians. These northern beads

were made by winding, and two deserve close attention.

The one is made of amber glass pressed into a square tube and impressed with six spots along each face. The other is opaque black decorated with white by rolling the molten black matrix over a flat die with grooves (for lines) or pits (for spots). Finely powdered white glass in the depressions was picked up by the matrix. Spotted beads decorated this way have been excavated at Nevasa, Maharashtra, dated to 50 BC - 200 AD (52: 355; pers. observ.). What is astounding about these two bead types is that they are still being made today in northern India. The amber tube with incised dots might have been merely a chance resemblance, but the powdered glass decoration is unique to northern India. The continuation of these styles is eloquent testimony to the antiquity and the unbroken tradition of the glass bead industry of the northern area of India (Color Plate II, 1: 1 & 2; 2:1).

In the south, two glass beadmakers, Arikamedu, Pondicherry, and Karaikadu, Tamil Nadu, are known. Both traded with Rome ca. 50 BC to 200 AD (63: 95; 29: 21). Published reports tell us little, but examination of the Arikamedu material at the Pondicherry Museum and a visit to the site allow a reconstruction of the industry. The beads were made by cutting up drawn glass tubes and heating them to smooth and round them. Some large beads, such as the collar beads, were made by pressing the tubes into molds, but the vast majority were small beads, 3 mm or so in diameter. Many colors were used: opaque "Indian" red, black, green, and yellow, and translucent blue, green, violet, and rarely clear glass. The range of colors shows considerable glassmaking skills, using oxidizing and reducing processes with iron, copper, manganese, and antimony as ingredients. The glass was clearly Indian made (59: 22); what we do not know is how the tubes were made and whether the Indians learned beadmaking from their Roman trading partners.

In the west on the Deccan plateau, a third beadmaking tradition flourished at Kolhapur, Maharashtra (ancient Brahmapuri), in the Satavahana period (ca. 200 BC - 200 AD). Again, the small beadwork beads were most common, but melons (*amalaka* beads), square blue tubes with white center lines, and beads with gold foil sandwiched between two layers of glass, were typical Satavahana products. Colors were similar to those at Arikamedu, but the Satavahanans used cobalt for dark blue, including the melons (15: 159). Many of the beads were drawn (pers. observ.), despite what the report said (51: 98), especially the small blue beads, as well as some of the larger types.

An enigmatic small drawn orange bead points to a fourth beadmaking center at this time. These beads are unlike those from Arikamedu or Kolhapur; they have tapering perforations and often twisted stretch marks. They are common for a long time from 300 BC at Taxila (5: 27), Kausambi and Ahichchhatra (13: 57), and in the south such as at Pedabankur and Dhulikatta, Andhra Pradesh (pers. observ.; V.V. Krishnasastry, excavator). They were produced at a center not yet discovered.

It is likely that a number of glass beadmaking sites are yet to be discovered. Several urban centers may have made beads. At the south Madhya Pradesh site of Navdatoli, for example, glass slag matching the beads found there was uncovered though little more is known of this industry (53: 361).

In sum, from about 200 BC to 500 AD, Indian beadmakers in several centers made many sorts of beads. We cannot yet identify the northern makers, but it is clear that a long tradition has been active there. In the peninsula, Satavahanan Kolhapur and the Indo-Roman sites of Arikamedu and Karaikadu had their own traditions, and an unknown center made the small orange beads. The early and wide use of the drawing technique is notable. Drawn Indian red and orange beads date back to the fourth century BC, and are apparently the earliest known beads made by this process. India may be the home of small drawn beads, so often used for sewn beadwork (18).

From the fifth century, the next thousand years is what Dikshit called the Dark Period of Indian glass history (15: 59). The term says more about our own ignorance than about Indian beadmaking, for glass beads were still being made, and there was a lively trade in them. Many literary references to glass beads, especially imitating precious stones, have been cited from this period (15: 169). During this time India sold beads to lands far to the west and the east.

Beck first noticed how beads from the Zimbabwe ruins were similar to those from India and further east (4: 237). Van der Sleen later demonstrated the Indian origin of many East African beads from 200 to 1600 AD by chemical analysis (55; 56: 92), work that was further refined by Davidson (10). Trade began with short wound bicones, and after 800 AD continued mostly with small drawn beads. The Indian glass bead trade paralleled the Indian agate bead trade (19).

Indian glass beads are also found in the Far East, Malaysia, Indonesia, and elsewhere, first noticed by Beck (3). This trade has not been studied as well as the African, but Lamb has analyzed it in some detail, examining beads from Malaysia and Viet Nam, where Indian types date from ca. 1000 AD, and as early as the first century from Sumatra (36). Beads of "Indian red" predominate, and known Indian types such as collared beads, melons, cornerless cubes, and those incised to resemble interlocked chain links are common (36: 89).

Where in Medieval India were these beads made? The northern beadmakers must have continued, but remain unidentified. Kolhapur made beads through the 16th century, while drawn beads from the south-east coast were made at or near Arikamedu, judging from their presence up to the 12th century (36: 84). An important beadmaker was Maski and/or near-by Kadkal (Karnataka). Though the excavator found no beadmaking evidence at Maski (58), Dikshit was sure of it after examining the finds (15: 71). Maski beads include small drawn ones, wound bicones like those found in Africa, black and yellow grape pendants, interlocking chain beads, and good coral imitations (pers. observ.).

The Historical Record

Early writings about Indian glass beads are scarce. Glass and some glass beads are mentioned in literary texts (14; 15: 65, 162), but they tell us nothing about how or where glass beads were made. The *Ain-i-Akbari* (ca. 1590), a court record of Akbar's reign, mentions gilded glass from Bihar, and window glass made in Agra and Oudh provinces (22: 12; 7: 1 235, 318, 325, 329). The Agra area is the heart of the Indian glass bead industry today, and it is not too much to speculate that the industry there is quite ancient.

Firm historical details begin in the British period. In 1650, the East India Company, anxious to protect its monopoly, prohibited private trading in lucrative commodities, especially coral. Diamonds, rubies, and agates were privately traded; glass beads do not even figure on these early lists (20; 49: 33).

By 1793 the Company's prohibited lists had altered considerably. Corals and such luxuries were replaced by metals and military supplies as the chief products sold to India. Glass beads were allowed in private trade (48: 27). The trade in European glass beads to India was important enough to be noticed by Parliament, but not profitable enough to be reserved for the Company.

What was Indian glass like then? The opinion of some English writers was certainly low:

Though the Hindus know the art of making a species of rude glass, which was manufactured into trinkets and ornaments for the women, they had never possessed sufficient ingenuity to apply it to the many useful purposes for which glass is so admirably suited. (43: 11 42)

As we have seen, this is not exactly correct, for the Indians made many sorts of beads, and other fine glass wares have also been documented (15). India was even exporting glass beads in British times. In 1877 beads and false pearls from Bombay were shipped to Aden and from there sold to East Africa (27: 93).

What glass beads did India make at this time? Our information is quite scanty, but Watt's *Dictionary* said in 1880 that beads were made at Kaira (Gujarat), Jaipur and Bundi (Rajasthan), Sagor (Madhya Pradesh), Multan (Pakistan), and Delhi. Most of these imitated European beads, or so it was believed. Sagor beads were "round, flat, about a quarter of an inch in diameter, and one-eighth to three-sixteenths of an inch in length." These sound like beadwork beads. Delhi and Multan made small ring beads, Lucknow small flat beads, Surat spherical beads, and Kaira large flat beads and pigeon-egg beads (61: 429). Of this list, we are only sure about the pigeon-egg beads, large barrel beads put on cattle (Color Plate II, row 5: 1).

We must consider the nature of Indian glass. Mill's "rude glass" was made in a manner unique to India. This "country glass" was made from gathering a soil encrustation after the rains, or evaporated in shallow pits. The encrustation often contains enough silica to use

without adding any sand. It is fired for a couple of weeks, producing a bubbly, semi-translucent green glass or black glass colored by the carbonization of goat dung added to the batch. The glass could be used directly or refined by being crushed, adding colorizers, and firing again. This drove out bubbles of gas and made a fine glass. Today "country glass" has been largely replaced. Plate 3 shows one of the last furnaces for making this glass. The work and skill required to make good glass in this manner are worthy of our admiration.

But the once admirable Indian glass industry had sharply declined in the 19th century. Visitors like Mill (1826) and Buchanan (1800) (15: 127) reported a feeble industry. The geopolitical balance had turned against India. In the pre- and early British period demand for well-crafted, exotic Indian luxury goods was high. But competition from industrialized Europe and a British policy to make India a customer rather than a supplier led to the ruin of millions of Indian citizens. India, the home of cotton, now imported Manchester broadcloth; the vendor of fine Mysore steel now bought cheap iron trinkets. The antiquated glass industry, always decentralized due to the locations of soil salts and fuel, was doomed, virtually wiped out by cheaper and more gaudy competition (21: 46; 24: 92).

Import figures show how European beads flooded the Indian markets. In 1879/80 India imported 1,800,000 pounds (818 metric tons) of foreign glass beads, 78% from Venice and 8% each from China and Austria (Bohemia) (61: 428). Minor imports from the U.K., France, Belgium, and Egypt were likely Venetian- or Bohemian-made, though small bead industries are known in each of these countries; beads from Ceylon and the Straits Settlement probably were made in China or Japan.

By the late 19th century, the British began to recognize the mistake of their policy, for the once rich India was quickly becoming too impoverished to buy European goods. British investment was then encouraged. Raw materials, cheap labor, and a huge Indian market were combined with British capital and technology to bring industrialization to India. Though clearly a better policy than before, industrialization was concentrated in the cities, and the village potter, tanner, blacksmith, and glassmaker reeled under the impact of this new local competition (24: 94).

The first modern Indian glass (bottle) factory was opened in Jhelum (Pakistan) in 1870, directed by a German, H. Wymer. Up to 1916, some 27 more factories with European, Japanese, or European-trained Indian engineers opened. Of these, few succeeded, and only the one at Ogalvadi, Gujarat, still operates. The most interesting was the Paisa Fund Glass Works at Telegaon, Maharashtra, capitalized by thousands of subscribers giving donations as small as a paisa (roughly a penny). It trained workers who began 16 other glass factories. The poor success of these early factories is attributed to the foreigners' unfamiliarity with India and the inexperience of the Indian workers.

World War I helped the industry, especially as Bohemian competi-

tion was cut off. (Note the growth of Bohemia's sales; 30 years before they were only 8% of India's imports.) By 1918 there were either 14 (62: 123) or 20 (38: 26) factories operating. By 1923 a 30% duty on imported beads, bangles, and false pearls was imposed, and by 1932, 22 new factories had begun. A 1931 rebate on soda ash duty followed. Trade policies and the growing Independence movement lessened the effects of the Depression. The number of glass units rose from 59 in 1931 to 101 in 1938/39.

There was further impetus from World War II as Czech, Venetian, and Japanese products were all banned. After the War and Independence (1947), Firozabad, U.P., emerged as India's glass center, concentrating on bangles (Appendix B) and glass for India's bead-makers. The statistics are impressive: in 1918 there were 17 bangle units in Firozabad; in 1931, 20; in 1939, 27; in 1941, 45 and five block glassmakers; in 1950, 158 bangle and 142 joining and cutting units; and by 1970, 14 large and 142 small units with 70,000 workers processing 30,000 tons of glass, accounting for 41% of all Indian glass factories, making a third of all glass used in India. Rightfully is Firozabad regarded as the glass capital of India.

Statistics for all India are also noteworthy: glassworkers numbered 2318 in 1923; 8934 in 1939; 18,328 in 1943; and 55,181 in 1970 (excluding subsidiary bangle workers). In the mid-1970s India became self-sufficient in glass production, and exports rose. In the 1960s Ethiopia and Afghanistan were the main bead customers and Italy, Iran, Iraq, and Lebanon minor; volume quadrupled from 1960 to 1964. Today the U.S. is a major buyer. Bangle export dropped in the 1960s: Sri Lanka now makes its own, and Aden likely imports from Pakistan, accounting for most of this loss. Tubes and rods were selling briskly to East Pakistan (Bangla Desh) in the 1960s. (Above compiled from 62: 123; 38: 26; 30: App. II, xiv; 32; 46: 6; 16: 494; 31: 18, 136).

Labor conditions for Indian glassworkers are relatively good. About 95% of the workers are men. Child labor is said to be negligible, though this is open to question (pers. observ.). More than half of the workers are permanent, and a third temporary, though only 31% had worked more than five years in 1969. Wages are paid by time (92%), most factories working one shift (62%) or three (27%). The average workday is 7½ to 8½ hours. Half the workers have provident funds, and over half belong to trade unions. There is little worker housing, training programs, or medical insurance (the accident rate is 3%, mostly minor). Almost all the factories have drinking water and toilet facilities. Wages are high for India, managers earning 27 rupees a day, and laborers 11.75 on average, at a time when the minimum wage was five rupees (ca. 62¢) (32: 71).

The selling of ornaments is peculiar to India, for they sell best when people are in a festive mood. Bead peddlers are and always have been found primarily at weekly markets, local festivals, and places of pilgrimage. At larger resort and pilgrimage places beadmaking industries become permanent, as at Benaras and Mathura (U.P.), Puri (Orissa), and Rameswaram (Tamil Nadu).

Traditionally, beads and bangles were sold by members of the caste that made them, concentrated in certain regions. The largest of these castes was the Manihars (*mani* is Hindi for bead), forcibly converted to Islam by Aurangzeb (died 1707) (22: 13). In 1912 they numbered 102,300. Another large north Muslim caste was the Curihar (55,500). Other peddling castes were the southern Gazula (102,000), the Patra of Orissa (61,400), and the Punjabi Bisati (3,600) and Ramaiya (5,300). Some Curihars in north and central India and the Kancars (Kanch-kar = glass-workers) in the north and the Deccan (19,100) were the principal glass beadmakers (1: 97, 150). A more recent study of these groups is not known to the author, nor was he equipped to carry it out himself. Hampering such inquiry is that caste populations are no longer reported by the Indian Census. However, the situation seems little changed. Work in the north is still largely in Muslim hands (Firozabad, Purdalpur, Hyderabad, Pakistan), while the Kancars of Maharashtra and the Patas (Pateras) of Orissa carry out their traditional functions (pers. observ.).

To see what happened to beadmakers during the growth of the Indian glass industry, let us look at two small centers. One is Jaipur, Rajasthan, where jewelry is still made. In the mid-1800s Jaipur made fine faceted glass beads imitating precious stones and sold them both in India and abroad. By the 1880s business was weakened by competitors, most likely the Bohemians. By 1888 there were only a few beadmakers at the School of Art and one or two in the bazaar (61: 1 428; 44: 295). Today there are none.

Kapadvanj, Gujarat, was famous for art glass since the 17th century. How long beads were made there is not known, but they were produced a century ago (9: 76; 6: 168), with 50 families employed in glassmaking. By 1967 only 15 families in two factories were working, rather evenly split by sex (45 men, 48 women) and age (42 under 14 years old, 51 "adults") (60: 76, 90). The large barrel-shaped cattle beads (the "pigeon-eggs" of the British) were made until the late 1970s (25; 42). Two factories remained in 1981, but only produce mirrors for sewing on dresses and bags (pers. observ.). In the older days, country glass was made there; recycled bottles replaced it by the mid-1960s (60: 90).

The fate of Jaipur and Kapadvanj beadmakers is similar, as both fell to competition, but they differ. Jaipur was driven out by foreign beads. Kapadvanj held on longer, probably because Europeans did not make the crude cattle beads, only to fall victim to Firozabad bangles and Purdalpur cattle beads.

The Present Industry

How many glass beadmakers are there today in India? Though we may be overlooking a few minor centers, the basic structure consists of four independent but interlocked glass beadmaking centers.

Firozabad produces glass for all Indian beadmakers and a specialty bead of its own. The glass travels 72 km north to Purdalpur, U.P., the

heart of the industry, 500 km west to Benaras (Varanasi, U.P.), where a humming business produces fine lamp beads in the Czech style, and 1300 km south to Papanaidupet, Andhra Pradesh, where it is drawn into tiny beadwork beads by a unique process. Exported beads may be sold directly by brokers in the large cities, but beads for the Indian market are often sent to Benaras where they are strung in villages surrounding the holy city.

This picture is somewhat simplified. We know of beadmakers in Hyderabad, Pakistan, northern Muslims who chose to leave India after Partition in 1947 (17: 9). There may also be minor beadmakers in India. A false pearl industry has been reported at Amritsar, Punjab (62: 126; 26: 1510). Whether this work continues is not confirmed, but all "pearls" observed in India were of plastic. Two Gujarat beadmakers have recently been reported: Jamnagar (23: 623), and false agate beads at Ogalvadi (60: 22). The chances of survival of minor beadmakers seems slim (See Appendix A).

Firozabad

Glass for India's beadmakers is made by large firms in Firozabad at big furnaces which melt sand and commercial alkalies heated by wood and coal. About ten firms also make a particular bead.

Small earthen furnaces have a single worker at each of four to six ports. A small gathering of clear molten glass is removed and blown into a bubble (parison). A short metal rod (pontil) is attached to the other end and the worker swiftly pulls the parison down forming a tube, which he skillfully positions between two halves of a long brass mold. The mold is snapped shut with a foot pedal, and in a few seconds is opened to remove a tube of connected hollow glass balls.

The tubes pass to a worker who dips four or five at a time into silver ammonia nitrate solution, sucking the chemical up the tubes. Filled tubes rest a few minutes, and after the excess chemical is poured out, a thin inner deposit of silver remains. This is an old process to make mirrors (2: 87), still used at Kapadvanj. Clear glass (silver beads) and amber glass (gold) and other colors are used. The tubes are cut apart with a blade for individual beads. Oblate golds are the most popular all over India, while bicones, faceted shapes, shapes imitating metal gold beads, etc. are also made.

How old is this technique in India? Workers say it dates to about 1970 in Firozabad, but a beaded fringe owned by the author suggests an earlier date for production elsewhere. Though without provenance, the fringe has silvered beads and drawn tubes like those made at Purdalpur. The red tube beads are not of red glass but are coated red inside. Clear red ruby glass can be made with copper, gold, or selenium. The copper technique is tricky, gold is expensive, and selenium must be imported to India. Today Firozabad uses selenium, and has certainly had no trouble securing it since Independence (46: 6). But during or before World War II it is likely that gold and selenium were denied glassmakers. Thus it follows that the fringe must be at least 35 years old. Since silvered beads were not made in Firozabad then, we

assume one of the cities making the brass molds (Kanpur and Jlasser, both U.P.) were the beadmakers. While we admit this is speculation, it suggests that the silvered beads preceeded their present home in Firozabad.



Plate 1: FIROZABAD A tube blower has just snapped the mold shut. The boy helps remove the tubes.

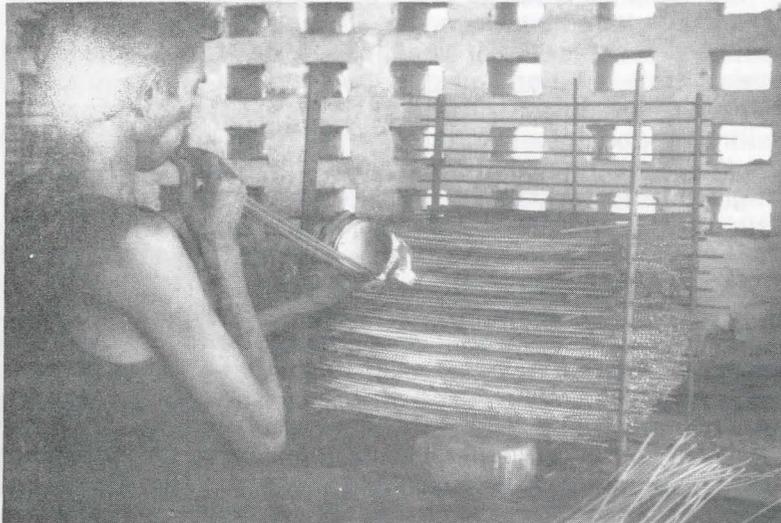


Plate 2: FIROZABAD A worker sucks up silvering solution into blown tubes of glass.

Benaras

For centuries beadmakers at this ancient and important pilgrimage center worked in wood, ivory, steatite, and above all, the Rudraksha bead (seed of *Elaeocarpus ganitrus* Roxb.) for sale to pilgrims. These beadmakers were joined by glass beadmakers when the brothers Kanhiya Lal Gupta and Banarsi Das Gupta set up the Benaras Bead Manufacturing Co. in 1940. Czech glass technicians, Mr. and Mrs. Hendrick, were hired in 1941 to open a training school. This institute survived 20 years, closing in 1962, having begun the bead industry, but not succeeding in establishing glassmaking. In 1967 B.D. Gupta opened his own firm, the Natraj Bead Manufacturing Co. Since then, some 20 smaller firms have sprung up. In 1981 the Benaras Co. employed about 600 workers, Natraj some 400, and the other score about 300.

Benaras beads are fine products, carefully hand-crafted, and often inspired by Czech, Venetian, or Japanese models. The imitation is more than mere flattery; the beads are lamp-wound, a process employed at these other centers.

A worker sits behind an array of six kerosene nozzles, each with a blowpipe which intensifies and directs the flame to a spot in front of a stone crucible. The blowpipes are run by bellows pumped by the worker's foot. He takes a copper wire pre-coated with kaolin (china clay) in one hand, and one or two Firozabad glass canes in the other, melting it in the flame and winding it around the wire.

While still hot, the beads are shaped to near perfection in iron half-molds. These are dies made of small metal cubes with depressions on one face corresponding to half the ultimate section of the bead. Grooves running from the center of the depression to the edge of the die allow the wire to rest in them. The bead and wire are laid on the half-mold and the wire is twirled, shaping the bead by this rolling action in the depression. After seven or eight beads are made up the wire, it is stood upright in a tin can full of sand. When cooled, the clay allows the beads to easily slip off the wire, leaving a coating in the hole. The whole process mirrors the Czech technique for making lamp beads (57: 16).

Benaras beads are also formed in two-part molds for non-circular sections. Shapes are only limited by the dies; some of the noteworthy ones are ribbed bicones in imitation of Venetian Art Nouveau beads, tiny beads with diameters of 2 mm, and a domed double spacer used on bracelets and necklaces. They are also decorated with other glass colors trailed on them, often being swirled or combed into desired designs. Imagination is the only limit to decoration; trailed and combed lines and crumbs are most common, but there are others, including a finely crafted eye.

Benaras beads are easily distinguished from other Indian beads, as they are more perfect, have small holes, and (when new) have clay in the perforations. The best Benaras work compares favorably with beads from anywhere else in the world. Outside help and influence are

obvious, but the industry is now completely indigenous, the only exception being goldstone (aventurine) glass, still imported from Venice.

Benaras is also the last stage for many Indian beads, for the stringing of necklaces and bracelets is done there in villages around the city and at some of the smaller bead factories. Beads from all four Indian beadmaking centers are used (and some fine small Japanese beadwork beads).

Sunderpur is a village where we observed a woman knotting a strand by stringing the beads, then tying one end to her big toe, and then knotting between the beads by passing the knot through the completed part of the strand. We were amazed at the slow rate used for stringing the single strand of tiny beadwork beads compared to the speedy method used at Papanaidupet (see below). A distinctive Benaras device is to put each bead on a short beaded wire in a chain. There are about as many people stringing beads as making them in Benaras — from 1200 to 1500, mostly women and girls.

Purdalpur

The heart of the Indian bead industry is the tiny village of Purdalpur (also Purdalnagar), important for several reasons. For one, it is an old beadmaking center. Though we lack specific dates, the industry there must date back several centuries. The wide variety of beads produced is astonishing. Moreover, Purdalpur is heir to the ancient northern beadmaking tradition. It is fortunate that it has survived, because much has thereby been preserved.

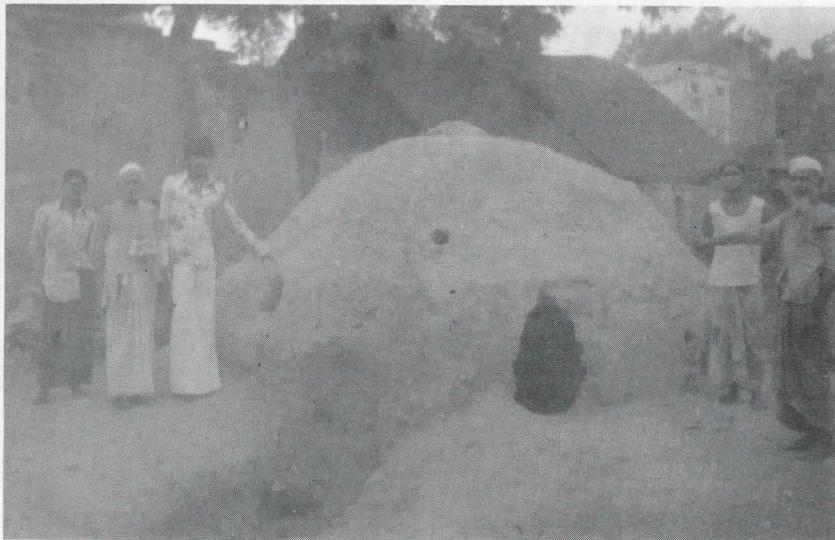


Plate 3: PURDALPUR The last furnace in the village for making country glass. Fuel is fed below; the large gap in front was broken out to remove the glass.

As we have seen, Indian beadmaking was once quite decentralized, a family working in a village until raw materials were exhausted. These workers were related to peddlers, and each group had its own specialty. The pattern was broken in the last 200 years by European competition, British mercantilism, and Indian industrialization. A final blow cleft the northern beadmaking community in half, as many workers went to Pakistan. To survive, the remnant had to cluster together. What historical processes led to Purdalpur becoming the center are not known, but the results are easily seen in the variety of techniques used there to make beads. Let us look at those techniques in turn.

Furnace-winding A low-domed clay furnace under a tin roof open at the sides accommodates a dozen workers squatting in front of individual ports. Wood is fed below ground, with a floor in the furnace (open at the center) holding the glass away from direct flames. The worker builds a bead by rolling a bit of glass onto an iron rod (mandrel or pontil). He withdraws it from the furnace and may choose to leave it round or shape it on a flat plate or with a small steel scoop. Simple beads are knocked off the rod (which, being of iron, contracts faster than the glass) into a small clay pot kept just outside the protective door of his port. The beads cool slowly in the pot (anneal), preventing internal stresses from cracking them. Monochrome beads are made one or several at a time, cut apart, or left in series. Beads are made quickly; it took a boy ten seconds to build, shape, and knock off five small beads together. Furnace-wound beads have black iron oxide hole deposits.



Plate 4: PURDALPUR A boy shapes furnace-wound beads with a small steel scoop. Note annealing pot at next port.

These beads may also be molded: pressed between two iron die halves, joined by a steel ribbon serving as a spring. They may be decorated with powdered glass on an iron plate die in a process we have seen is 2000 years old. Crumbs of glass or slices of fancy canes made at Purdalpur are also used for decoration.

One bead begins as two beads on the rod. The first is slipped off into the bottom of a mold, and the second, still on the rod, is placed upon it. The mold is squeezed, resulting in a round tabular bead impressed with a picture of Hanuman, the monkey hero of the epic *Ramayana* (Color Plate II, row 3: 1).

Drawn Beads At another furnace, boys are making bangles, and a couple of masters form drawn tubes. They gather glass on their blowpipe and alternately heat, marver (smooth on an iron plate), and inflate it until the parison is cylindrical. Grooves are often incised down the sides. After a last heating, the free end of the glass is quenched in a bucket, an iron rod is stuck into this end, and the rod is put in a sand pile or on hooks driven into the ground. The master pulls the tube out by walking backwards with the blowpipe for 20 to 25 meters. If it is grooved, he twists it while pulling. The operation is quick; in 45 seconds the tube is formed and already cooling. Later they are broken into meter lengths and women cut them with a blade in one hand resting the tubes on another blade stuck into the ground. The finished beads are some 8 cm (3") long and are used for curtains and fringes.



Plate 5: PURDALPUR A master prepares a parison for drawing into tubes.

The technique is of interest, as it differs from that used at Venice, Italy. There two men pull, perhaps because the tubes are thinner (and longer). It also differs from the method we shall discuss below used at Papanaidupet. How old is this drawing technique at Purdalpur? The beaded fringe discussed above (ca. 1940) has these tube beads. The author found a broken tube bead of country glass embedded in the wall of a deserted, crumbling house in Purdalpur, suggesting even greater age. Excavation at Purdalpur is obviously desirable.

Fancy canes A work related to drawn tubes is often called "millefiori" (a thousand flowers), though "mosiac" or "fancy cane" are perhaps better terms. These are relatively new to Purdalpur; the Indians are imitating Venetian work, in turn inspired by ancient Roman glass. Older Venetian millefiori beads are collector's items today. Several cases of new Indian work being passed off as old Venetian beads are known, though the deception does not originate from Purdalpur.

These canes are not perforated, rather they are sliced thin and used to decorate beads and bangles. They are made at a small isolated furnace reserved for this work. The master starts with one color of glass on a rod, adding other colors by attaching semi-molten strips, rolling the gathering in glass, or grooving it and filling in with other colors. The glass must be reheated constantly, though not so much that it melts together or runs out of shape. Once the desired pattern is built up, the gathering is pulled out into a long cane in the same way as the tubes, giving the same cross-section along its entire length.

Other processes Some Purdalpur men trained at the Institute at Benaras, and now make Czech-style lamp beads at home. One master makes fine granulated beads by having boys grind and heat tiny glass balls and attaching them himself to tubes mounted on wires; this exacting work takes a day to make two necklaces. Some beads have been decorated with stenciled paint patterns, but the process is not especially successful. Molds are used to make heart shaped pendants decorated with fancy canes or "Allah." Fine lamp work is used to form a mini-zoo of glass animal pendants.

We have noted that Purdalpur and Hyderabad, Pakistan, bead-makers are related. Distinguishing their work is sometimes quite impossible, but some general hints may be of help. The predominant Pakistani product is swirled glass, made much less often at Purdalpur, while Pakistan does much less millefiori (fancy cane) work than India. Both use the ancient technique of decorating with crushed glass, but in Pakistan only the eye beads have been seen, while in India eyes, lines, Muslim crescents, and imitations of the "Tibetan Tzi beads" are decorated this way. Some of these differences are the result of the time of separation. Thus "Tzi" beads and the granulated beads were apparently introduced at Purdalpur after Partition in 1947. This also suggests that fancy cane technique predates Partition.

The Muslim fourth of Purdalpur's population of a few thousand is busily engaged in making beads at 50 furnaces, working largely on

orders. Purdalpur is heir to ancient techniques, but is open and flexible to adopt new methods and make new beads. Without proper excavation we cannot be sure of Purdalpur's antiquity, though the villagers say that when they dig they turn up beads and glass for a meter (3 feet) or more.

It is no exaggeration to say that Purdalpur ranks as one of the oldest, most varied, and most successful glass beadmakers in the world.

Papanaidupet

The only Indian beadmaker outside of Uttar Pradesh state is technically the most interesting. Papanaidupet, Andhra Pradesh, is a real beadmaking village; virtually everyone works on beads, and the work continues 24 hours a day, six days a week, producing a single type of bead. These are the tiny beads used for beadwork or, when black, for the married women's necklace, the *mangalsutra*.

These beads are drawn by a unique manufacturing process. The tubes are made at night to avoid daytime heat, and all night 20 furnaces draw 50 kg of Firozabad glass each into tubes. Though mentioned in print (15: 139), the process has never been adequately described.

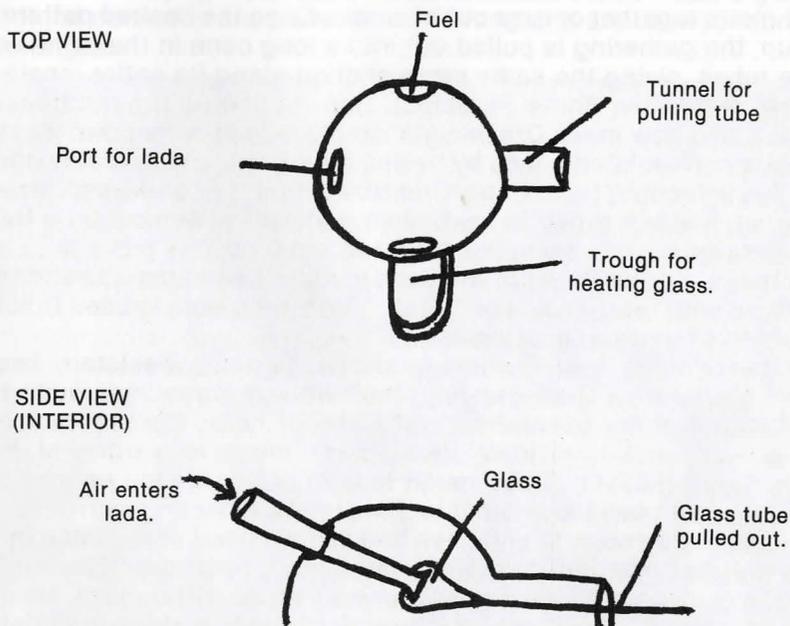


Plate 6: PAPANAIDUPET Schematic drawing of the furnace used to draw tubes.

The arrangement of the furnace is part of the secret. They are low domed mud affairs, like those seen elsewhere, but made with only four openings. A low port is used to feed wood. Opposite it a higher port opens out onto an elevated trough where the glass is melted. On the third side is a high port where the *lada* is placed, and opposite that at ground level is a port with a tunnel: that side of the furnace resembles an igloo. (Plate 6).

Molten glass is gathered on the flared end of a long (2.5 m/ 3 yds) tapered pipe, the *lada*, and put into the furnace. The *cheatleak*, an iron plunger with a bulbous end, is put through the *lada* and pushes out a bit of glass inside the furnace. A man in front of the tunnel grabs this extended glass with an iron hook and pulls it by walking backward about five meters. Simultaneously, the plunger is withdrawn from the *lada*. The tube-puller drops the hook and draws the tube hand-over-hand, snapping it off every meter or so. His hands are protected only by squares of jute packing. The diameter of the tubes (and ultimately the beads) depends upon his drawing speed.

Within the furnace, a vacuum is created in the glass by the drawing of the tube. Air entering the free end of the *lada* is heated and expands, giving enough pressure to prevent the tube from collapsing. The process at this stage is not unlike that used by modern automatic drawing machines, such as the Danner method. But how old is the technology at Papanaidupet? We have no idea; it may be very ancient. It might even be the process used at Arikamedu and elsewhere centuries ago. Only further investigation will tell us.

At daybreak other members of the village begin the work of turning the tubes into beads. First men take ten or so tubes at a time, lay the ends on a corrugated blade stuck into the ground, and cut them with a heavy, sharp blade in the other hand. They face a wall draped with a large cloth to catch the scattering beads and gather them at their feet. The beads then go to a man who packs them in cow dung ash and heats them in a large caldron, stirring them with a flat shovel. The heating rounds the cut edges, and the ash prevents the beads from collapsing or sticking together. His wife then pounds the beads in a meter-high wooden mortar with a wooden pestle to remove the ash. Finally, women place the beads into flat winnowing baskets and string them ten to twelve strands at a time on long (50 cm; 20") thin needles, running them through the beads, assisted with the left hand. Strands are bunched by the half dozen to go to the five or six wholesalers of the village, many bound for Benaras.

Though it is difficult to know how old beadmaking at Papanaidupet is, we suspect it is the last surviving center of the once flourishing southern Indian bead industry. A few glass beadmakers are known to have gone out of business in this century (15: 130). A glass factory set up at nearby Gudar to supply Papanaidupet recently succumbed to Firozabad competition (62: 126). There have been few notices of Papanaidupet (41: 150), but, as we have seen, this does not mean the industry was not there. Indeed, we may well suspect that it is very old,

but as with the rest of the glass bead story, much more work is needed, especially well-funded projects of exploration and excavation.



Plate 7: PAPANAIIDUPET Cutting the tubes into bead sizes.



Plate 8: PAPANAIIDUPET A worker stokes the fire for the furnace to round the beads, which are placed on top. The stirring shovel lies in front of the worker.

Conclusions

Glass beadmaking in India holds many surprises for those interested in ornament, glass, ancient technology, and traditional crafts. Though it is far too early for a comprehensive study, we do have enough data to piece together the outlines of the story.

India was later than other ancient civilizations in developing glass, not making the first beads and bangles until ca. 1000 BC. Much early glass was crude, full of bubbles and subject to corrosion, but the Indians soon learned to refine their glass and produce a great range of colors for their beads.

By 200 BC Indian beadworkers were skilled, and beads are found at nearly all archaeological sites. We can discern several centers of beadmaking at this time: one or more in the north (not pinpointed), one on the Deccan (Kolhapur), and two in the south (Arikamedu and Karaikadu). There are other centers to be discovered such as the one that made the small orange beads.

The Dark Period of Indian glass history began in the 5th century AD. Judging from literary references, the paucity of glass vessels at that period might be explained by noting that beads and bangles seemed to use up most of the glass. During that period there was considerable trade in Indian glass beads to Africa and elsewhere in Asia. Much more is yet to be learned, including the identification of production centers.

The picture of a widespread decentralized industry emerges from the historical sources of later centuries. During the 19th century, the Indian glass industry reeled under the impact of foreign competition (Venice and Bohemia) and the British policy of making India dependent on imports. After much damage was inflicted, the policy was reversed, but the emphasis on urban industrialization all but wiped out the small glassmaker.

Centralization continued after Independence, and we have seen small beadmakers (Jaipur and Kapadvanj) die a slow death. What remains in India today is not a strictly centralized industry, but an interdependent one. All beadmakers rely on the glass capital, Firozabad, to supply raw glass. Each center works in its own way, each producing specialized beads. As often as not, the beads of Firozabad, Purdalpur, Benaras, and Papanaidupet are strung together in and around Benaras. The set-up is strong; there is a huge local market and there are many opportunities for export.

The Indian glass bead industry appears to be as healthy as any such industry anywhere in the world. Its unique features are products of historical processes and have left it a vital industry, prepared and willing to expand production and improve operations. In short, India has long been, and again has become, a giant among the glass beadmaking countries of the world.

APPENDIX A INDIA'S GLASS BEADMAKERS

The following 61 places have been reported making glass beads in the last century. The list includes those on the *Handicrafts Map, Atlas of India* (1977: Plate 182), which marks beads and bangles of any material with the same symbol (a necklace). Other sources include state information officers locally and in Delhi, recent gazeteers, personal observation, and works in the reference section numbered 6, 14, 15, 26, 61, and 62.

Present Operation Confirmed: Benaras, Firozabad, Purdalpur (Uttar Pradesh), Papanaidupet (Andhra Pradesh).

Present Operation Possible: Jamnagar, Ogalvadi, (Gujarat), Amritsar (Punjab).

Operation Ceased, Confirmed by Author: Kapadvanj (Gujarat), Sagor (Madhya Pradesh), Thanjaver, Trichchi (Tamil Nadu).

Operations Ceased, Confirmed by State Agencies: Hyderabad, Jangaon, Nalgonda (A.P.), Kaira (Gujarat), Panipet, Karnal (Haryana), Patiala (Punjab), Jaipur (Rajasthan), Lucknow, Rampur (U.P.).

Operation Ceased, Confirmed in Literature: Ragampeta, (A.P.), Bhagalpur, Dharbangha, Madhubani, Matikera, Pandaul, Samsatipur (Bihar), Bhuj, Junagdh, Rajkot (Gujarat), Gwaloir, Lashkar (M.P.), Tonk (Rajasthan).

Investigated by Author, Operation Unlikely: Bhopal (M.P.), Surat (Maharashtra), Jaunpur (U.P.), Multan (Pakistan), Delhi.

Industry Reported, but Unlikely: Ahmedabad, Margrol, Shihor (Gujarat), Ghodegere (Karnataka), Baldiri, Bundi, Churu, Jhalawar, Jhunjhun, Kota, Nasirabad, Samdiri, Siwana (Rajasthan), Banda, Bhagpat, Bilgram, Dalman, Faizabad, Shahjahanpur (U.P.).

Atlas Entries Representing Bangles: Akola, Samgamnar (Maharashtra), Bara Banki (U.P.).

APPENDIX B THE BANGLES OF INDIA

The reader will have noticed that it is impossible to discuss Indian glass beads without reference to bangles, unbroken rings worn on the wrist. Next to the bead, bangles were man's first ornament; ivory ones from France and Siberia are 18,000 to 25,000 years old (8: 238; 45: 52, 249). Indian bangles of natural materials first appear in the third millennium BC in the Indus Valley.

Bangles and beads were made from the first glass manufactured in India, ca. 1000 BC. Not long ago, it was assumed that glass bangles were introduced by Muslims in the 14th century (50: 252), but when much earlier bangles were found, this idea had to be corrected (58: 113).

We do not know how ancient Indians regarded bangles, but their use today is very important. Along with the forehead spot (*tika*), and a necklace of black glass and gold beads (*mangalsutra*), bangles are a mark of married Indian women. Girls may wear them, but not widows; they are removed and destroyed when mourning for a husband. Breaking a bangle is such bad luck for the husband that if ever discussed at all, a woman says that it has "increased."

It takes little imagination to understand that a thin bit of glass on a hard-working Indian woman's wrist breaks often. Indeed, the surface of India is strewn with broken bangle pieces. Their fragility contrasts with the durability of most beads, and must have affected the distribution pattern of bangle- and beadmakers. Since they need constant replacement, bangles are bigger business. Many local makers were needed, as bangles are also difficult to transport over long distances.

As with beads, the once widespread bangle industry is now concentrated in a few hands, yet still reflects ancient practices. Industrialization brought efficient means of making bangles. We shall look at both ancient and newer manufacturing techniques.

Traditional banglemaking begins with a bead-sized bit of molten glass on an iron rod. This is expanded by rotating the rod and hitting it with another rod. The combination of gravity's pull and the jarring from being hit opens up a ring of glass. This is put on the end of an earthenware cone (*kalgood*), and pulled up the cone with the rod. In 25 seconds, the ring is the proper size and is cool enough to slip off the cone. Purdalpur is the primary maker of such bangles today; they are known as *chhal*, and are always seamless.

Another old technique was to draw a cane from the furnace, let it cool, cut it and reheat it around a cone. These *kara* bangles were made until recently at Tarapur, Maharashtra (38: 34). The technique is used in Firozabad for twisting multi-colored bangles. *Kara* bangles have round cross-sections and a joint.

Most modern bangles are produced in Firozabad by an ingenious technique. A gathering is shaped into a cylinder, given the right colors, and then handed to a master standing in front of a small square

furnace open on four sides. He feeds the glass onto a huge grooved iron roll (*balen*) suspended above the fire. A second worker turns the roller, a third keeps the glass in the grooves with a long-handled paddle, and a fourth on the last side removes the glass when the *balen* is full.

This produces a large glass coil which is cut lengthwise with a blade, separating it into some 75 unjoined circlets. These circlets go to cottage units where they are joined by the heat of a lamp and decorated.

These *gola* bangles are the staple of Firozabad and the predominant type throughout India. They (and the *reshmi*, made of undecorated silky glass) are recognized by uniform size, squarish cross-sections, and the joint. The master who feeds the *balen* is one of the highest paid industrial workers in India, earning 100 rupees (\$12) a day; the minimum wage is 5 (pers. observ.; 12: 4).

Two other processes are used in Firozabad. Thin tubes, silvered like the beads, are joined into bangles. Large tubes of bangle size diameters are cut cross-ways. The latter are jointless and rather durable (62: 126).

The wide and ancient use of Indian bangles, their variety and decorations, and the many centers of bangle-making show their importance when fully studied. It is not within the scope of this work to make a detailed study of them here, but the interconnection between the beads and bangles of India must be appreciated.

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COLOR PLATE II

Beads from Purdalpur

- Row 1: Powdered glass decorated beads. 1-2) Made in ancient style, dating from 1st c. AD in north India. 3) Imitation Tzi bead.
- Row 2: 1) Another ancient bead style with impressed dots along faces. 2-4) Decoration of paint designs stenciled on beads.
- Row 3: Various impressed beads. 1) Hanuman tabular made from two beads.
- Row 4: A variety of beads. 4) Foil decorated.
- Row 5: A variety of beads. 1) "Pigeon-egg" cattle bead.
- Row 6: Fancy canes for decorating beads.
- Row 7: Beads with mosiac or millefiori decoration, made from canes as shown in Row 6.
- Row 8: 1) Drawn tube bead for curtain. 2) Piece of similar bead found in wall of abandoned house.
- Row 9: Various pieces for costume jewelry; not perforated as beads.
- Row 10: 1) Parrot pendant. 2-5) Granulated beads. 6) A piece of "country glass."



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