

SOUTH ASIAN ARCHAEOLOGY 1999

Proceedings of the Fifteenth International Conference
of the European Association of South Asian Archaeologists,
held at the Universiteit Leiden,
5-9 July, 1999

edited by
Ellen M. Raven

EGBERT FORSTEN • GRONINGEN

2008

Typesetting: Piet Hazeveld
Photo on cover: Candrababha, West Bengal (fig. 38.5)
Courtesy Indian Museum, Kolkata

This book was printed with financial support from the
J. Gonda Foundation, Amsterdam
and the
International Institute for Asian Studies, Leiden and Amsterdam



ISBN 978 90 6980 155 1



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The Indus Talc-Faience Complex

Types of Materials, Clues to Production

Heather Margaret-Louise Miller, *Toronto*

The talc-faience complex of materials well represents the intricacy of Indus artificial (human-created) materials. Classification of these materials is difficult, as they are almost identical in appearance even under low magnification, and descriptions in the literature are thus often incomplete or confusing. Based on research by a number of scholars, I am able to provide the first comparative, descriptive terminology for these various materials since E.J.H Mackay's outlines (1931; 1938). This should allow a more uniform description of these artefacts in the future.

I also provide an overview of the probable processes of manufacture for these materials and the objects created from them (fig. 7.1). A more detailed discussion can be found in H.M.-L. Miller (1999:Chapter 4). These production reconstructions are still regrettably incomplete, which is especially apparent once I turn to possible craft indicators. I will update past descriptions (Miller 2000) and provide illustrations of a variety of archaeological debris from high-temperature firing events.

Material types and production processes for the Indus talc-faience complex

I particularly want to stress the inter-related nature of the artificial materials in the talc-faience complex. These materials are linked not only by their very similar physical appearances, but also in their overlapping raw-material components. In addition, they likely had connections during the process of production, whether through the recycling of by-products such as talc powder, or in the use of similar techniques of production. They may well have been made in the same workshops. Recent analytical work, supporting some of the suggestions by early researchers,¹ has begun to identify the many types of talcose and siliceous materials produced by Indus craftspeople.

General terms: talc, faience, paste

General terminology is advisable until materials have been analyzed. Only after analytical characterization would I recommend using some of the precise terminology described below, such as 'talcose paste', 'siliceous faience', etc. Instead, 'talc' can be used for objects made of a talcose stone material, whether massive stone or possibly powdered talc / steatite. 'Faience' can be used in cases where there is clearly a vitreous matrix, but analytical studies have not yet been done to show whether the matrix is strictly siliceous or includes talc. The inclusive, non-specific

term 'paste' can be used for objects of all types (see below) which can be visually distinguished as *not* being made of massive talc. Thus 'pastes' could include talc / steatite paste as well as the cores of talcose or siliceous faiences. Mackay (1938:497) employed 'paste' in this fashion, as did Vidale (1989a). If possible, appropriate descriptive adjectives should be added, such as 'glazed paste', 'white paste' or 'white paste with blue-green glaze'.

Massive talc and glazed massive talc

'Talc' refers to the massive variety of the talcose minerals, often called 'steatite' by Indus archaeologists (cp. Vidale and Bianchetti 1997; Miller 1999:292-293). In general, 'talc' and 'steatite' are interchangeable terms, referring to the same mineral structure, $[\text{Mg}_3(\text{Si}_4\text{O}_{10})(\text{OH})_2]$. However, technically the two are differentiated on the basis of particle size: talc refers to coarser-grained platy forms, whereas steatite (or crypto-crystalline talc) refers to fine-grained, more homogeneously textured forms (Schüller and Kromer 1987:396; Grimshaw 1971:326). While there are some measurable differences,² these two forms of the mineral are difficult to differentiate even with

1 Mackay 1931; 1938; 1943; Sana Ullah 1931; references in Vidale 1989a.

2 For example, steatite transforms to clinoenstatite at a lower temperature than talc (Grimshaw 1971:326, fn.); see Schüller and Kromer (1987) for other differences.

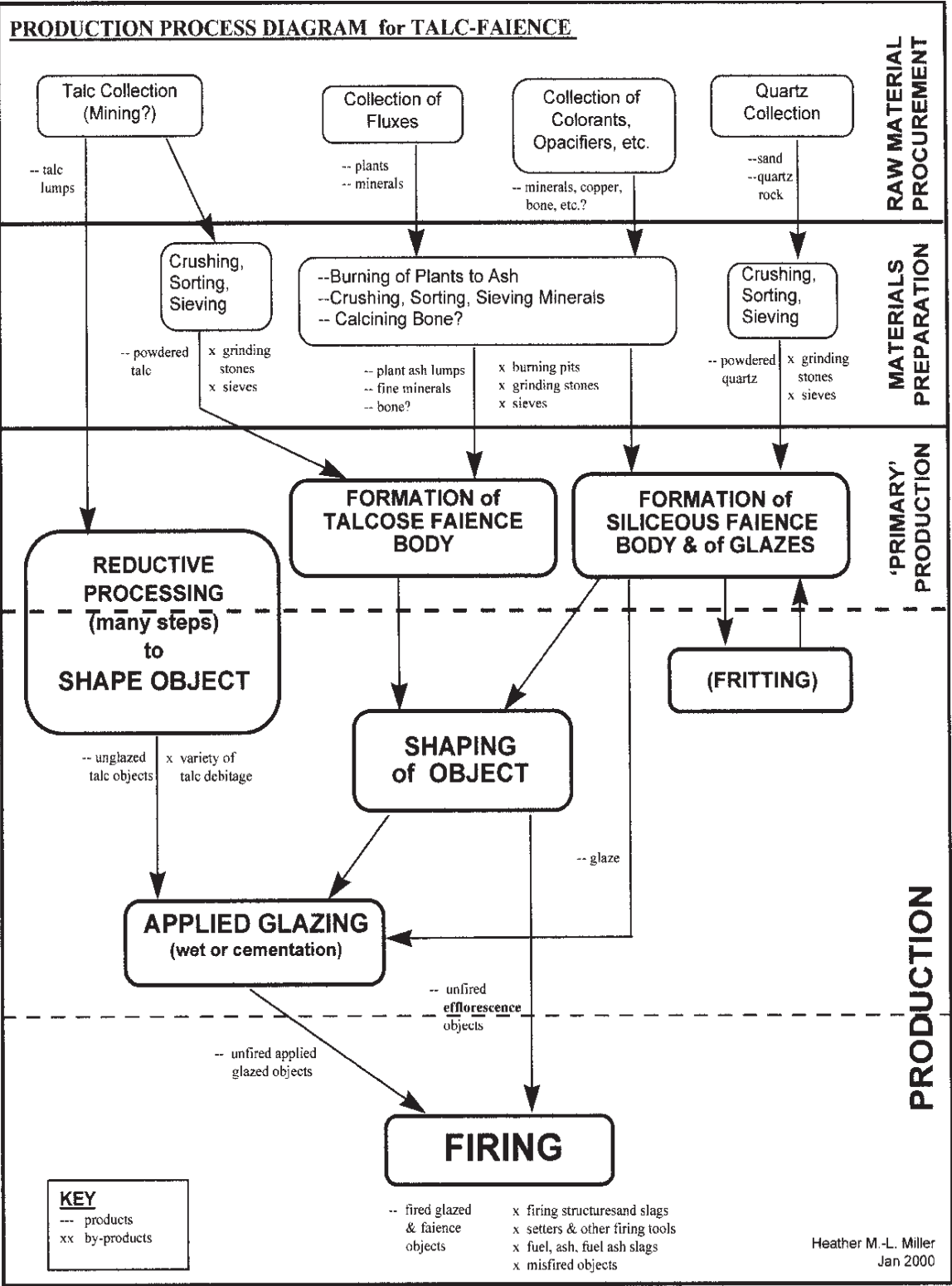


Fig. 7.1 Outline of production processes for the talc-faience complex

laboratory analyses. I use the more general term ‘talc’, but it will be important to determine if steatite (vs. talc) was used by the Indus peoples to make certain types of objects, particularly suspected ‘paste’ beads as described below.

Of all the materials in the talc-faience complex,

massive talc (both glazed and unglazed) has been by far the best studied.³ Massive talc in a variety of

3 Barthélémy de Saizieu and Bouquillon 1994; 1997; Bouquillon and Barthélémy de Saizieu 1995; Mackay 1931; 1938; 1943; Rissman 1989; Vanzetti and Vidale 1994; Vidale 1986; 1987; 1989a; 1989b; 1989c; 1992; 1995; 2000; Vidale and Bianchetti 1997; Vidale and Shar 1991.

colours (white, creme, light green, grey-black) was brought to Indus sites.⁴ This soft stone (1 on the Mohs scale) was processed by carving, sawing and grinding, using chert or copper tools, then polished or smoothed, and fired to high temperatures. Talc becomes quite hard after firing (about 6 on the Mohs scale), and if fired to a high enough temperature (800-1000 °C for most talcs), all colours of talc become bright white.

Talcose stone was used primarily to make beads, seals and tokens, but also for inlay pieces, small figurines and sculptures. In contrast to faience, massive talc was not commonly used to produce either small vessels or bangles. Massive talc was also sometimes glazed, particularly the beads, usually with a blue-green colour. There is increasing evidence that Indus talcose objects were glazed more often than generally thought, as the glaze often breaks down during the thousands of years of burial, leaving only trace amounts (Barthélémy de Saizieu and Bouquillon 1997).

Even tiny chips of talc debris were made into beads; a hoard of drilled but not rounded micro-bead-sized chips was found by Mackay at Chanhu-daro.⁵ Tiny debris chips and powder were used in refractory objects (see below). Talc powder was used in the body of talcose faience ('steatite faience') objects, and may have been used to manufacture 'talc paste' beads. Thus, recycling of talc was a major part of the manufacturing process, and recycled talc an important raw material.

Talc / steatite paste and glazed talc / steatite paste

Mackay (1931; 1938:495) first suggested that the Indus people made some of their 'steatite' beads from a paste rather than from the massive stone, particularly the disc and micro-beads. Hegde, Karanth and Sychanthavong (1982) and Vidale (1989a; 2000) also considered the use of a paste likely for the production of microbeads, based on their small size (average diameter of 1 mm) and surface appearance, especially the nature of the *striae* running along the exterior of the beads. Mackay (1931) suggested that a paste was formed into blocks, which were then cut, drilled and ground in the same way as massive talc. In contrast, Hegde, Karanth and Sychanthavong (1982) and Vidale (1989a) both proposed the creation of long, tiny tubes by extrusion methods. Extrusion, if practical, would have allowed the rapid mass-production of disc beads and / or microbeads, which were certainly produced by the thousands in some fashion. These paste beads would then be fired, either uncoated or glazed.

Unfortunately, it is extremely difficult to differentiate fired massive talcose stone from re-formed talcose powder, even analytically. The very existence of such a paste is thus currently equivocal. Experi-

mental studies have not yet duplicated such proposed paste beads. A major stumbling block lies in the exact composition of the paste, particularly in how the paste was bound together. Clay is usually suggested as a binder, but no trace of clay was found analytically by Hegde, Karanth and Sychanthavong (1982:241). However Vidale (2000) found traces of anorthitic plagioclase in some beads, indicating that a very small amount of clay may have been admixed with a talc paste (see note 4).

If talc paste did exist, it may be that it was simply produced by the exertion of strong pressure without a binder, something Mackay (1931) also casually suggested. Modern electrical applications employ talc materials, and if true steatite is used (that is, a very fine-grained material), a dry paste can be solidly bound simply by exerting pressure (Schüller and Kromer 1987; Rosenthal 1949).⁶ Hence the importance of distinguishing true steatite from talc in the beads of the Indus civilization, as five thousand years ago Indus craftspeople may have discovered this unusual property of true steatite.

Talcose faience ('steatite faience')

Mackay (1931; 1938) also described a type of glassy faience made with a talcose-based body, which he called 'steatite faience'. This composition was confirmed by Hamid's and Sana Ullah's analyses, as well as by modern analytical identifications.⁷ It appears to be a uniquely Indus material, not found elsewhere (Barthélémy de Saizieu and Bouquillon 1997:75). Talcose faience, at least that found at Mehrgarh and Nausharo, was composed of talc fragments 'embedded in a fine matrix made of talc, flux elements and a colouring agent (copper oxide)' (Bouquillon and Barthélémy de Saizieu 1995:50).

Talcose faience and some of the siliceous faiences were apparently all created in much the same way, although with different compositions of the main body (fig. 7.1). Quartz, whether from sand or stone,

4 Possible sources of talc are found to the West throughout Baluchistan (Vidale and Bianchetti 1997; Vidale 2000), and to the East in many areas of modern India, especially Rajasthan. Much of the archaeological talc found at Indus sites contains distinctive secondary mineral compounds, which may make it possible to eventually trace the Indus sources. However, such a project would involve sampling a large number of these unhomogeneous source areas (Vidale and Bianchetti 1997).

5 Personal observation of collection at the Museum of Fine Arts Boston.

6 I am in the process of experiments with true steatite materials, to see if binding by pressure is a feasible method of manufacturing disk beads.

7 Barthélémy de Saizieu and Bouquillon 1997; Bouquillon and Barthélémy de Saizieu 1995.

was finely ground.⁸ For talcose faience, talc chips and powder would be ground. This quartz (and talc) powder would then be mixed with a flux to lower the melting point of the powder and cause sufficient fusion of the material. Any binders used would have been added at this point, as well as any desired colourants or possible opacifiers.⁹ The mixture would then be wetted and formed, either by hand or in a mould.

Talcose faience has provided a clear link between the talcose and siliceous industries, but has also made the discussion of Indus talcose and siliceous materials even more complex. The work by Barthélemy de Saizieu and Bouquillon (1997) has provided a highly informative chronological sequence of bead types from Mehrgarh / Nausharo that seems to reflect stages in the development of new materials: glazed massive talc beads, talcose faience beads and siliceous faience. The talcose faiences disappear at Nausharo during the Indus period ('Mature Harappan'), once the siliceous faiences become abundant. However, all types of faiences were rare in these assemblages, which were dominated by massive talcose beads throughout the sequence. In contrast, the two samples analysed from Mohenjo-daro (fragments of a figurine and a small vessel) were definitely talcose faiences, and from 'Mature Harappan' contexts (Mackay 1931:576). Furthermore, Mackay (1931:576) and Barthélemy de Saizieu and Bouquillon (1997:67-68) all clearly state that these objects, found on analysis to be talcose faience, were indistinguishable from siliceous faiences on the basis of visual examination. Much of the 'faience' identified at many Indus sites may well be talcose faience rather than siliceous faience.

Siliceous faiences

Indus siliceous faience refers to several distinct varieties of an opaque, glassy material made primarily of quartz, and similar to Egyptian and Mesopotamian 'faience'. Laboratory analyses of Indus siliceous faience objects have been done by Basu, Basu, and Lele (1974) and McCarthy and Vandiver (1991). The production of Indus siliceous faience is currently under study.¹⁰ It was used by the Indus peoples to make beads, bangles and other ornaments, tokens or tablets with inscriptions, figurines, small vessels and inlay pieces.

In general, the basic manufacturing processes for the siliceous faiences were the same as those described above for the production of talcose faiences.¹¹ However, manufacturing processes differed depending on the method of glazing employed. These manufacturing techniques, as deduced from laboratory and experimental studies, include:

- a body with a separately applied wet glaze;
- a body glazed by cementation of a separate glaze; and

- a body self-glazed by efflorescence of materials from within the body.

These varieties are succinctly described for Mesopotamia and Egypt by Moorey (1994:182-186), who summarizes the extensive work by Vandiver, Kaczmarczyk and Hedges, Tite and others. While all three of these varieties appear to be found in the Indus, at least some of the Indus techniques differ from Mesopotamian and Egyptian techniques, including the use of a pre-fired frit.

Glazing

Many of the various talc-faience materials were composed of a body and a glaze, which were often of different compositions. Thus, a major challenge for the artisan was insuring the correct binding of the glaze to the body, both before and after firing. The wet glaze had to sufficiently adhere to the body and not drip off, but not be absorbed into the body completely on drying. The fired glaze had to be sufficiently bound to the body so it did not flake off, but excessive shrinkage of the glaze had to be avoided or the glaze would crack or craze. The glaze composition and / or the firing regime would have had to be somewhat different for each body, and for each of the three primary methods of glazing: wet applied glaze, cementation and efflorescence.

8 It is possible to produce siliceous faience using normal river sand as the source of quartz (Moorey 1994:183), and pockets of clean sand are available throughout the Indus floodplain. Thus, for at least some of the siliceous faiences, all of the major raw materials were available within the main Indus valley. However, for white faiences and glazes, and probably for higher-quality faiences and glazes of all types, crushed quartz stone would more likely have been used. Most of the sands contain some iron, which would colour the faience or glaze, so pure mineral quartz would be the most straightforward way to produce a white material. Possible alternative methods of producing white faiences and glazes from less pure quartz would include the use of various opacifiers, such as lead or perhaps bone (Miller 1999:301-304).

9 See Miller 1999:302-304 for more on fluxes, binders, colourants and opacifiers.

10 Barthélemy de Saizieu and Bouquillon 1997; Kenoyer 1994; Miller 1997; 1999; 2000; Vidale 1986; 1987; 1989a; 1989b; 2000.

11 As for the talc pastes, the use of clay as a binder has been suggested for siliceous faiences, particularly as alumina is found in the bodies of at least some samples (McCarthy and Vandiver 1991). However, McCarthy and Vandiver (1991:504-505) note that (1) no traces of ferroginous clay were seen in the body microstructure, and (2) the Indus valley clays were too high in iron to have been added in sufficient amounts to supply the quantity of alumina found. Additionally, if Indus clays were added, we should see evidence for anorthitic plagioclase produced by the sintering of the clay above 1000 °C, as noted for possible talc pastes. It seems likely to me that the Indus peoples were adding some unknown material to *all* of their pastes, something relatively high in alumina in comparison to its iron content. By examining all of the pastes together and looking for analogous patterns in their composition, it may be easier to solve this problem than by considering them separately.

After creating a body, whether of massive talc or of one of the pastes,¹² two methods could be used to apply a separate glaze: application of a wet glaze or cementation. For an applied wet glaze, the body would either be painted or dipped in a separately manufactured, coloured siliceous glaze, then fired.¹³ In the process of cementation, glaze is 'applied' by firing the body embedded in a dry powdered-glaze mixture (Moorey 1994:184).¹⁴ The silica in the body and in the glaze are 'wet' at high temperatures (around 1000 °C), but the lime or other unreactive material in the glaze powder is not, so the objects do not stick to the bed of powder. The presence of lime or some similar material in the glaze powder is thus crucial.

Cementation would work best on bodies containing at least some silicate, allowing a bond between the silicates in the body and the glaze powder as they both are heated. Bodies made of massive talc or talc paste were thus probably glazed with an applied wet glaze. However, cementation might have been used for talcose faience objects, and was definitely used for some of the siliceous faiences. Note that cementation removes the pre-firing difficulties of glaze-to-body adherence inherent in wet glaze application. Use of cementation as the primary method of faience production would explain both the lack of numerous setting marks on Indus faience objects, and the lack of evidence for setters with glaze marks.

The third method of glazing, efflorescence, could only be used for the faiences. Some of the Indus faiences were truly 'self-glazing'; that is, a separate glaze was not applied, but formed from the migration of materials within the body of the faience (Moorey 1994). In this method, alkalis (usually from plant ash) within the body of the faience migrate to the surface during drying, and precipitate or *effloresce* out to form a powdery layer. The drying stage is thus very important, and the faster the drying, the thicker the glaze coat. During firing, this layer fluxes the silicates in the surface of the body and creates a glazed surface. Any desired colourants are thus included in the body of the object. Kenoyer (1994) concluded that efflorescence was the primary method of Indus faience production, as the glaze surface showed no discontinuity with the body material in the objects he examined, either in bonding or in colour. As with cementation, this method avoids the pre-firing glaze-to-body adherence problems of a wet glaze application method, and many of the post-firing adherence problems are much reduced. However, a setter with a non-stick surface would be needed.

One unique type of Indus faience produced by self-glazing through efflorescence included the additional creation of a pre-fired frit, from which the body was produced (McCarthy and Vandiver 1991). The use of frit adds an additional stage to the process, but creates a very strong, smooth, glossy material. Pow-

dered quartz would be mixed with a colourant and a flux, partially melted ('fritted'), then reground again to a fine powder (Kenoyer 1994; McCarthy and Vandiver 1991). Multiple stages of fritting and regrinding may have taken place to produce a particularly fine material (McCarthy and Vandiver 1991). The powdered fritted material would then be mixed with more flux and possibly a binder, and then formed and fired. The objects produced would be very homogeneous and so stronger, allowing the production of such structurally precarious objects as the Indus faience bangles (McCarthy and Vandiver 1991).

Craft indicators related to the talc-faience complex

The vast majority of talc-faience manufacturing debris published to date is from the forming stages of massive talc objects (see references in note 3). No forming tools for any of the paste-based objects have been reported. Many of these objects appear to be individually hand-formed, so few tools would be required, beyond grinding stones to produce the powders and vessels to mix the pastes. While at least some faience objects were formed in moulds, no such moulds have been found, perhaps because they were made of fine-grained woods that have not been preserved.

One would expect debris from the firing stages of glazed and faience objects to be particularly conspicuous, as *all* types of materials in the talc-faience complex were fired to temperatures of 1000 °C or higher. However, the types of firing structures, setters, containers and tools used are still largely unknown. Here I provide an overview and update of previously published descriptions of possible firing tools (Miller 1997; 1999; 2000), with illustrations.

Wasters

Relatively few mis-fired or mis-glazed objects ('wasters') have been noted from Indus sites. There are

12 There are a handful of terracotta objects with glaze from Mohenjodaro; a few beads (Mackay 1931) and a few sherds from the lowest levels (Mackay 1931; Plenderleith 1931). A unique, roughly cylindrical, sand-tempered terracotta fragment was excavated by HARP from debris levels on the South side of Mound E at Harappa in 1990. It was covered with a heavy blue-green glassy glaze (true, crazed glaze), and also had tiny bone fragments on one surface, but it has not yet been analyzed. So while the technique of glazing terracotta was known to the Indus peoples, it appears to have been little used, and I will not discuss it here.

13 I assume that glazed massive talc was not fired before it was glazed, as it seems likely that the glaze would adhere better to the softer unfired material. However, I would appreciate any comments about this assumption. Also, see Miller (1999:309) for information on the much debated 'glazed' or 'burnt' white surface of massive talc / steatite seals.

14 Cementation is often referred to as 'self-glazing' (like efflorescence) because no wet glaze mixture is applied *prior* to firing. However, the glaze is still a separate material applied to the body, but *during* the firing.

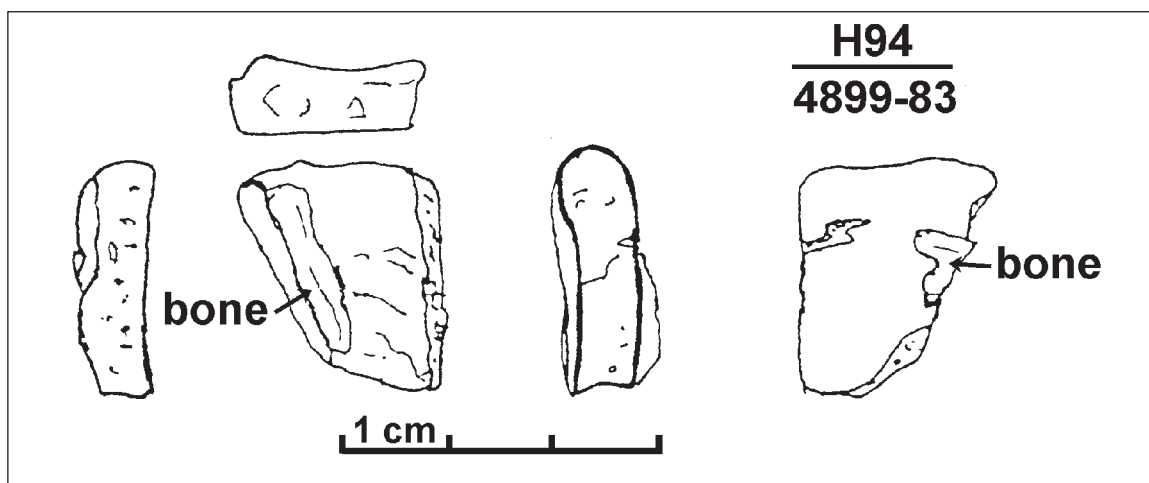


Fig. 7.2 White / creme siliceous fragment with bone, from excavations at Harappa

occasional beads stuck together by glaze, as well as examples of setter marks, but no systematic study of such marks has been done. Kenoyer has suggested that the few blue-green faience objects with reddish cores are underfired, and future analytical work on these objects should be informative. However, no overfired, melted wasters of glazed talc or faience objects have been reported, not even from areas with suspected faience / glaze manufacturing debris. The lack of such wasters is quite surprising, given the likely precarious nature of these very high-temperature firing systems. It is possible that wasters of paste-based materials could have been ground to powder and re-used to make new objects, but experimental studies are needed to test this suggestion.

Prepared paste

No debris from fritting stages of faience manufacture has been identified, in particular no crucibles, although these pyrotechnological by-products should be quite well preserved archaeologically. While there are two proposed types of 'prepared paste', only the first set is likely to be the product of a fritting stage.

The first set consists of two small flattened fragments from the 1994 HARP excavations on the Southwest corner of Mound ET at Harappa (fig. 7.2). The matrix is made of an opaque, whitish-creme paste material, coarse-grained, but very homogeneous. The individual grains are held together in a fused, somewhat glassy matrix.¹⁵ Based on these characteristics, these fragments were probably made from a siliceous paste, although they have not yet been analytically tested. Both of these objects also had one or two bone fragments embedded in one of the flat surfaces.

Secondly, Mackay (1943:234-235) suggested that the 'paste plaques and cylinders' he found at Chanhudaro were perhaps fragments of a prepared siliceous paste used to make faience. However, attributes of

these materials fit better with Vidale's (1987) suggestion that these were setters or kiln elements for the firing of glazed materials, as described below.

Possible firing tools

There are no published firing structures for any of the talc-faience complex materials (Miller 1999:317-319), although a faience kiln is reported from Kuntasi (personal communication, Vasant Shinde). Vidale (1987) has speculated that this is because small, impermanent structures made out of movable elements may have been used. If so, a number of the objects illustrated here may have functioned as kiln elements, as well as firing containers and setters.

Many of the talc-faience complex materials would need to be placed on setters with a 'non-stick' surface, or they would have surface scars from sticking to the setters during firing. In addition, many of these objects may have been fired in containers, to protect them from smoke and atmospheric variation within the firing structure, especially as firing conditions can so radically affect the colours of glazes (Moorey 1994:184-186). I will discuss several types of possible containers and / or setters identified to date.

Talc-coated clay containers

These objects are fragments of flat-based, vertical-sided clay containers, almost L-shaped in cross-section (fig. 7.3). They are 1-2 cm thick and usually heavily straw-tempered. Some seem to be fragments of large dishes, but at least some appear to be fragments of very large open-ended troughs (Miller 1999:321; Miller 2000). These 'troughs' may have been either firing containers or elements of a firing structure it-

¹⁵ In my first publication of these materials (Miller 1997) I stated that these objects were similar to the 'paste plaques' found at Chanhudaro (Mackay 1943; Vidale 1987). This is not correct. The objects from Harappa are dense, hard and siliceous, while the paste plaques from Chanhudaro are much softer and more friable.

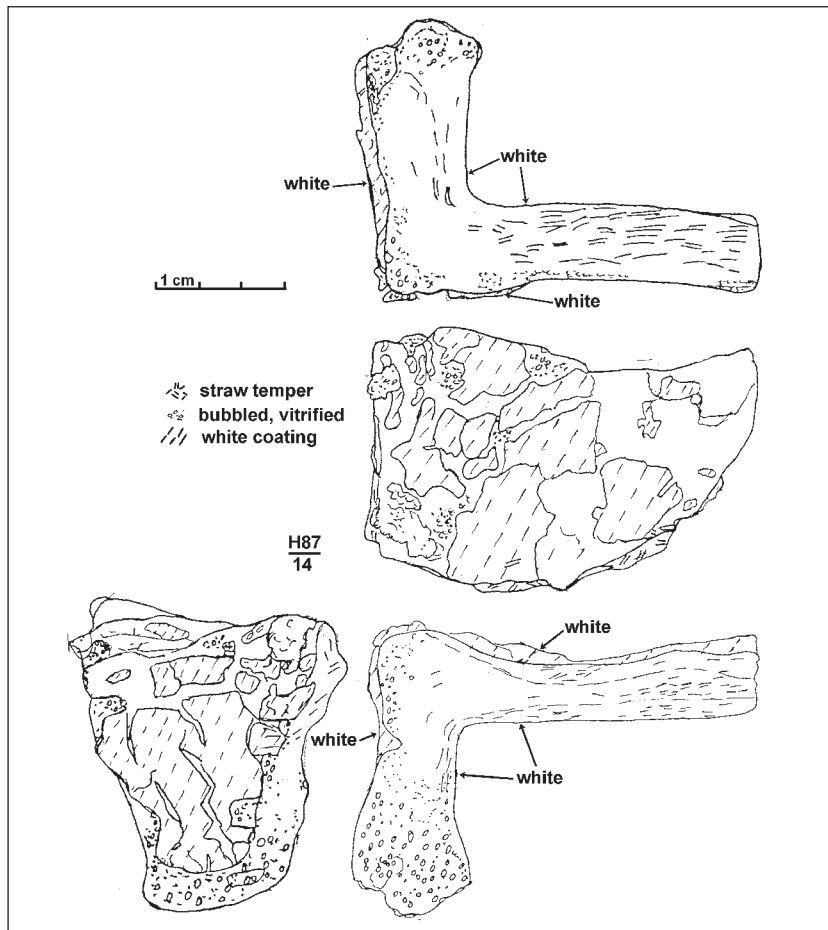


Fig. 7.3 Talc-coated clay container, from excavations at Harappa

self. Their distinctive characteristic is one or more coatings of a white paste or powder, usually on both inner and outer surfaces. SEM microprobe analysis and X-ray diffraction analyses identified this powder in all cases as enstatite; that is, talc / steatite heated to above 1000 °C.¹⁶ Based on tentative associations with massive talc manufacturing debris at Harappa and the similarity to the firing temperature of talc / steatite objects (more than 800-900 °C), we suspect that these objects were firing containers for *unglazed* talcose objects (no traces of glaze have been found on any of these objects to date). The coatings were perhaps used both to increase the heat resistance of these objects (hence the coating on both interior and exterior) and also to prevent objects from sticking during firing.

Paste plaques and cylinders

Paste plaques and cylinders are known only from Chanhu-daro.¹⁷ Mackay (1943:234) described these as flat rectangular 'plaques' and slightly tapered cylinders, made of a 'white, porous paste with a texture like a fine pumice but sufficiently friable to be scraped away easily with the finger-nail'. I very briefly examined nine of these fragments from Mackay's excavations, which are now in the collections of the Museum of Fine Arts in Boston. These are small objects,

all less than 10 cm in length and 5 cm in width, and are described more fully elsewhere (Miller 1999:316-317, 322-323). Their white matrix seemed much softer than a quartz-based silica, perhaps instead talc paste, gypsum, lime, or pressed cakes of a very pure, highly-siliceous plant ash. The last possibility is enhanced by the structure of the needle-like matrix, which to my unaided eye appeared to include shapes like very fine chaff (*paleas* or seed coats), and which was certainly not fused like the siliceous fragments from Harappa (above; see also Vidale 1987:59). Many of the local desert plants used to make plant ash have a very high silica content, which would fit Lucas' conclusion as to the siliceous nature of the matrix (Mackay 1943:234). Examination under a microscope combined with very simple analytical tests could answer this question.

Other attributes of these objects support Vidale's (1987) suggestion that they were setters or kiln elements for the firing of glazed materials. Like the plaques and cylinders found by Sher and Vidale (1985), some of the objects in the Boston Museum of Fine Arts had traces of an unidentified white powder

¹⁶ Miller 1997; 1999:321; Miller 2000.

¹⁷ Mackay 1943:234-235, pl. 91/12-13, 20-22; Sher and Vidale 1985; Vidale 1987; 1989b.

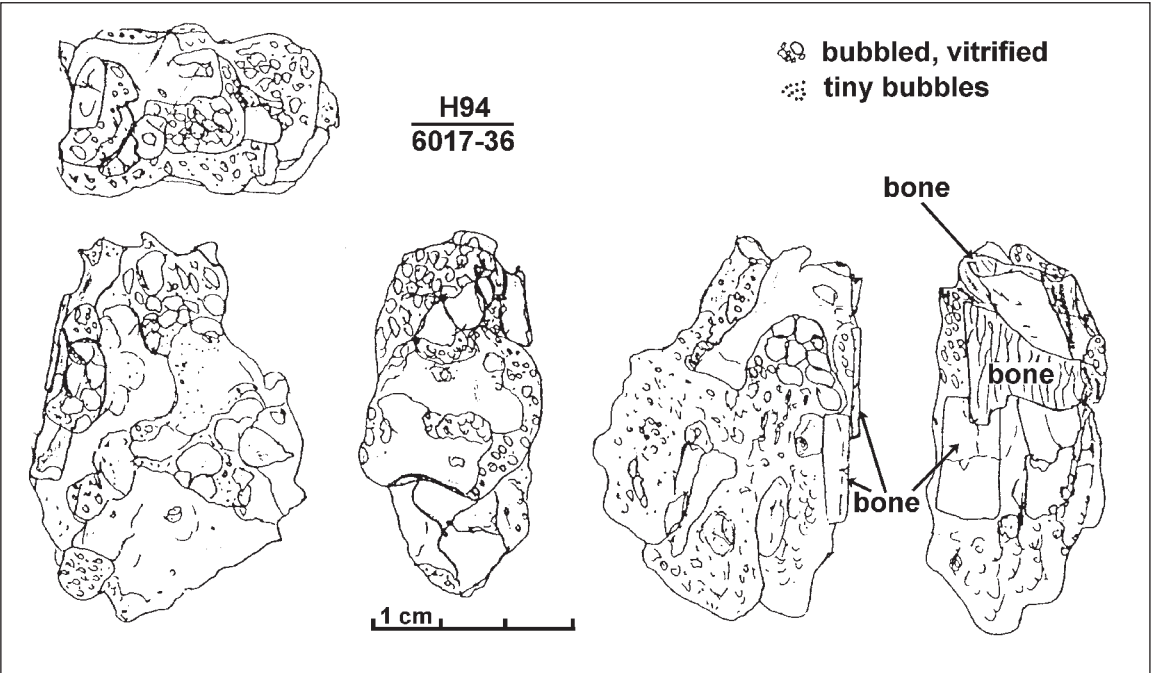


Fig. 7.4 ‘Frothy’ slag with bone, from surveys at Harappa

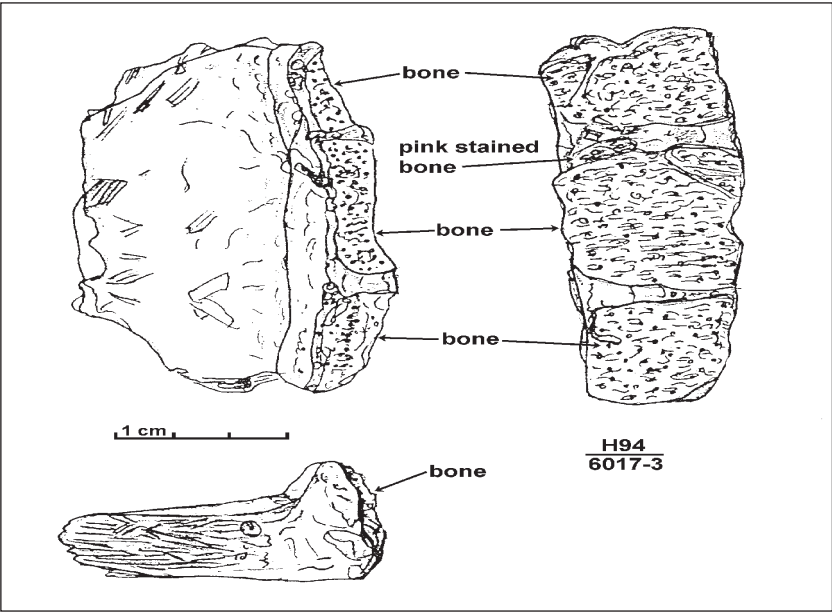


Fig. 7.5 Straw-tempered clay fragment with large bone fragments (‘kiln’ slag), from surveys at Harappa

on their surfaces, some contained visible chips of talc (including unfinished bead fragments), several also had patches of ‘frothy slag’ (as described in the next section) on one of their faces, and one had a single glaze drip.¹⁸

Bone-related slags

The ‘bone-related slags’ encompass a very diverse range of debris types, all of which contain animal bone fragments of various sizes either on their surfaces or in their matrices. Such materials have only been reported from Mohenjo-daro and Harappa, with only the most common types (‘frothy’ slags and

glazed bone) reported from Mohenjo-daro. The remaining types all come from recent excavations and surveys at Harappa, and have been thoroughly described in recent publications.¹⁹

There are very few of these materials, and they tend to show discrete distributions. The most common type at Harappa are light-weight, light-coloured, highly porous or ‘frothy’, amorphous fragments which often contain relatively large (1-2 cm)

18 See Vidale (1987) for very detailed descriptions of the similar objects found by their surveys at Chanhudaro, including photographs and line drawings.
19 Miller 1999:323-334, 422-428, 441-442; Miller 2000.

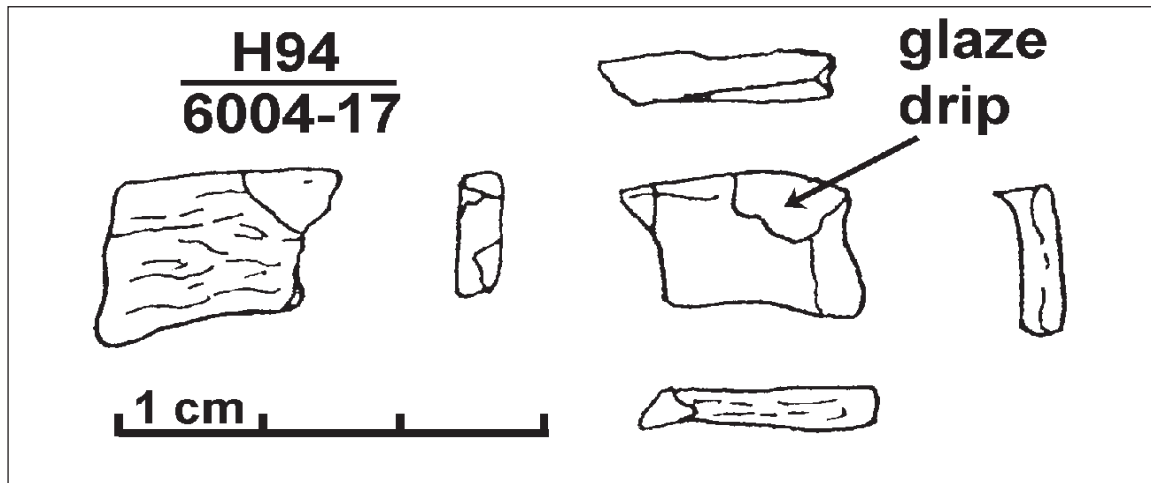


Fig. 7.6 Glazed bone fragment, from surveys at Harappa

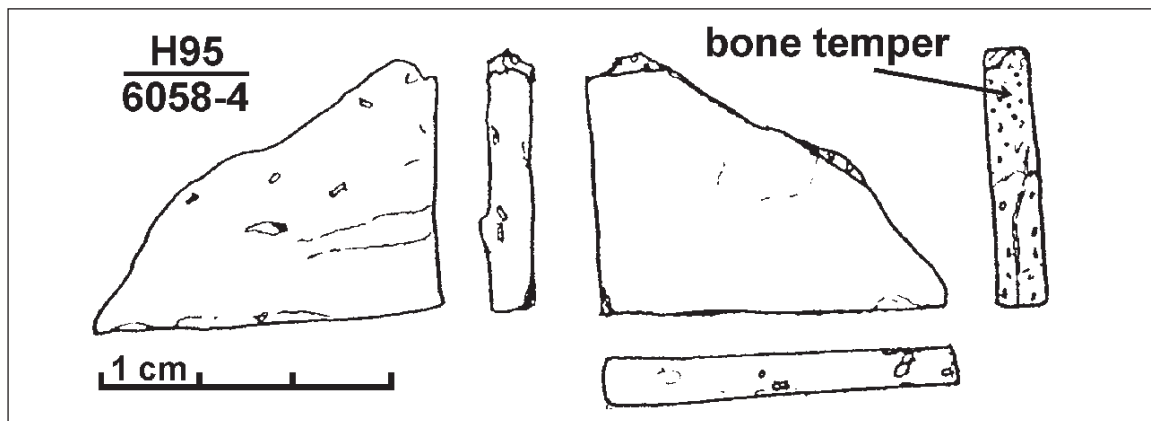


Fig. 7.7 Thin bone-tempered 'tile', from surveys at Harappa

bone fragments on one or two surfaces (fig. 7.4). Straw-tempered clay fragments with vitrified, glossy surfaces scattered with medium to large bone fragments are the next most common type (fig. 7.5), followed by fragments of flat bones (often coloured pink) with drips of greenish glaze (fig. 7.6). Less than a dozen bone-tempered flat 'tiles' with glossy / glazed surfaces have been found (fig. 7.7), at least one with fabric impressions on one of the flat surfaces. A very rare type includes a half-dozen fragments of thin, flat, hand-formed clay objects with their interior surface covered with tiny fragments of bone (fig. 7.8). Two of these each have a single, entire talc / steatite microbead on its glazed, bone-scattered surface.

'Frothy' slags and glazed bone were found by the IsMEO surveys at Mohenjo-daro, where they are referred to as glaze-like residues, slags or drops (Vidale 1986; 1987:57-58, 65). Vidale suggests that the two assemblages found represent glazing of talc objects, with the bone splinters acting as a flux. It is striking that, while both sets of Mohenjo-daro scatters contain 'frothy' slag, bone splinters *and* talc debitage,

none of the various types of bone-related assemblages at Harappa are directly associated with talc chips (with the exception of a single microbead in each of two objects, both of the type shown in fig. 7.8).

Although it is now clear that the association of bone with all of these slags is not just a fortuitous association, the activity involved is still unknown. Rubbish burning or ritual sacrifice seem unlikely.²⁰ It does seem likely that a number of different activities are involved, perhaps including faience manufacture, talc / steatite object glazing, talc micro-bead production, glue manufacture and deliberate calcining of bones for other uses. In short, research on these and the other debris materials is only just beginning.

20 As explained in Miller 1999:422-423; Miller 2000.

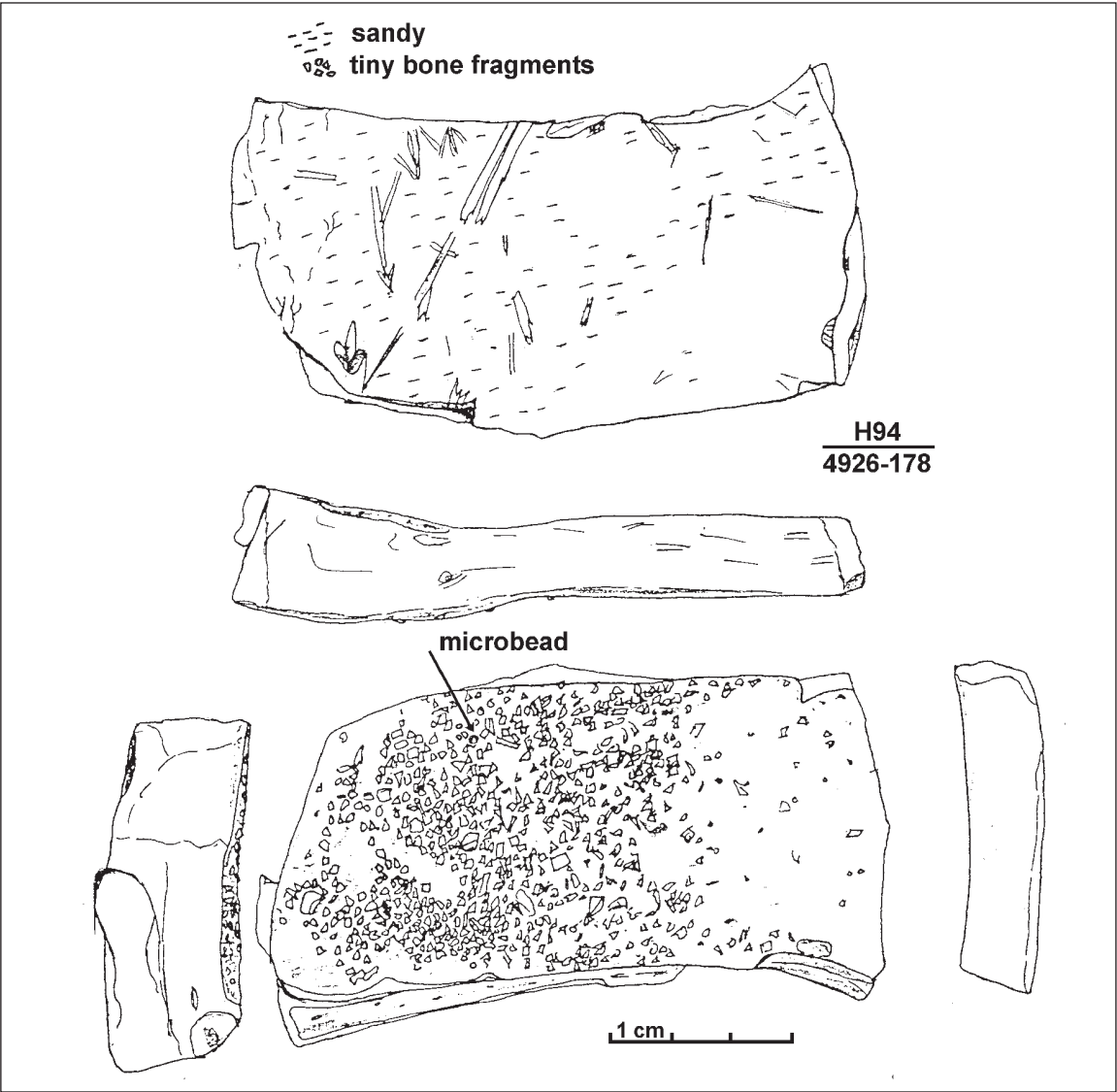


Fig. 7.8 Flat clay fragment with tiny bone fragments (and microbead) on interior surface, from excavations at Harappa

The importance of the talc-faience complex

The unexpected diversity of the talc-faience complex of materials, all producing end-products quite similar in appearance, offers to provide a remarkable amount of information about the process of innovation in an ancient society. The similarity or difference in manufacturing techniques (once we can identify manufacturing areas) will provide crucial data on the technological aspects of inventing new materials. The history of development and the distribution of these objects will give us insights into the economic and social reasons for the development of new materials.

Once we have a better idea of the appearance, disappearance, relative proportions and contexts of these various materials at different Indus sites through time, we can begin to look for patterns.

Does the invention of new materials and the abandonment of old relate to changes in accessibility to the raw materials, as the Indus sphere of influence grows and diminishes? Or does increasing demand for such objects across a wider range of economic and social classes encourage the development of new imitations made from cheaper, more accessible raw materials? These questions address the very essence of Indus society, and what better data set to use than the quintessence of Indus technical ability, the talc-faience complex.

Acknowledgments

Many, many thanks to Anne Bouquillon, Blanche Barthél  my de Saizieu and the Laboratoire de Recherche des Mus  es de France, Louvre, for ana-

lyses of some of these materials. Mark Kenoyer and Massimo Vidale, along with Anne and Blanche, have been invaluable sources of information and ideas. The Museum of Fine Arts Boston kindly allowed access to their Chanhudaro collection. Heidi J. Miller deserves special thanks for arranging the visit and providing copies of her slides of the 'paste plaques and cylinders'.

References

- Barthélemy de Saizieu, B., and A. Bouquillon 1994. Steatite working at Mehrgarh during the Neolithic and Chalcolithic periods: quantitative distribution, characterization of material and manufacturing processes. In: A. Parpola and P. Koskikallio (eds), *South Asian Archaeology 1993*, Vol. 1, pp. 47-59. Helsinki.
- 1997. Evolution of glazed materials from the Chalcolithic to the Indus period based on the data of Mehrgarh and Nausharo. In: R. Allchin and B. Allchin (eds), *South Asian Archaeology 1995*, Vol. 1, pp. 63-76. U.S.A. and New Delhi [etc.].
- Basu, M.K., S.K. Basu and R.V. Lele 1974. 4000 years old faience bangles from Punjab. *Bulletin – Central Glass and Ceramic Research Institute* 21/44:85-90.
- Bouquillon, A., and B. Barthélemy de Saizieu 1995. Découverte d'un nouveau matériau dans les parures de la période pré-Indus de Mehrgarh (Balochistan): la "faïence" de stéatite. *Technè: la Science au Service de l'Histoire de l'Art et des Civilisations* 2:50-55.
- Grimshaw, R.W. 1971. *The chemistry and physics of clays and allied ceramic materials*. 4th rev. ed. New York.
- Hegde, K.T.M., R.V. Karanth and S.P. Sychanthavong 1982. On the composition and technology of Harappan microbeads. In: G.L. Possehl (ed.), *Harappan civilization: a contemporary perspective*, pp. 239-244. New Delhi [etc.]. Repr. in G.L. Possehl, *Harappan civilization: a recent perspective*, 2nd rev. ed. (1993), pp. 239-244. New Delhi.
- Kenoyer, J.M. 1991. Ornament styles of the Indus valley tradition: evidence from recent excavations at Harappa, Pakistan. *Paléorient: Revue Pluridisciplinaire de Préhistoire et Protohistoire de l'Asie du Sud-Ouest* 17/2:79-98.
- 1994. Faience from the Indus Valley civilization. *Ornament* 7/3:36-39, 95.
- Mackay, E.J.H. 1931. Ivory, shell, faience, and other objects of technical interest. In: J.H. Marshall (ed.), *Mohenjo-daro and the Indus civilization: being an official account of archaeological excavations at Mohenjo-daro carried out by the Government of India between the years 1922 and 1927*, Vol. 2, pp. 562-588. London.
- 1938. *Further excavations at Mohenjo-daro: being an official account of archaeological excavations at Mohenjo-daro carried out by the Government of India between the years 1927 and 1931*. Delhi.
- 1943. *Chanhudaro excavations 1935-36*. New Haven. (American Oriental Series 20)
- McCarthy, B., and P. Vandiver 1991. Ancient high-strength ceramics: fritted faience bracelet manufacture at Harappa (Pakistan), ca. 2300-1800 B.C. In: P. Vandiver, J. Druzik and G.S. Wheeler (eds), *Materials issues in art & archaeology II: symposium held April 17-21, 1990, San Francisco, CA*, pp. 495-510. Pittsburgh. (Materials Research Society Symposium Proceedings 185)
- Miller, H.M.-L. 1997. Locating ancient manufacturing areas: high-temperature manufacturing debris from surface surveys at Harappa, Pakistan. In: R. Allchin and B. Allchin (eds), *South Asian Archaeology 1995*, Vol. 2, pp. 939-946. U.S.A. and New Delhi [etc.].
- 1999. *Pyrotechnology and society in the cities of the Indus valley*. Ph.D. thesis, University of Wisconsin. Madison.
- 2000. Reassessing the urban structure of Harappa: evidence from craft production distribution. In: M. Taddei and G. De Marco (eds), *South Asian Archaeology 1997*, Vol. 1, pp. 77-100. Rome.
- Moorey, P.R.S. 1994. *Ancient Mesopotamian materials and industries: the archaeological evidence*. Oxford.
- Plenderleith, H.J. 1931. Note on glazed pottery. In: J.H. Marshall (ed.), *Mohenjo-daro and the Indus civilization: being an official account of archaeological excavations at Mohenjo-daro carried out by the Government of India between the years 1922 and 1927*, Vol. 2, pp. 692-693. London.
- Rissman, P. 1989. The organization of seal production in the Harappan civilization. In: J.M. Kenoyer (ed.), *Old problems and new perspectives in the archaeology of South Asia*, pp. 159-170. Madison. (Wisconsin Archaeological Reports 2)
- Rosenthal, E. 1949. *Pottery and ceramics: from common brick to fine china*. Harmondsworth. (Pelican Books A201)
- Sana Ullah, M. 1931. Notes and analyses. In: J.H. Marshall (ed.), *Mohenjo-daro and the Indus civilization: being an official account of archaeological excavations at Mohenjo-daro carried out by the Government of India between the years 1922 and 1927*, Vol. 2, pp. 686-691. London.
- Schüller, K.-H., and H. Kromer 1987. Properties of talcs and steatites, with emphasis on ceramic applications. In: L.G. Schultz, H. van Olphen and F.A. Mumpton (eds), *Proceedings of the International Clay Conference, Denver, 1985*, pp. 396-399. Bloomington.
- Sher, G.M., and M. Vidale 1985. Surface evidence of craft activity at Chanhudaro, March 1984. *Annali dell'Istituto Universitario Orientale* 45/4:585-598.
- Vanzetti, A., and M. Vidale 1994. Formation processes of beads: defining different levels of craft skill among the early beadmakers of Mehrgarh. In: A. Parpola and P. Koskikallio (eds), *South Asian Archaeology 1993*, Vol. 2, pp. 763-776. Helsinki.
- Vidale, M. 1986. Steatite cutting on glazing: relational aspects of two technological environments in Harappan urban contexts. *East and West*, n.s. 36/1-3:520-525.

——— 1987. The paste plaques and cylinders of Chanhudaro: a descriptive report. *Annali dell'Istituto Universitario Orientale* 47/1:57-66.

——— 1989a. Early Harappan steatite, faience and paste beads in a necklace from Mehrgarh-Nausharo (Pakistan). *East and West*, n.s. 39/1-4:291-300.

——— 1989b. Specialized producers and urban elites: on the role of craft industries in Mature Harappan urban contexts. In: J.M. Kenoyer (ed.), *Old problems and new perspectives in the archaeology of South Asia*, pp. 171-181. Madison. (Wisconsin Archaeological Reports 2)

——— 1989c. A steatite-cutting atelier on the surface of Moenjodaro. *Annali dell'Istituto Universitario Orientale* 49/1:29-51.

——— 1992. *Produzione artigianale protostorica: etno-archeologia e archeologia*. Padua.

——— 1995. Early beadmakers of the Indus tradition: the manufacturing sequence of talc beads at Mehrgarh in the 5th millennium B.C. *East and West*, n.s. 45/1-4:45-80.

——— 2000. *The archaeology of Indus crafts: Indus craftspeople and why we study them*. Rome. (Reports and Memoirs ; Series Minor 4)

Vidale, M., and P. Bianchetti 1997. Mineralogical identification of green semiprecious stones from Pakistan. In: R. Allchin and B. Allchin (eds), *South Asian Archaeology 1995*, Vol. 2, pp. 947-953. U.S.A. and New Delhi [etc.].

Vidale, M., and G.M. Shar 1991. Zahr-Muhra: soapstone-cutting in contemporary Baluchistan and Sind. *Annali dell'Istituto Universitario Orientale* 50/1:61-78.

Illustrations

All illustrations by the author.

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- 7.4 'Frothy' slag with bone, from surveys at Harappa.
- 7.5 Straw-tempered clay fragment with large bone fragments ('kiln' slag), from surveys at Harappa.
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