Bead Technologies at Harappa, 3300-1900 BC: A Comparative Summary

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Introduction

The study of bead manufacture and changing styles of beaded ornaments is an important method for investigating the social and economic development of a society. Numerous studies, including our on going work at Harappa (Meadow & Kenoyer 2001) have demonstrated that the careful documentation of bead manufacturing techniques, raw material sourcing and stylistic analysis can reveal valuable information about prehistoric cultures. The analysis of beads from different periods and areas of Harappa have made it possible to define specific trade networks and the organization of production as well as changing patterns of interaction over the history of the site (Kenoyer 2000, 2001).

During the past 15 years of excavation and research at Harappa, all of the major mounds have been systematically surveyed and selected areas have been both horizontally and vertically excavated. In the course of these excavations, large numbers of beads, drills and bead making debris have been recovered from different parts of the city and from all of the major chronological periods (Fig. 1 & Table 1). The vast majority of the beads are made of fired steatite (Table 2), which was a widely used raw material, beginning with the Ravi Period and continuing through the Late Harappan Period. The long use of a raw material combined with changing techniques of production and bead morphology provide a unique perspective on the technological tradition and the people who used it. Terracotta is a locally available material that was also used to make beads throughout the history of Harappa. The use of faience for making beads starts in the Kot Diji phase and continues on through the Late Harappan phase. Beads that are made of hard stone such as agate, carnelian are relatively less common, with a significant drop in numbers for stones such as lapis lazuli, grossular garnet, serpentine and amazonite. Marine shell, which is relatively abundant at the site in the form of shell bangles and inlay, was not a common bead material, possibly because of the common use of white-fired steatite. Precious metals such as copper alloys and gold were probably quite intensively recycled, so it is not surprising that these materials are not often recovered in the course of excavation. A rare discovery of preserved seeds of the *Coix* plant comprises the only evidence of organic beads from Harappa. These various materials, regardless of their abundance or scarcity reveal the importance of beads to Harappan culture and the dynamic nature of the bead industry over time.

The largest proportion of beads comes from the Harappa Phase (Period 3, 2600-1900 BC) that has been excavated most extensively, but there are important collections from all of the other periods as well. At this time it is not possible to separate all of these beads and man-

Harappa Chronology		
Early Harappan		
Period 1A/1B	Ravi aspect of Hakra Phase*	> 3700 BC - 2800 BC
Period 2	Kot Diji Phase	*c.* 2800 BC - 2600 BC
Harappan (Indus)		
Period 3A	Harappa Phase A	*c.* 2600 BC - 2450 BC
Period 3B	Harappa Phase B	*c.* 2450 BC - 2200 BC
Period 3C	Harappa Phase C	*c.* 2200 BC - 1900 BC
Late Harappan		
Period 4	Late Harappa Transition Phase	*c.* 1900 BC - 1800 BC
Period 5	Late Harappa/Cemetery H Phase	*c.* 1800 BC - 1300 BC
* called the «Ravi Phase» in this article		

Table 1.

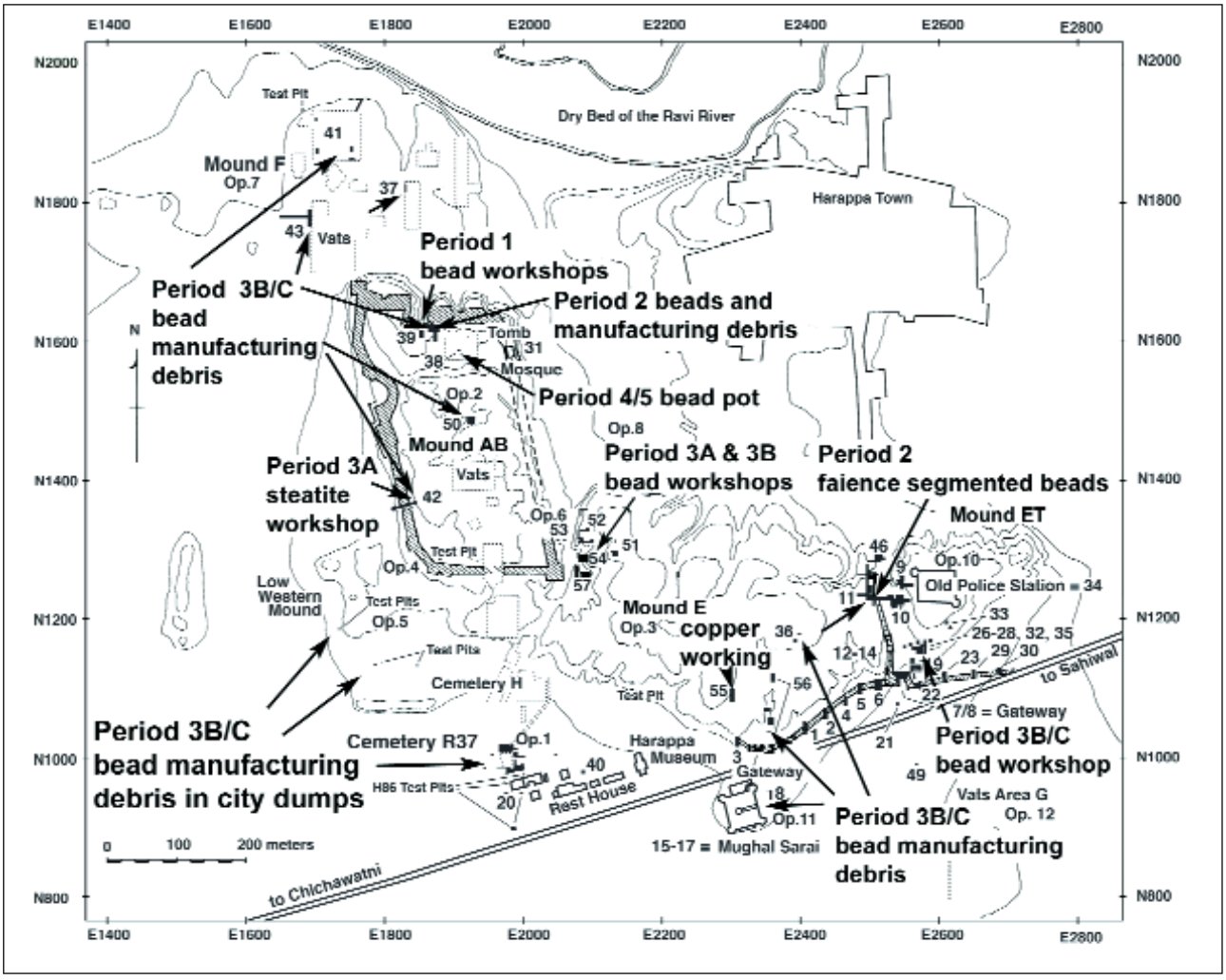

Fig. 1 – Bead Making Areas of Harappa: 3300-1700 BC.

ufacturing debris into different chronological periods because we are still in the process of analyzing the bead styles and the contexts in which some of them were discovered. However, as will be illustrated below, discrete samples of beads and manufacturing debris from well-stratified contexts in different periods, make it possible to compare specific aspects of bead technology, bead shapes and styles, as well as the organization of bead production over time. Scanning electron microscopy allows for the comparison of sawing and drilling techniques, while basic sequences of manufacture (chaîne opératoire) can be defined through the analysis of manufacturing debitage, tools and finished commodities. Preliminary results indicate that some important similarities and continuities link one period to the next. However, distinctive patterns can be identified from each period indicating important changes in the technology as well as the organization of production. Some of the technological features can be used to reliably date many beads found in secondary contexts.

Organization of Bead Technology

The organization of bead technology is defined to some extent by the nature of the raw materials being used and the complexity of the technology and tools used to process the raw materials. Generally speaking we can divide the production of beads discovered so far at Harappa into the following eight categories (Table 3). Terracotta, soft stone and hard stone bead making is found in all periods at Harappa. It is not unlikely that

Harappa 1986 to 2001: Beads and Manufacturing Debris from all Periods*	
Artifact Type	*Number*
Steatite / Paste Bead	17037
Terracotta Bead / Whorl	3993
Faience Bead	2224
Lapis, Serpentine, Garnet, Amazonite, etc Beads	227
Agate, Carnelian, Jasper Beads	907
Copper/Bronze Bead	143
Gold Bead	63
Marine Shell Bead	136
Organic – Coix seed	3
TOTAL	24,733
Unfinished Bead – Steatite	655
Unfinished Bead – Agate, etc	92
Unfinished Bead – Lapis etc	24
TOTAL	771
Sawn Steatite	1542
Steatite Fragments	654
Sawn Agate, Lapis etc.	19
Blocklet – Agate, Lapis etc.	197
Flake – Agate, Lapis etc.	3141
Nodule – Agate, Lapis etc.	121
Gold Fragments	29
Shell Bead Manufacturing Debris	153
TOTAL	5,856
Chert Drill/Agate Drill	2050
Constricted Ernestite Drill	28
Ernestite Drill Manufacturing Debris	37
TOTAL	2115
Glass Bead – Pre-Modern	1
Glass Bead – Modern	434
Plastic Mead – Modern	44
Shell Bead – Modern	1
Agate Bead – Modern	1
TOTAL	481
GRAND TOTAL	35,590

* This is a preliminary tabulation and will be updated after microdebitage samples have been sorted.

Table 2.

Bead Production at Harappa by Phase				
Bead Material / Production	*Ravi Phase*	*Kot Diji Phase*	*Harappa Phase*	*Late Harappa Phase*
Terracotta	present	present	present	present
Faience		present	present	present
Soft Stone (steatite)	present	present	present	present
Hard Stone (agate, lapis, etc.)	present	present	present	present
Shell	?	present	present	?
Copper/Bronze		present	present	present
Gold/Silver		present	present	?
Organic			present	

Table 3.

organic beads were used throughout the history of the site as well, but we have only found them preserved in the Harappa phase. The absence of shell from the Late Harappan phase is significant, as it may reflect the breakdown of trade networks to the coast (Kenoyer 1995). Given the abundance of gold and silver ornaments found from Late Harappan sites in India (Khatri & Acharya 1995), the absence of such beads at Harappa during the Late Harappan Phase may be due to the small area excavated. It is also possible that gold objects found on the surface have generally been lumped with the Harappa phase. Bone, antler and ivory beads have not been found, but can be expected in the future.

Terracotta Bead Production

The manufacture of terracotta beads involves the collection of fine clay and preparation of a bead by hand or with the aid of some tools. Most terracotta beads were made simply by rolling or pinching the form and perforating the bead using a long thin tool, such as a reed or even a porcupine quill. Incising, impressing, or pinching the surface of the bead was often done to create additional decoration. During the Harappa phase some terracotta beads were made using different colors of clay to create the effect of banded sandstone or jasper. Finally, the firing of terracotta beads was a relatively simple process and could be done using a small fire or in the course of firing pottery.

Faience Bead Production

In contrast with terracotta beads, the production of faience beads is extremely complex (Kenoyer 1994; McCarthy & Vandiver 1990) and requires materials that were not locally available. Rock quartz was brought to the site; heated and crushed to make a powder that was then melted using a flux, probably from plant ash

(potash). Colorants were added to the resulting frit either during the initial processing or in the course of subsequent grinding and melting. The frit was reground and mixed with additional fluxing materials and colorants prior to being shaped into beads and ornaments. After careful drying to allow the fluxing agent to effloresce to the surface, the beads were fired in specially prepared ceramic canisters and glazed. Recent experimental studies of firing techniques suggest that the canisters may have been fired in a bonfire or pit kiln and not in an updraft kiln. Large quantities of misfired beads and faience slag, burnt bone and vitrified canisters are characteristic of debris from faience bead making activities.

Soft Stone Bead Production

Soft stone beads at Harappa are made from varieties of steatite (talc) that have different colours and qualities. The most common varieties are greyish-white to bluish grey, black to grey-black, yellowish green to greenish whit, and brown to tan. Some rare examples of reddish steatite and mottled variations of the more common forms have been found. Detailed sourcing of the steatite at Harappa is being done by Randall Law and more precise classification of steatite types will be possible when his study is completed.

Unlike clay, which is locally available, all steatite at Harappa was brought to the site from distant resource areas more than 300 km from the site. Unworked lumps of steatite range in size from 1 to around 7 cm maximum length, but most of the fragments have been sawn or ground to prepare bead blanks. The saws used to cut steatite were primarily fine toothed metal blades of copper or bronze. Stone blades were occasionally used to create a groove for splitting a blocklet of steatite, but never to make the thin wafer-like slabs used to make disc beads. The manufacture of steatite disc beads at Harappa is similar to that described for Mehrgarh and Mohenjodaro (Vidale 1989, 1995). Flat slabs were sawn from blocklets and then either chipped or ground to the basic shape and size of the desired bead. The bead blank was perforated using a fine pointed object and then all of the perforated beads were strung on a cord. The strand of rough beads was rounded by rolling diagonally across a flat grinding stone and sometimes the exterior edge was smoothed or faceted. During the Ravi Phase, the exterior of the bead was left rough to better hold a glaze.

After the string of beads was ground to the desired shape and size the beads were either fired with no further treatment, or bleached using some form of alkali and then fired. Some steatite beads during the Ravi Period were coated with a powdered frit to create a blue green glaze. During the Harappan and Late Harappan periods steatite beads were sometimes incised with decorative designs that were filled with colors, such as vermilion, or just left plain. The firing techniques used for steatite beads is probably identical to that used for faience described above.

Hard Stone Beads

A wide variety of stone beads were produced at Harappa during all of the major periods. The manufacturing process involved various stages of shaping, grinding, perforation and polishing that was defined by the nature of the rock itself (Bhan *et al.* 1994). Each variety of stone was acquired from some distant resource area that was more than 300 to 800 km from the site. Microcrystalline rocks such as agate, carnelian and jasper appear to have been heated prior to flaking. Other varieties of rock that would not benefit from heating, such as limestone, sandstone, rock quartz, amazonite, serpentine, lapis lazuli and grossular garnet, were processed directly. Chipping, grooving, sawing, splitting, pecking and grinding were the major methods used to shape the bead blanks. The drilling techniques used on hard stone varied over time and will be addressed in the appropriate sections below. Major drilling techniques included pecking with a stone tipped percussor, drilling with a tapered cylindrical stone drill or with a constricted cylindrical Ernestite drill (Kenoyer & Vidale 1992), or a copper drill with abrasive. The copper drills were either solid rods or hollow tubular in form (Kenoyer 1997). Polishing, heating to enhance the color or bleaching to create white patterns were the final stages of production before a bead was threaded onto an ornament.

Shell Bead Production

Shell beads were produced using two different processes (Kenoyer 1984, 1995). The most expedient process involved making a hole in a natural shell to create a bead or pendant. Perforation was done by grinding, chipping, or using a drill made from chert or copper. The more complex process of shell bead making involved first breaking or sawing off a segment of the shell body or the whorl and then shaping the bead blank by sawing or grinding. Perforation was done by drilling with a stone or copper drill. After final polishing the bead was ready for use. During the Harappa phase shell and stone were sometimes combined to created layered beads with bands of white shell alternating with different colors of stone.

Metal Beads

The production of beads from copper, bronze, gold or silver would have involved all of the basic processes used for other aspects of metallurgy (Kenoyer & Miller 1999). There is no evidence for smelting of copper ore at Harappa, so we assume that all of the copper/bronze beads were made using imported copper ingots or scrap metal. Some copper beads from Harappa have been alloyed with tin, but it is not possible to determine if these beads were made from recycled tools or if they were intentionally alloyed to make a golden colored bead. Gold beads at Harappa are made using a wide range of techniques that include drilling solid discs of gold, hammering thin sheets of gold to make tubular forms, drawing and hammering to make wire beads, or by making thin sheets of gold to cover copper beads. Similar techniques would have been used for silver beads, but we only have a few examples that are heavily corroded. No primary workshop for metal working has been excavated at Harappa, but numerous small crucibles have been found that may have been used for gold working, and larger copper crucibles have also been discovered.

Organic Beads

As mentioned above, we have only one example of three preserved *Coix* seeds (Job's Tear) that were used as beads (Meadow *et al.* 1998). These seeds were found inside a tiny pot along with carnelian, faience and steatite beads. The association of the natural bead with other more valuable stones and artificial materials suggests that

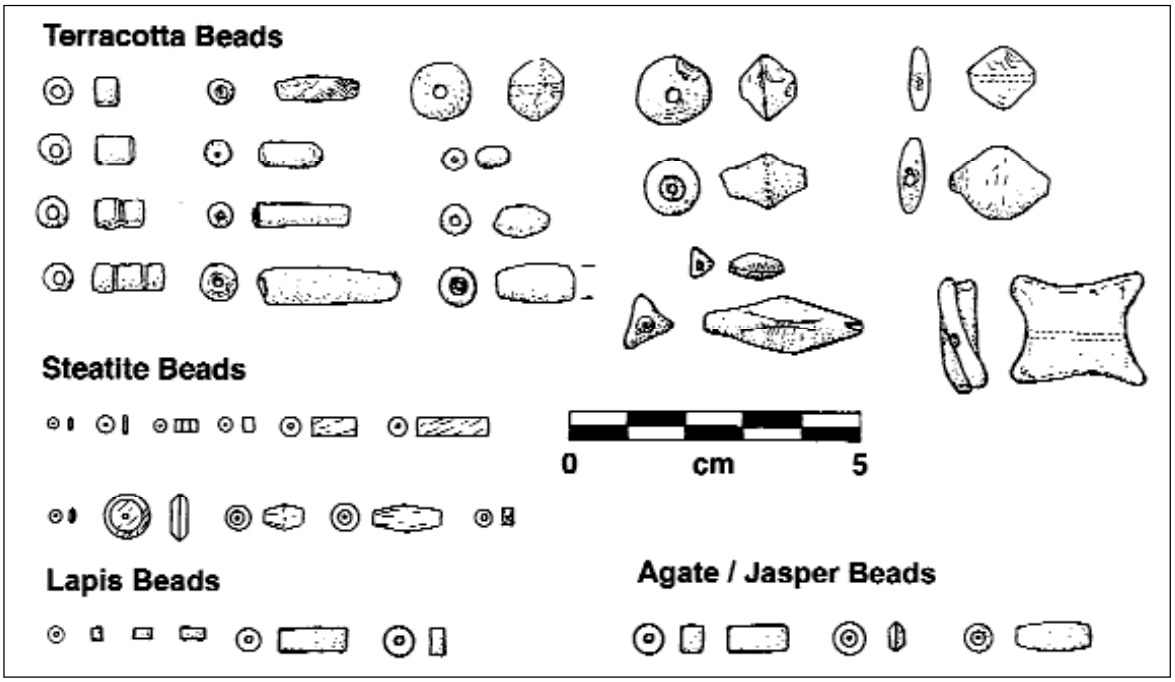

Fig. 2 – Selected Ravi Phase Beads at Harappa: 3300-2800 BC.

they may have had some specific symbolic meaning. We can assume that other perishable materials were also used for ornamentation and must keep looking for preserved examples.

This brief summary of the different types of bead production shows how each category of raw material requires distinct processing techniques and stands alone as a production technology. It is not unlikely that craftsmen were capable of making beads from different materials and some workshops may have been involved with the production of beads from several related materials. However, the specialization required for some of these technologies, such as metal, faience and hard stone bead working would suggest that they were produced in distinct workshops. In the following section, the major evidence for the different bead technologies during each major occupational period at Harappa will be presented to demonstrate how the technologies are interconnected and how they changed over time. The differences between the specific bead technologies, from raw material acquisition to final distribution of finished beads, are critical to understanding the relative "value" of beads and for defining the different ways in which production could have been controlled by elite groups (Vidale 2000).

Ravi Phase Bead Making

During the Ravi Phase occupation we have evidence for terracotta bead making as well as both soft stone and hard stone bead production (Fig. 2). Terracotta bead necklaces and isolated beads provide a wide range of shapes and styles of beads. Necklaces were made with multiple bead shapes, including long barrel, short bicone, long bicone and triangular section bicones as well as both short and long cylindrical beads. Most of the terracotta beads were undecorated, but a few have been impressed with simple weave coarse fabric to create a textured surface. The production of these beads may have taken place in the household or in conjunction with pottery making, but so far we have no direct evidence for terracotta bead production.

On the other hand we have been fortunate to find two distinct areas with evidence for soft and hard stone bead manufacture even though we have excavated only two small areas of the site (Trench 39S; 4 × 4 m and Trench 39N; 6 × 11 m). Both types of beads were being made in open areas associated with household debris, pits, hearths and domestic pottery. The distance between the two areas is only 25 to 30 m, with the hard stone beads being made in the northern area and the soft stone (steatite) in the south.

In the southern area, evidence for steatite bead production is seen in the large quantities of unfinished beads, some sawn fragments of manufacturing waste, and numerous finished beads that had been hardened and whitened by glazing and firing at high temperatures. Some of the fired beads had been decorated with a blue-green glaze which was probably made with powdered frit and copper oxide combined with a flux from plant ash (*sajji*), a process that is well documented for glazed faience (Kenoyer 1994). Steatite bead shapes are less varied than terracotta beads, and short cylindrical or disc beads are the most common. Based on SEM studies of the drill holes, it appears that the longer steatite beads were drilled by slender copper drills (Kenoyer 1997), while the shorter beads could have been perforated with sharp thorns or tiny slivers of chert.

The manufacturing debris and finished hard stone beads found in the Ravi levels reveal the use of three different perforation techniques, but the range of shapes is even more limited than that of the steatite beads. The main types are short and long biconical beads, and short and long cylindrical beads. Lapis beads were drilled with what appears to have been stone (chert or jasper) drills while carnelian beads were perforated by pecking. Beads made from amazonite, which has a fragile crystalline structure were perforated with a tapered cylindrical stone drill (Kenoyer & Vidale 1992). The presence of different drilling techniques in the same area of the site indicates the virtuosity of craftsmen who had developed specialized ways to effectively perforate different types of raw materials (Fig. 3).

Evidence from bead production and other artifacts reveal the establishment of extensive exchange networks during the Ravi Period. Beginning around 3300 BC, Harappa was connected with the agate and amazonite sources in Gujarat and Rajasthan, the lapis lazuli sources to the west and north in Baluchistan and Afghanistan, and copper resource areas in Baluchistan and/or Rajasthan (Kenoyer 1997). It was also connected to the coastal regions to the south for shell used in bangle mak-

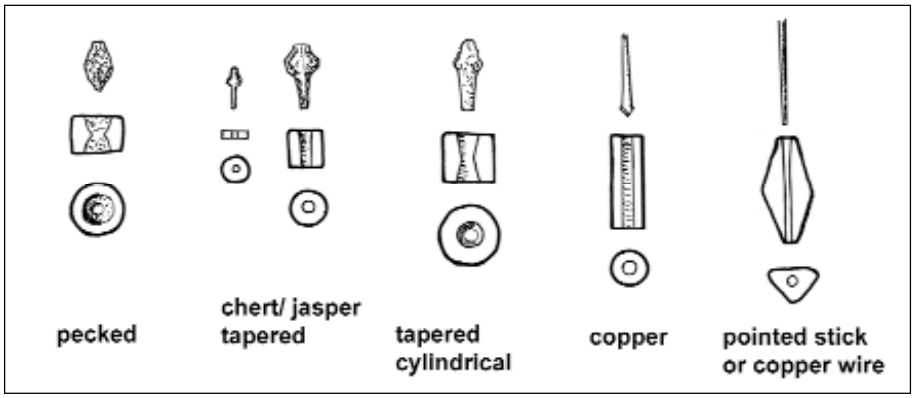

Fig. 3 – Ravi Phase Drills and Perforation Types.

ing. The household production of beads from imported raw materials suggests that some individuals or communities were engaged in entrepreneurial trade that would profit from the local production of specialized ornaments. This pattern of long distance trade and local production beginning in the Ravi Phase continued through the subsequent expansion of the site during the Kot Diji Phase (2800-2600 BC) (Kenoyer 1997).

Kot Diji Period

Although the total area of the different excavations for the Kot Diji Phase, Period 2 is much greater that that of the Ravi period, no significant primary concentrations of bead manufacturing debris have been discovered. In Trench 39N on Mound AB (13 × 15 m) it has been possible to expose a long north south street and open drain flanked by houses made of mud brick. Along the northwestern corner of Mound E (*c.* 2 × 15 m) the fragmentary remains of mud brick houses and a small kiln were discovered. The other areas where this period was exposed consist of small sondages along the city wall to the south and east of Mound E, but no significant architecture or domestic features could be defined due to the small areas of exposure (usually less than 2 × 2 m). Nevertheless, it is possible to determine the general features of the bead industry during this period based on the types of finished beads and manufacturing debris that have been recovered and the contexts in which they were found.

Finished beads of terracotta and steatite beads reveal less variation than in the earlier Ravi Phase (Fig. 4). For terracotta, the main forms are short cylindrical beads along with some short and long bicones. Fired steatite beads were primarily made in the form of short cylindrical forms or what are commonly referred to as disc beads that range in size from very small microbeads (2 mm diameter) to large discs (+ 12 mm diameter). While in the Ravi Phase, the steatite beads were relatively thick, the Kot Diji phase beads are often only 1 to 2 mm in thickness. Some of the steatite beads have been found in groups that appear to be necklace fragments of graduated bead sizes. The original complete necklace appears to have been made with hundreds of thin beads that would have formed an elegant flexible ornament. The apparent decrease in variation of terracotta and steatite beads may relate to the presence of faience technology during the Kot Diji Phase.

Although relatively few faience beads have been found, they occur in several different shapes, and a wide range of sizes. A segmented faience bead found on Mound E, indicates the production of microbeads of faience, while a large blue-green lenticular barrel from Mound AB is an example of highly refined compact faience production (Fig. 4). Hard stone beads continued to be made in a variety of materials such as agate, jasper, carnelian, lapis, as well as some new forms of stone that are totally unique and unidentified. The shapes of the stone bead have more variation than in the Ravi Phase, with long barrel, long bicone as well as lenticular and tabular shapes being added to the previous range of forms. Longer beads of hard stone had to be drilled with more effective drills, and it is possible that the development of the Ernestite drill began in the Kot Diji Phase, but so far no Ernestite drills have been recovered from these levels.

Rare examples of copper and gold beads have been found and these metal ornaments were made as short spheres or sequins. While copper and gold ornaments may have been present earlier, it is only during the Kot

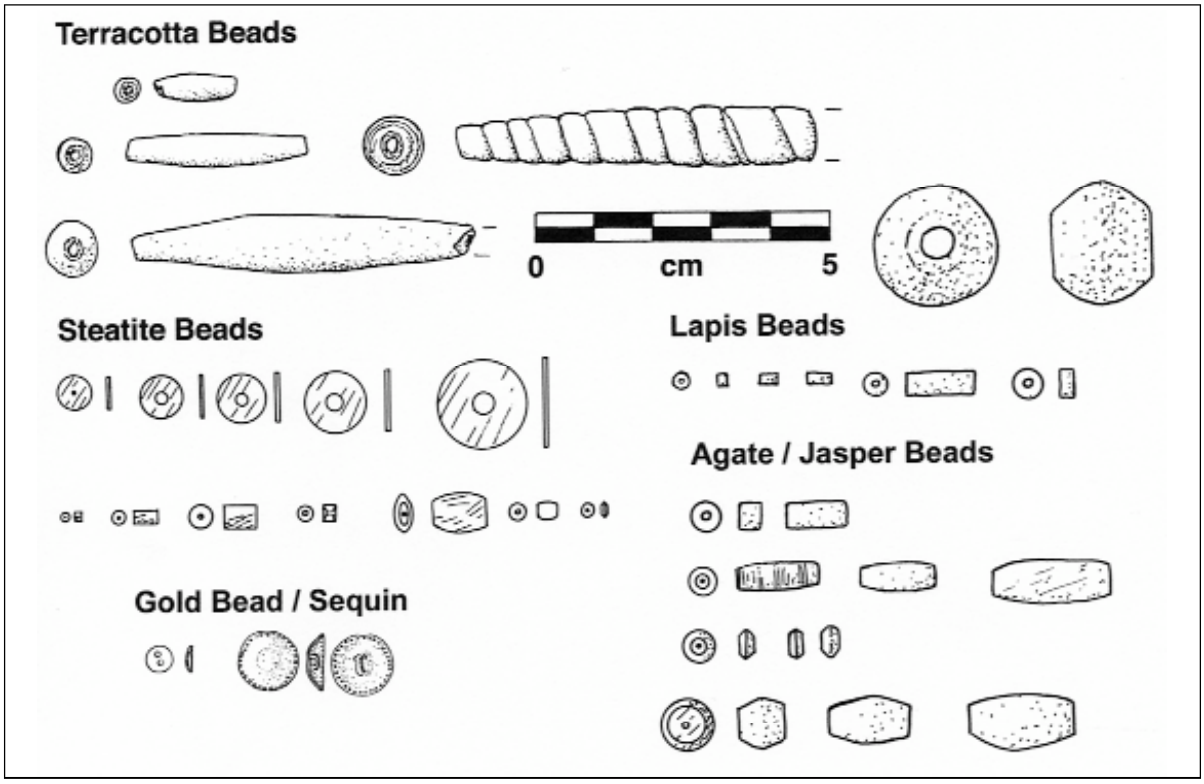

Fig. 4 – Selected Kot Diji Phase Beads at Harappa: 2800-2600 BC.

Diji Phase that they make it into the archaeological record. They have been found in drain deposits and domestic debris, which suggests that people who wore these valuable metals were quite wealthy and did not spend a lot of time trying to find lost ornaments.

The significance of the changing patterns of bead styles and variations in raw material during the Kot Diji Phase is consistent with the overall trend of site expansion and larger populations in the settlement. As the settlement grew from a small village to a larger town, there was increased standardization and specialization in some forms of bead production, such as terracotta and steatite. On the other hand we see evidence for more variation in types of bead raw materials and styles in the faience, hard stone and metal bead technologies. This variation can be associated with increased economic complexity and the emergence of social or political hierarchies within the society. It is significant that the exotic hard stone beads, as well as gold and faience beads from the wide drain on Mound AB, were found in association with seal making debris and pottery with Early Indus script. Seals and writing are indicators of economic and political power and the people with this power may have been the ones using and losing their ornaments in this part of the site.

Harappan Period

Most of the evidence for bead making at Harappa comes from the Harappa Phase, Period 3 (2600-1900 BC). Beads appear to have been made from every available material and in a wide range of styles. Since Harappa phase bead production has been extensively discussed in other articles (Bhan *et al.* 1994; Kenoyer 1986, 1994, 1997; Vidale 2000) only the major patterns will be discussed here. Terracotta beads were once again made in many different shapes and sizes (Fig. 5), with even more variation than seen during the Ravi Phase. This same pattern is seen in the manufacture of steatite beads. What is most significant, is that both terracotta and steatite raw materials were used to replicate shapes and styles of beads made from other materials. Long biconical beads of terracotta were painted red to imitate the valuable long carnelian bicones. Steatite was painted red and white or incised and inlaid with different colors to imitate stone beads. This same pattern is seen in faience beads, where the colors of faience glazes appear to have been made to imitate turquoise, lapis, shell or white steatite, and even carnelian. Even in the production of hard stone beads, we see carnelian being painted to imitate natural orbicular

jasper with eye designs. Copper was alloyed with tin to create a golden color and many copper beads with high tin content may have been made to imitate more precious gold beads.

The production of beads that look similar but are made from different qualities of materials represents an extremely important new aspect of Harappan society. Bead ornaments were clearly important for ritual or economic status and they appear to have been worn as public displays of ideology, status, wealth and/or power. However, people who were unable to afford original raw materials were still able to wear ornaments that looked similar, even if they were made from less valuable materials. This aspect of the bead industry suggests that beads were being used in two different ways within the Harappan society. On the one hand, elites would have been distinguishing their status and wealth by wearing beads made from exotic materials or produced through exquisite manufacturing processes. Examples would be the exotic patterned jasper beads with eye designs, long carnelian beads perforated with slender Ernestite drills (Fig. 6), or tiny microbeads (1 mm diameter) made from steatite (Fig. 5). At the same time, other communities would have been wearing imitations of these more valuable ornaments either for their ritual value or in an attempt to emulate the elites. The shared styles of ornaments reflects the vertical integration of hierarchical Indus society, while the variations in raw materials and technology can be seen to reflect ritual, economic or political status.

Another important aspect of stone bead making relates to the people who actually acquired the raw materials and produced the beads, as well the communities who controlled the production and distribution of fin-

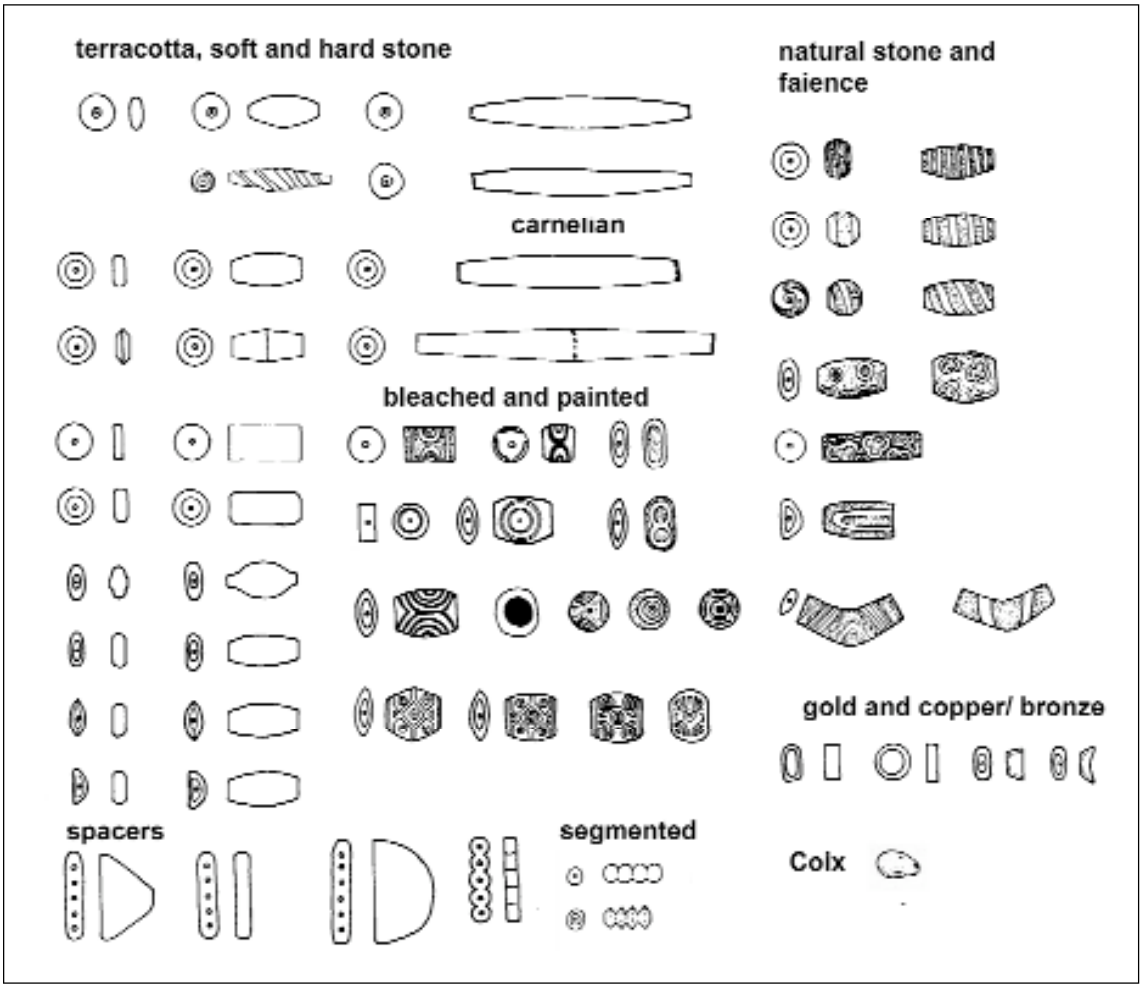

Fig. 5 – Selected Harappa Phase Beads at Harappa: 2600-1900 BC.

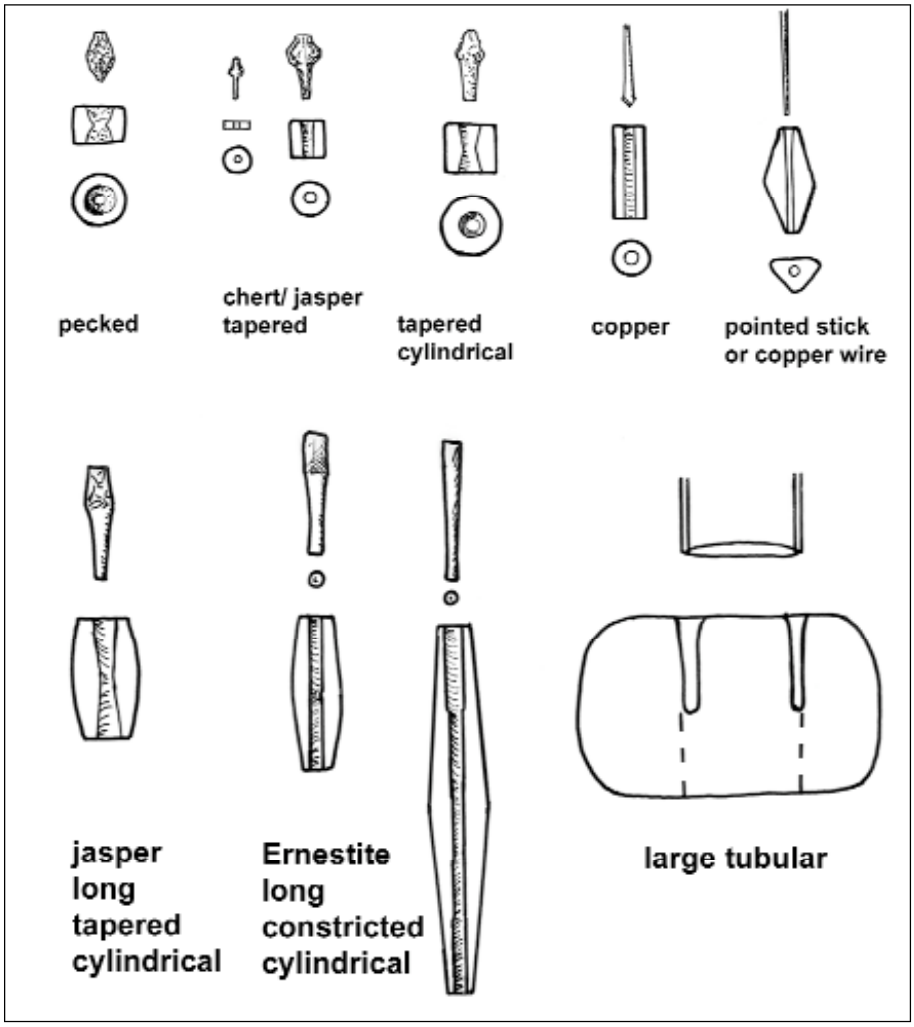

Fig. 6 – Harappa Phase Drills and Perforation Types.

ished beads. For example, agate and steatite bead making represent two very different craft traditions and both of these technologies developed side by side at Harappa, beginning in the Ravi Phase. However, as outlined above, the organization of production stages and the varying uses of pyrotechnology, drilling techniques and finishing are quite distinct.

Limited excavations of the early levels of the Harappa Phase (Period 3A, *c.* 2600-2450 BC) on both Mound AB (Trench 42) and Mound E (Trench 54), have revealed distinct concentrations of steatite bead manufacturing debris. This indicates that specialized workshops for steatite disc bead production were located in both of the major mounds and the discovery of manufacturing debris in other areas suggests that there may have been several competing workshops within each walled sector of the city. The absence of agate manufacturing debris in direct association with the steatite debris would indicate that hard stone bead production was located in other parts of the mound or in adjacent areas that were not excavated.

Horizontal excavations in levels dating to Period 3B (*c.* 2450-2200 BC) provide a larger exposure of craft activity areas along the western edge of Mound E (Trench 54). Debris found in ancient dumps along the street and between houses, as well as in house fill, contained stone beads, agate flakes and steatite manufacturing debris. Other crafts in the area include pottery making, gold working, and a workshop for the production of beads and inscribed tablets made from both faience and steatite. The association of these crafts in one general area inside the ancient city walls is an important pattern for understanding the role of these crafts in the overall economic and political structure of the urban center. It is possible that each walled mound at Harappa had more

than one area for craft activities, and during the following Period 3C there are distinct locations on each mound, usually just inside a major gateway, where we see the association of many related crafts.

On Mound E, copper working, that may have included the production of copper beads, is concentrated in the south central area of the site, just to the north of a major gateway. Manufacturing debris from agate bead making, steatite bead manufacture, and shell working (possibly including shell beads) is located in the main north south street leading from the gateway into the center of Mound E. It is assumed that a major craft production area is located somewhere along this major street. On Mound ET, a similar pattern of debris is found in the street leading down to a different gateway, and in this part of the site a large area with workshop debris from many different crafts was excavated. Primary bead manufacturing areas have been identified on the basis nodule fragments, flaking debitage, bead blanks, partly drilled beads, several different types of spent drills (Fig. 6), and drill manufacturing waste. Microdebitage from all stages of steatite and agate bead manufacture has been recovered from some floors inside rooms and courtyard areas. Excavations in adjacent areas of the site have no evidence for steatite or agate bead working.

Other crafts in this area include faience ornament and possibly bead production, gold working, shell ornament and inlay manufacture, as well as bone and ivory working. All of these crafts may also have included the manufacture of beads, but this remains to be confirmed through further analysis of the manufacturing debris. In addition, this area has evidence for chert weight manufacture, and chert tool production that may have been associated with wood working or furniture inlay setting. The overall pattern in this part of the site indicates that bead making was restricted to a small area inside the gateway, associated with numerous other specialized crafts as is seen in craft bazaars of traditional cities of the subcontinent today. Although the location of these crafts in a restricted area inside the gateway cannot be interpreted as direct control by urban elites, it does indicate a degree of indirect control through the regulation of movement into and out of the craft area. The presence of chert weights and weight manufacturing debris in the area just inside the gateway may indicate the taxation of goods coming into or leaving this walled sector of the city (Kenoyer 1997).

Late Harappan Period

No manufacturing areas have been discovered from the Late Harappan period levels at the site since most of them have been destroyed by brick robbing. However, a collection of assorted beads in a small pot in a Late Harappan house does provide a glimpse of technological innovation, changing trade networks and socio-economic hierarchies during the Late Harappan period (Kenoyer 1997). A total of 133 beads and other objects were found in the pot, but here we will focus only on the Late Harappan beads, which can be defined by their unique shapes, style of manufacture and raw material (Fig. 7).

Steatite beads with new styles of incised decoration indicate that this raw material continued to play an important role in the bead industry. The Late Harappan faience beads in the pot were made in unique shapes and with different coloring than during the Harappan period. Azure blue faience beads may have been intended to replicate lapis lazuli, while the bright turquoise colored faience of the Late Harappan period is extremely compact and glassy. A red-orange colored glass bead that looks very much like imitation carnelian was also found in the pot and represents the earliest glass in the Indus Valley. The pot was found in levels dating to before 1700 BC and possibly even as early as 1900 BC. On the basis of this well dated bead and numerous other surface finds that appear to date to the Late Harappan period, we can say that glass production in the Indus valley is an indigenous development and slightly earlier than glass production documented in Mesopotamia and Egypt. The earliest sustained glass production in Mesopotamia is around 1600 BC and in Egypt it appears around 1500 BC (Moorey 1994: 190 ff).

The emergence of new styles and techniques is also seen in technological features and types of raw materials used for stone beads from the Late Harappan period. Hard stone beads appear to have been drilled using a tiny copper tube with abrasive sand (Fig. 8). This new technique appears to have replaced the more efficient use of Ernestite drills, which have not been found from this period. Although we do not know the exact source of Ernestite during the Harappan period, it probably came from the general regions of either modern Gujarat or Baluchistan, which were also the source for carnelian and jaspers. The lack of these drills and the apparent decline

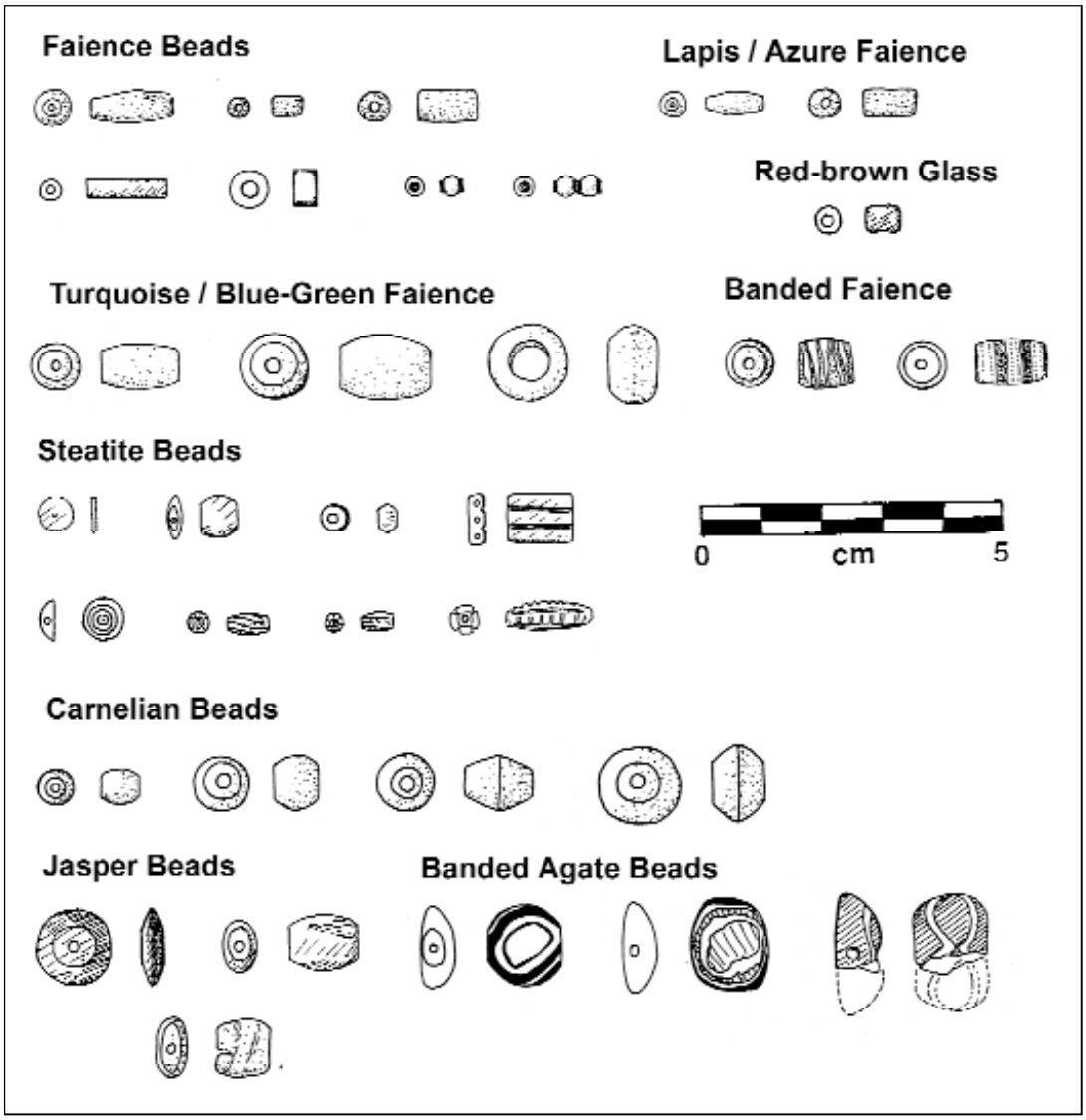

Fig. 7 – Late Harappan Beads at Harappa: 1900-1700 BC.

in the use of carnelian and lapis indicates the breakdown of long distance exchange within the greater Indus valley during the Late Harappan period. This restructuring of regional trade is also suggested by the absence of shell ornaments and the use of new raw materials for beads, such as banded black and white agates. These unique stones do not appear to have been available during the Harappan period and may have been obtained from new source areas further to the east in the central Deccan plateau or the Vindhyan mountains (Kenoyer 1995).

When the evidence from stone bead making is combined with other artifacts and architectural features, it is clear that major changes were happening in the economic, political and ideological spheres of the Late Harappan period. However, contrary to the model of decline and decay proposed by earlier scholars, the bead industry reveals technological innovation, new styles of ornaments and the exploitation of new source areas. While the common people may have continued to wear ornaments of terracotta or other more easily produced materials such as steatite, the faience, glass and stone beads represent a dynamic bead industry and discerning urban consumers.

Conclusion

Bead making techniques and styles of beads from the major periods at Harappa provide a unique perspective on the complex history of this important settlement. Unlike subsistence activities or the production of utilitarian tools, bead makers were involved in creating ornaments that could be used and in most cases viewed by all members of the society. The selection of rare and exotic materials and the development of more refined technologies allowed early bead makers to produce objects that had both beauty as well as power.

During the initial settlement of Harappa (Period 1, 3300-2800 BC), the Ravi phase bead makers were highly skilled in making tiny beads from material brought from great distances to the site. The soft steatite and hard agate became the foundation of later bead making technologies. Although these two technologies remained distinct throughout the history of the site, they were often practiced side by side in larger craft areas of the city. During the Harappan Phase, specifically in Period 3C (2200-1900 BC), we see bead making workshops established in each of the major walled sectors of Harappa.

Since bead making was one of the main crafts used to create objects used to reinforce social and ritual status within the Indus cities, it would have been important for elites and merchants to be able to control the production of high value ornaments. While the knowledge of specific bead technologies may have been passed on within a single community, the actual production and distribution could have been controlled, either directly or indirectly by merchants or urban elites. One example of more direct control is seen in the faience and steatite workshop excavated in 2000-2001, where beads were being made along with inscribed tablets (Meadow *et al.* 2001) (see Meadow & Kenoyer in this volume). However, most of the bead production at Harappa appears to have been controlled indirectly by situating craft areas within walled sectors of the city. In addition to protecting the market places filled with valuable goods, the walls and gateways of Harappa would have allowed for the taxation of both bead raw materials being imported into the city as well as finished beads and ornaments leaving the city.

As is evident from this brief overview, the general patterns of continuity and change in the bead industry can be outlined on the basis of recent work at Harappa. However, additional work remains to be done on the sourcing of raw materials and specific aspects of technology as well as the distribution of finished beads within the city of Harappa and surrounding sites. Further excavations are also needed to understand the nature of the Kot Diji phase bead industry and Late Harappan bead production. It is clear however, that the study of Indus bead making and its legacy will continue to provide valuable insights on the processes underlying the emergence of Indus urban centers.

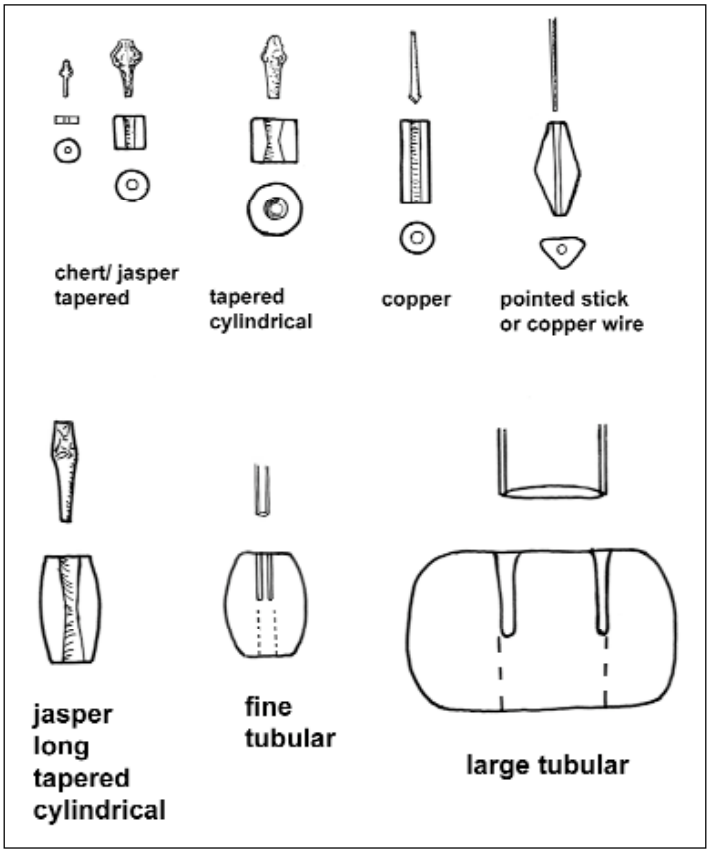

Fig. 8 – Late Harappan Perforation Types.

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