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The Paste Plaques and Cylinders of Chanhudaro:
A Descriptive Report

1. INTRODUCTION

The present brief report may be considered as a further development of the research the author is carrying out on Harappan craft industries and labour organization, as a candidate to the Research Doctorate at the Istituto Universitario Orientale, Napoli and as a member of the Joint German-Italian Archaeological Mission to Moenjodaro (Bondioli et alii 1984; Pracchia et alii 1985; Vidale n.d.). In particular, this contribution details an aspect of a previous paper (Vidale 1985) centered on the artefactual evidence suggesting, at Moenjodaro, some kind of convergence between steatite-working and glaze-smelting in specialized pyrotechnological contexts. On the other hand, the paper describes in greater detail some relevant classes of Archaeological Craft Indicators (Tosi 1984) recovered in the site of Chanhudaro (Mackay 1943), recently revisited for a brief surface inspection (Sher and Vidale 1985).

To simplify the discussion, the information so far available on the arguments we are discussing may be summarized in the following points:

a) *Surface evidence from Moenjodaro, 1982-85*

Out of the about 50 Craft Activity Areas (hereafter AA.) so far detected on the surface of Moenjodaro, 2 yielded artefactual remains suggesting glaze-smelting (AA. 38 and 48). The two sites might be considered as part of a localized series of small-sized AA. possibly linked by relationships of technological interdependence (Vidale 1985). This set of AA. shares the common occurrence of steatite debitage, often exhibiting saw marks. In one case (AA. 48) drops of glaze-like material have been found still sticking, in a primary smelting context, to steatite chips. The two sites with glaze-like residues were characterized by a very similar association (vitreous glaze-like slags, steatite debitage and bone micro-splinters) whose technological meaning is still largely a matter of speculation.

In AA. 38 we observed small bone fragments embedded and partially melted in small glaze-like slags (Vidale 1985: fig. 15, d, e). It is remarkable, finally, to find two possible rim-fragments from crucible or saggur-like containers characterized by a chaff-temper and some vitreous encrustations (appearing very similar to the glaze-like material). In either case the surface concentrations with steatite, bone fragments and glaze-like remains did not exceed 2-4 sqm. of ground extension.

b) *Excavation data from Chanhudaro (1935-36)*

One of the last paragraphs in the Chanhudaro report's "Miscellaneous Objects" section is entitled "Paste Plaques and Cylinders" (Mackay 1943: 234-235; Pl. XCI, 12-13, 20-22). These two types of objects in the same material evidently occurred together, in relatively large amounts, across the excavated compound of Mound II. Such a material is described as being "... white, porous... with a texture like a fine pumice but sufficiently friable to be scraped away easily with the finger nail" (Mackay 1943: 234). Lucas (*ibidem*) found that this paste contained finely divided silica (a feature recalling the composition of the refractory body of faience ceramics). In accordance with this line of interpretation, Mackay thought that plaques and cylinders could represent prepared lumps of raw material for faience-making: no explanation was attempted of the morphological variability of the two artefactual types. It is noticed (*ibidem*: 235) that one of the recovered cylinders (reproduced in Pl. XCI, 20) had "patches of glaze adhering to one of its sides (sic!)" (*ibidem*: 235. Cf. p. 235 with p. 318, 20). We read, moreover, that a number of these objects were found together in an ashy deposit, possibly representing a sub-primary deposition (in Sq. 9/E, locus 171) within a very disturbed architectural context. Another possible concentration was encountered in the excavation of the northern test trenches.

c) *Surface observation at Chanhudaro (March 1984)*

A short survey of the Chanhudaro compound, although in the form of an unsystematic visit (Sher and Vidale 1985) allowed us to get a first-hand impression of some aspects of the craft production carried on in the Mature Harappan phases. Among the various surface localizations yielding concentrations of archaeological craft indicators, we have been able to single out two small patches characterized by the cooccurrence of steatite and glaze-like residues. Moreover, the sites restituted some bone pieces and fragments of some distinctive objects closely corresponding to the "paste" artefacts described by Mackay, somehow thus closing

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the circle and suggesting that the steatite glaze convergence observed at Moenjodaro should be considered within the same technological framework of the Chanhudaro finds.

In the fall of 1984, following the mentioned brief survey, some students collected from the main excavation dump at Chanhudaro a small group of fragments of paste objects which the author handed over to the Department of Archaeology and Museums of Pakistan. This small collection offered the opportunity of effecting a more detailed examination of the most relevant morphological features of these indicators. In spring 1985 the author spent some days at Khairpur, effecting the preliminary descriptive analysis forming the subject of the present paper.

2. DESCRIPTION OF THE COLLECTED FRAGMENTS: THE PLAQUES

The examined collection includes 9 fragments (fig. 1) which would have been described by Mackay as "paste plaques". No complete specimen is on record. Judging from the specimens published in the excavation report (Fig. 2) the original size of these ceramic barrets should have ranged around $7-10 \times 2-3 \times 1$ cm. They have a roughly rectangular contour and an irregularly rectangular section; the distal extremity of the barrets appears to be in some cases dilated both in width and in thickness. The ceramic material of which the plaques are made is very similar in all the observed specimens; it shows a whitish-buff homogeneous colour and the fracture surfaces generally reveal a dense chaotic structure of micro-voids (Mackay's pumice-like structure) with sheet or needle-like form. In the ceramic body are visible frequent inclusions of white micro-particles of steatite and some rare pieces of vitreous burned remains, probably indicating a stage of recycling of the ground ceramics.

Out of the total number of items (Fig. 1), 3 fragments are median sections, 5 are distal, 1 is doubtful. The pieces marked 3, 4 and 6-9 were the best preserved ones and presented technological features deserving a detailed description.

No. 3 (Pl. I *a, b* top middle) is a distal fragment of a subrectangular plaque. The piece has a second fracture surface in correspondence of the side marked as D in Fig. 1. Nonetheless, the barret seems to bear traces of glaze-like droppings over this latter fracture surface, suggesting its reutilization in the context of the drops downfall. One of the major sides of the piece has an extensive glaze-like covering in the form of irregularly deposited drops, partially removed by the plaque breakage. Both sides A and B bear remains of small later drops. The opposite side E has an

	W		T		F		GLAZE					COATING				
	m	M	m	M	M	D	A	B	C	D	E	A	B	C	D	E
1	2.95		1.00			●	—	—	—	—	—	—	—	—	—	●
2	2.45		0.95		●		—	—	—	—	—	—	?	●	—	●
3	—		0.90	1.30		?	○	—	●	○	—	—	—	—	—	●
4	2.85	3.00	1.00			●	—	—	○	●	○	—	—	●	—	○
5	—		0.90		●		?	?	○	?	—	?	?	—	?	●
6	1.75		0.70		●		—	?	●	—	—	○	?	●	○	●
7	2.55		1.20			●	?	—	●	?	—	?	—	—	?	—
8	2.55	3.90	1.10	1.90		●	—	—	●	○	—	—	—	—	—	○
9	3.70	5.55	1.55	2.25		●	—	—	●	○	—	○	—	○	●	●



Fig. 1 - Morphological and technological features of the recovered plaque fragments.
 W: width; T: thickness; m: minimum; M: maximum; F: fraction; M: median;
 D: distal. Measures in cm.

extensive residual covering of a white, homogeneous gypsum-like cement, mortar or lining. All over the fragment are visible micro-particles and chips of white steatite; the larger pieces show to belong to some kind of sheet-shaped debitage. A major piece visible on side E still shows the saw-marks characterizing all the most important concentrations of steatite-manufacturing waste in Moenjodaro.

No. 4 (Pl. I *b* top right, *c*). Distal, slightly dilated extremity of plaque with rounded contour. Contrarily to the preceding specimen, this fragment has a major presence of glaze-like drops, partially broken, over the narrow side A. The remains of a smooth, fine grained coating (different from the substance described in No. 3 in being harder and more compact, and

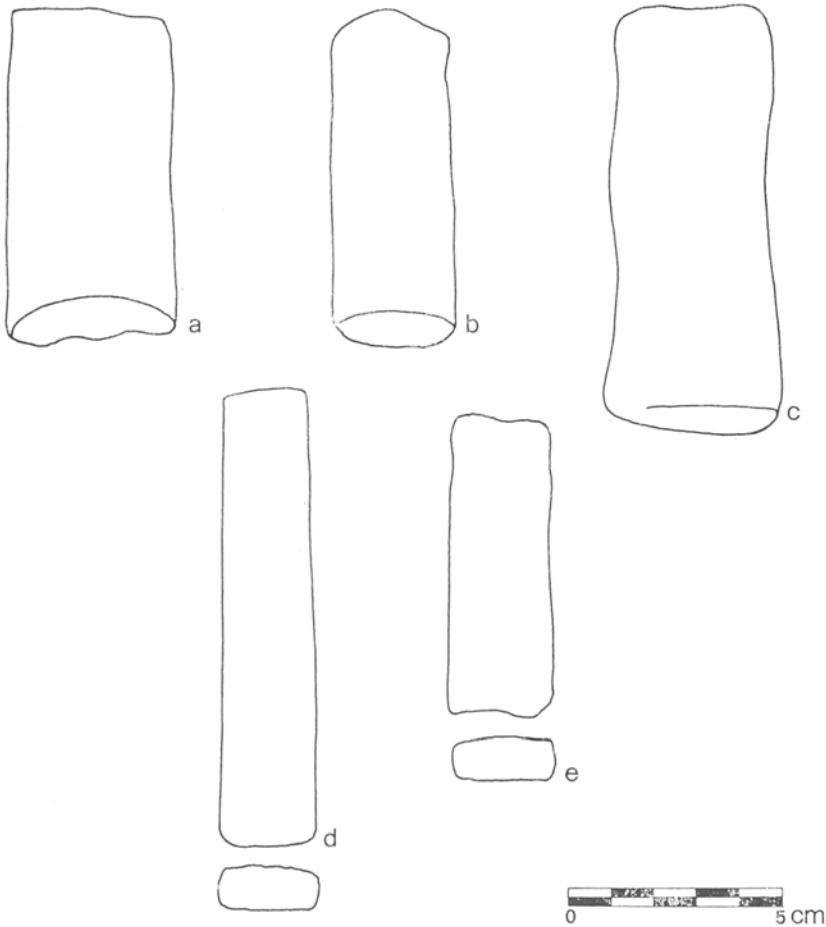


Fig. 2 – The plaques and cylinders published by Mackay in the Chanhudaro excavation report, redrafted from the photographs.

presenting a buff hue) are visible over the two main faces of the object. White steatite micro-particles are clearly recognizable.

No. 6 (Pls. I *b* bottom right, II *a*). Median section of a thin, elongated barret, distinguished by the presence of a discontinuous coating of the gypsum-like material all over the four ascertained functional sides. Drops of the glaze-like substance, partially broken, are visible at the height of the fracture on side C.

No. 7 (Pl. II *b*) is a small, probably median fragment, bearing a single large drop of a green glaze-like substance. Its most remarkable feature is the presence of a second plaque (or another type of artefact in the same

material) enclosed within the core of the barret. This evidence suggests that layers of buff-coloured, compact clayish mixtures (like the material visible over no. 3) was used to coat and connect into a single element other preexisting pieces.

No. 8 (Pl. II *c, d*). Distal extremity, slightly dilated, of a plaque bearing an extensive coating of glaze-like material over the major side C, few traces of the same substance on D, and residues of a buff-coloured clayish coating (analogous to the one observed on 3 and 7) on the opposite main face E. The temper of this piece contains some larger steatite fragments. In particular, the piece of steatite outcropping over face E (Pl. II *d*) is large enough to show 5–7 parallel saw-cutting marks; the thickness of this steatite sheet, like the particles recognizable in the other fragments of plaques, does not exceed 1 mm.

No. 9 (Pl. III *a, b*). This fragmentary plaque is the largest in our collection. The distal extremity is noticeably dilated and slightly rounded. Plate III *a* shows the superimposition sequence of the different materials occurring over its faces. Drops of glaze-like substance fell over extensive coverings of the white, gypsum-like material observed over plaques 3 and 6. In correspondence with the terminal dilation of the barret, the white covering grows thicker; the surviving portion indicates that this latter feature originally wholly enclosed the end of the piece probably fixing it with a normal orientation to a larger surface, as an individual element. The face opposite to the one with the glaze-like drops (side E) shows a particularly well preserved white coating, bearing the finger traces left in laying the film (Pl. III *a*). In turn, the white coating covers the underlying surface of a buff-coloured clayish material, analogous to the micro-layers already described in other specimens. This last formations, directly covering the plaque fragment, retains some small steatite chips; the plaque's temper includes some vitreous slag residues.

3. DESCRIPTION OF COLLECTED FRAGMENTS: CYLINDERS AND OTHERS

Paste cylinders are described by Mackay as having a slightly tapered shape, ranging, in the two published specimens, about 3–4 cm. of diameter by 7–8 cm. of height, but it is not possible to state if the pieces were complete or fragmentary. The collection includes a single fragmentary cylinder (Pl. IV *a*). This distal fragment seems to be slightly larger than the published pieces, with a diameter of 5.2 cm. Its make is careless, very irregular; the base, slightly concave, retains some residues of the same gypsum-like substance visible on some of the plaques. A further element of connection

with the described series of plaques is the presence over the cylinder's surface of the same irregular traces of broken glaze-like drops. The composition of the piece's ceramic body is apparently analogous to the material described for the plaques; in particular, the cylinder's fragments retained some clearly recognizable remains of burned vitreous slags.

A third artefactual type in the collection is represented by a single flattened ceramic wall, lining or diaphragm with a straight section (Pl. IV *b*). The piece, whose inner compositional features recall the cylinder's and plaques' characteristics, bears over one face some irregular superimposed patches of white coating (this latter feature is so shared by plaques, cylinder and by the single ceramic wall we have recorded). Furthermore, the piece is remarkable because of the presence, among the usual white steatite micro-particles, of a single small steatite disk-bead blank (Pl. IV *b, c*). The element has a squared regular contour and demonstrates that the small stone sheets were perforated before final rounding took place. Steatite disk-bead manufacture was evidenced during the excavation of Mound II by the find of large amounts of perforated micro-plates (Mackay 1943: 212; 1937) of unfired dark steatite.

Lastly, the ceramic fragment reproduced in Fig. 15 offers us some additional, although rather doubtful, evidence. The piece is a small fragmentary wall or bar, in which primary functional surfaces are not immediately distinguished from the fracture ones. It possibly represents the fragment of a plaque, wholly covered on one of its faces by a broken bubbled glaze-type deposit (Fig. 3 *a*). This material covers a layer of the gypsum-like substance previously described (Fig. 3 *b*), apparently unaffected by the contact with the overheated vitreous drops. Under the gypsum-like film is visible a further thin vitrified surface (Fig. 3, *c*), possibly rep-



Fig. 3 - Fragment of barret or wall with a superimposed series of ceramic deposits: a, vitreous glaze-like encrustation; b, white gypsum-like material; c, vitrified surface; d, "paste" body. Features e are two parallel grooves perhaps intended to receive other ceramic elements.

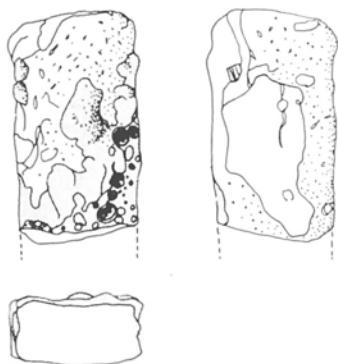
resenting either a previous vitreous layer or the vitrification of the plaque's surface. The opposite side of the object shows some possible finger traces, analogous to the ones observed in plaque No. 9; an outstanding feature of this rear face is the presence of two parallel grooves (Fig. 3 *e*), perhaps designed for the allocation of contiguous inferior ceramic parts, an element of evidence enhancing the aggregational nature of the paste assemblage.

4. PASTE PLAQUES, CYLINDERS AND WALLS AS COMPONENTS OF SMALL PYROTECHNOLOGICAL INFRASTRUCTURES

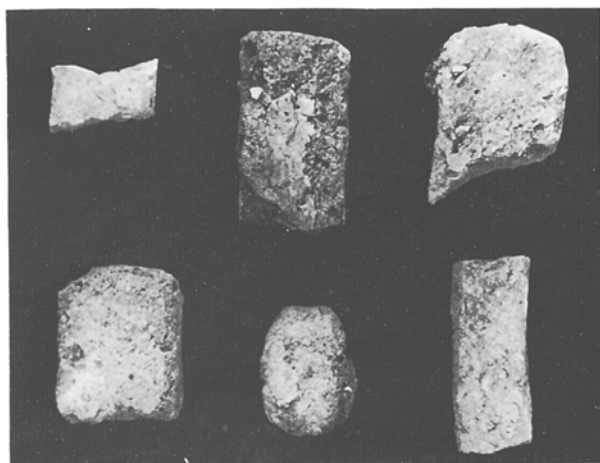
In the previous description we have scrutinized the compositional (presence of steatite and vitreous slags in the temper) and relational (glaze-like drops and coatings over the pieces) technological features connecting plaques, cylinders and, perhaps, straight-sectioned walls in a single interpretative context. It is here suggested that Mackay's explanation of these artefactual types was wrong, and that they should be more correctly considered as inner components of small infrastructural aggregates, possibly employed in glaze-smelting processes. Plaques and cylinders, in this light, could represent refractory barrets and suspensory elements to be assembled into small furnaces distinguished by a short life-time span, to be subsequently re-assembled more than once, and finally, perhaps, recycled by grinding and mixing the refractory powder so obtained into new formed units. The temporary character of these small installations could explain the small size of the relative surface localizations at Moenjodaro and Chanhudaro, as well as Mackay's inability to find in this latter site more than simple patches of ashes embedding concentrations of paste indicators.

The distribution of glaze drops and coatings (both of the white and buff types) over the plaque pieces of the sample seems to indicate that, generally, while one of the major faces is studded with glaze-like drops fallen from above, the opposite side shows wide portions of structural residual catings. Nonetheless, substantial glaze-like deposits occur on other sides of the plaques as well (Fig. 1: 4) and layers of coating are visible also under the vitreous formations (Fig. 1: 6, 9). The available collection is too small to draw any reliable conclusion on the original arrangement of the elements, especially in the light of the probability that the pieces were already displaced during the downfall of the vitreous drops. We expect, anyhow, that if the plaques were merely juxtaposed to form a continuous surface, the distribution of the drops over the pieces would have followed a more dichotomic presence/absence pattern.

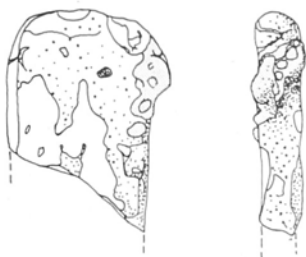
In Fig. 1 the term "coating" goes both for the white and the buff material. Most probably, the function performed by these quite different



a) Plaque no. 3 (cf. Pl. I b top middle).



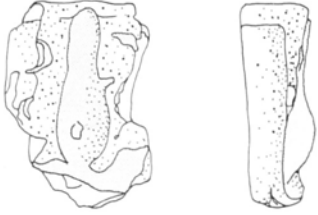
b) Fragments of plaques: *b*, no. 3;
c, no. 4; *f*, no. 6.



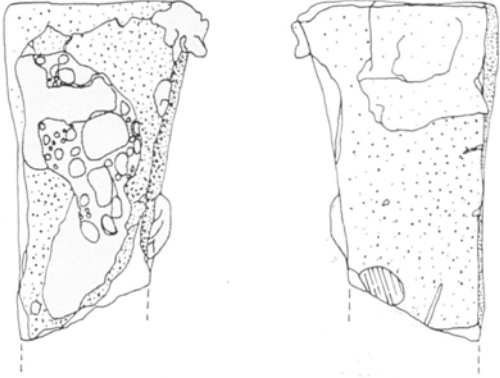
c) Plaque no. 4 (cf. Pl. I b top right).



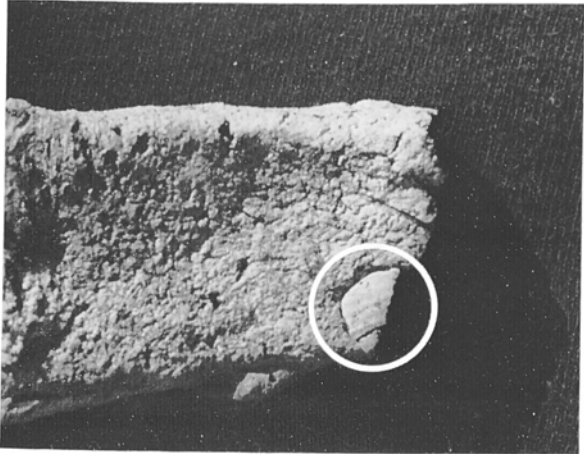
a) Plaque no. 6 (cf. Pl. I b bottom right).



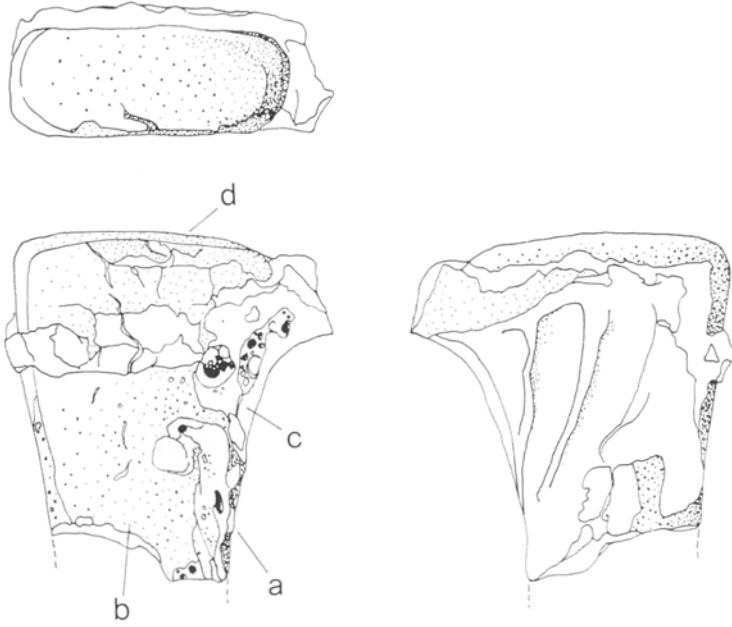
b) Plaque no. 7.



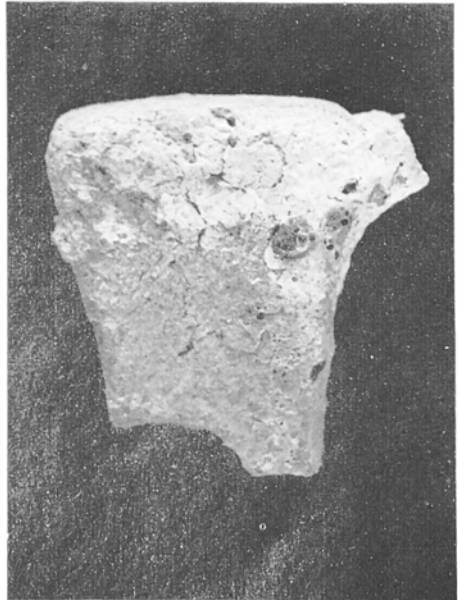
c) Plaque no. 8 (cf. Pl. II d).



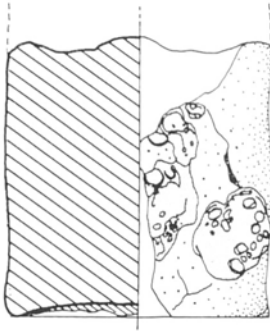
d) Detail of plaque no. 8, showing in the white circlet a macro-particle of white steatite with parallel saw marks.



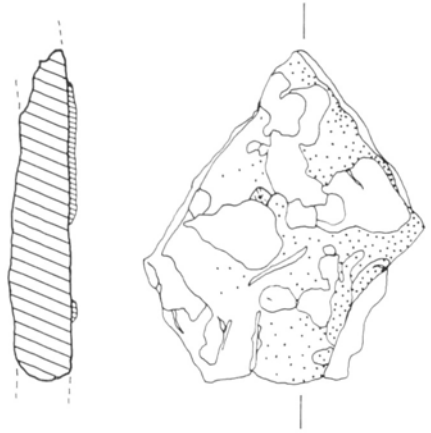
a) Plaque no. 9 (cf. Pl. III *b*): *a*, vitreous broken drops; *b*, *c*, buff and white-coloured coatings; *d*, original surface of the plaque. For further detail see text.



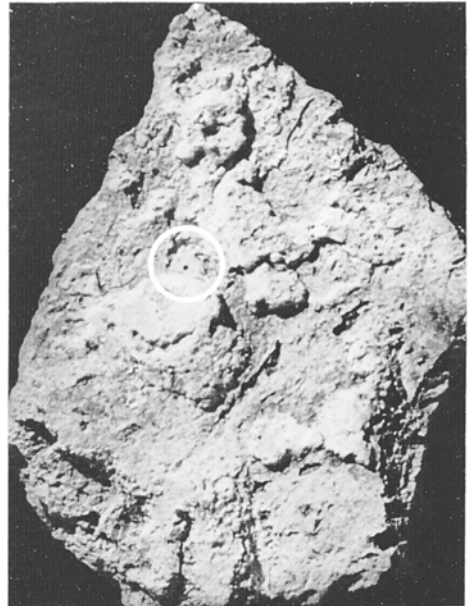
b) Plaque no. 9 (cfr. Pl. III *a*).



a) Broken extremity of cylinder with traces of vitreous dropping on the outer surface and remains of white coating on the concave base.



b) Fragment of straight-sectioned ceramic wall, lining or diaphragm (cf. Pl. IV c).



c) Close-up view of the object reproduced in Pl. IV c; the white circle encloses a squared sheet of white steatite, representing an unfinished disk-bead recycled as refractory material within the ceramics' temper.

substances was not the same; at the present moment we may hypothesize a mortar-like function for the buff clayish coating, and a refractory one for the white material, but these interpretations are simply conjectural.

If cylinders and glaze were three times their actual size, one would be tempted to ideally reconstruct a furnace grate composed by bars and supported by cylindrical pillars, but, given the weakness of our documentary base, it would be unfruitful to speculate any longer on the inner setting of the hypothetical infrastructure.

Going back to the evidence gathered from the surface of Moenjodaro, it should be stressed that paste plaques and cylinders have not been found in the survey, in spite of the find of identical associations among steatite debitage, glaze-like drops and bone splinters. At Moenjodaro the ceramic elements primarily associated with glaze-like drops and encrustations are the mentioned small chaff-tempered containers. The technological relationships between the Chanhudaro paste elements and the possible crucibles or saggars from Moenjodaro are presently unknown. Equally obscure is the exact function of the bone debitage in the examined pyrotechnological contexts, although this occurrence might suggest the extraction of Calcium Phosphate $-Ca_3(PO_4)_2$ - from butchery refuse to be employed as a flux to lower the melting temperature of glaze-like materials. In this perspective steatite and bone residues could be considered respectively the refractory and flux extreme components within a very controlled pyrotechnological system.

Steatite, once more, turns out to be the technological pivot around which the associations we have discussed are revolving. The evidence of paste objects of Chanhudaro clearly shows that the Harappan craftsmen involved in highly specialized ceramic manufactures (probably to be identified in glaze-making or faience-glazing) were dependent upon the debitage left by steatite disk-bead makers (if the craftsmen were not actually the same!) for the supply of part of the refractories needed for their firing installations (another source of refractory material, according to the recycling logic so often recognizable in 3rd millennium BC technology in Southwestern Asia, was probably provided by the remains of the infrastructures themselves).

This evidence allows us to reconstruct one of the material expressions of the "horizontal connections" linking part of the various manufacturing cycles so far identified in Mature Harappan urban contexts in Sind (Vidale 1985). These connections were determined by matter/energy transfers between critical points of the transformational chains, a variable of outstanding importance in the definition of the interrelationships existing within the sociosphere of Harappan craft production.

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