# SOUTH ASIAN ARCHÆOLOGY 1991

*Proceedings of the Eleventh International Conference of the Association of South Asian Archæologists in Western Europe held in Berlin 1–5 July 1991*

edited by

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with the assistance of Britta Zehmke

Franz Steiner Verlag Stuttgart
1993



# ETHNOARCHAEOLOGICAL EXCAVATIONS OF THE BEAD MAKING WORKSHOPS OF KHAMBHAT: A VIEW FROM BENEATH THE FLOORS

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## *THE TRADITION OF AGATE WORKING IN THE INDIAN SUBCONTINENT*

Archaeologists interested in ancient craft production, both those aided by ancient historical sources and those bound to the interpretation of material residues, are currently involved in major critical efforts to improve the quality of their interpretation of the archaeological record. An important step in this direction is ethnoarchaeology. This approach enables us to observe, within living cultural systems, the cycles of formation and destruction of material evidence that are ultimately responsible for the creation of the archaeological record. At the same time, ethnoarchaeology permits to observe how the action of structured social relationships affects the nature of these cycles. Ethnoarchaeology, in this perspective, allows archaeologists to study dynamic and complex relationships of cause-effect among different orders of factors, and, as a result, to build with the data more meaningful tools of interpretation. South Asia, where traditional societies are organized in complex formalized hierarchies, with many different levels of interaction with contemporary state structures, is an ideal field of ethnoarchaeological observation, relevant to the study of the so-called 'complex societies' of protohistory, i.e. dating to the bronze and iron age of the eurasian continent (see WULFF 1966; KENOYER 1983; RYE & EVANS 1976; KENOYER *et al.* 1991; SARASWATI 1978; DONNAN & CLEWLOW 1974; KRAMER 1979; BINFORD 1983; and many others).

This paper deals with the study of the traditional agate bead making industry of the contemporary city of Khambhat, India. The city of Khambhat is today one of the largest agate working centres of the world (ARKELL 1936; TRIVEDI 1964). The agate industry in this region of India can be traced back to the cities of the earlier phases of the Indus tradition (KENOYER 1986). In general, bead making in the Indo-Pakistani subcontinent has a very long history, dating back to 6th millennium B.C., as demonstrated by the French excavations in Baluchistan (JARRIGE 1981; SAMZOUN 1984; SAMZOUN & SELLIER 1983;

TOSI & VIDALE 1990) and by references to the working of semiprecious stones in some contexts referable to the integration phase of the Indus tradition. The technology of bead making in what we define as the Harappan phase of the Indus tradition (c. 2600-1900 B.C.), involving the use of metal tools and complex pyrotechnological treatments of different types of semiprecious stones, grew out of this cumulative know-how. At the end of the 3rd millennium B.C., this technology was developed to a maximum level of sophistication (KENOYER 1986; VIDALE 1987). The most striking evidence of intensive production of agate beads in a Harappan context is still represented by some buildings unearthed at the site of Chanhu-Daro in Sindh (MACKAY 1937; 1943; VIDALE *et al.* 1991), where the excavators found large amounts of agate lumps, semifinished beads, debitage and tools for manufacture. Archaeological evidence suggests that, in later times, the technology of agate bead making was just partially affected by the introduction of iron, and many aspects of production remained unchanged. The coming of electricity-powered machinery in recent times had a partial impact on its traditional technology, but this evolution, more than radically transforming the traditional picture, seems to have created new technological and economical perspectives (KENOYER *et al.* 1991).

In the framework of this long continuity of agate working Khambhat provides a unique opportunity to study the organization of a specialized craft and understand how different aspects of social, economic and political organization might be reflected in the archaeological record. The Khambhat Bead Project, co-directed by J.M. Kenoyer of the University of Wisconsin, Madison (USA) with K.K. Bhan of the M.S.University of Baroda (India) and M. Vidale of Is.M.E.0., Rome (Italy), was started in 1987. All the project members are directly involved in the study of craft production in the Harappan phase at Harappa, Mohenjo-Daro and in the Saurashtra region; among the various craft industries available for archaeological analysis, bead making plays a prominent role, both for its connections with trade and exchange networks and the unperishable nature of great part of its archaeological record (MACKAY 1937; KENOYER 1986; VIDALE 1987). Our interest in ancient bead production stems from the effort of understanding the role played by bead makers within their society and how production of beads was organized within early urban communities in Harappan times.

## *KHAMBHAT BEAD MAKING: THE QUESTION OF CRAFT SPECIALIZATION*

A central research goal of the project is to test the possibility of identifying in the archaeological record of the living communities of Khambhat the material correlates of bead making craft specialization (KENOYER *et al.* 1991). If we define craft specialization as the production of commodities for trade or use by members outside of the immediate kin group, Khambhat bead production is sustained by a very complex network of specialized



craft activities. The typology of semiprecious stone objects manufactured at Khambhat is extremely varied, ranging from the chalcedony mortars used in every archaeometric laboratory to the huge agate beads exclusively marketed to tribal societies of west Africa, as well as to the cheap agate articles marketed in European and American cities. In such a situation, specialization in stone working assumes extreme forms, being articulated not only after strict correlations between base material and production cycles, but often according to inner stages of individual manufacturing cycles.

It should be stressed that the definition here adopted for 'craft specialization' refers to a set of purely economic factors, and has a single direct material correlate that, at least ideally, might be observed archaeologically: *the rate of production versus consumption* of a commodity within the context of a social unit (defined in terms of kin relationships). In archaeological terms, the evaluation of this rate would require a long series of conditions: an actual capacity of identifying segments of the archaeological record referable to given kin groups; an effective, statistically meaningful strategy of spatial sampling, aimed at correlating functionally production and dumping areas; a deep knowledge of the production cycle under examination (sometimes to be acquired by experimental simulations), allowing a detailed evaluation of the rate refuse/finished products; a satisfactory understanding of the dumping processes and their post-depositional re-elaboration; a careful assessment of material effects of use and 'consumption' processes on the finished items.

In every case, we are dealing with different sets of variables interconnected by complex relationships, expectedly rather difficult and costly to define at an analytical level. As a preliminary step, we attempted to define craft specialization through an indirect approach, focusing on inner features of artefacts and their sedimentological contexts, i.e.

(a) measuring the degree of standardization of the finished products, as a possible index of psycho-motorial habits acquired by craftsmen restricting their competence on narrow parts of a given production cycle (cf. ROUX & CORBETTA 1990);

(b) reconstructing the formation processes of specific types of workshops areas, with particular reference to the primary space of manufacture and its floor sediments, and the complex series of transformations of industrial refuse from the primary production areas to tertiary dumps;

(c) measuring the variability of industrial refuse left *in situ* and/or in the various types of dumps, fillings, and other types of contexts.

This paper deals specifically with some aspects of the third and second point: we decided to carry out two ethnoarchaeological excavations of floors and piles of stored refuse within bead-making 'workshop areas' active nowadays at Khambhat. In the past, Harappan bead making workshops were excavated with the 'traditional' excavation methods of near eastern and classical archaeology when only rarely archaeologists focused on stratigraphic formation processes and on the relationships among floors, architecture and craft debitage. Although in time scholars developed sound typologies of objects and formal styles, and complex archaeological theories supporting their analytical classes, sediments and, in general, stratigraphical units were not considered as primary archaeological entities (with the obvious exception of architecture). Still nowadays, we face the complex task of reconstructing complex forms of social behaviour such as those underlying craft production without the possibility of referring to a shared typology of stratigraphic units. The excavations we carried out in the workshops of Khambhat were aimed at describing the sedimentological outputs of various types of specialized craft behaviour. Without assuming that the features we observed in our ethnoarchaeological excavations could be mechanically referred to protohistoric contexts, we think that this phase of our research may provide some 'models of complexity', that could be used to better interpret the results of current and future excavations.

### *VARIABILITY OF INDUSTRIAL REFUSE*

The reduction sequences of agate bead making are distinguished by an absolute loss rate of 80-90 % of the total weight of the original stone lumps (KENOYER *et al.* 1991). The most important stages of reduction produce large amounts of tiny agate flakes which continuously enter the archaeological record of the city. Looking at its agate working dumps, Khambhat appears like a huge clockwork orange where primary associations of lithic residues are constantly removed and turned into secondary assemblages (stockpiles or dumps), in turn often soon reworked, and finally conveyed into extensive tertiary dumps, sometimes connected to large earthworks of public interest. In general, one notices that, if the removal of primary lithic assemblages is carried out by the individual craftsmen, the management of secondary dumps may be carried out by service specialists or by sweepers hired by the municipality; the transport of mixed secondary dumps into large tertiary formations, usually in form of large earthworks such as platforms, fillings, embankments, may involve large carts or tracks and larger groups of workers. In other words, the progressive sedimentary evolution of lithic debitage requires correspondingly wider social contexts, and a more substantial alteration of the urban landscape.

Every deposit containing agate working debitage in Khambhat ideally represents a stage in this processual evolution. The relative variability of the debitage in terms of raw material, size and technological stage may be deemed as a diagnostic tool for understanding the degree of post-depositional evolution of the assemblage. After having placed each assemblage in this theoretical sequence of transformations, we may face the problem of defining the relative variability of assemblages that are comparable because they underwent similar post-depositional processes. In this perspective, assemblages produced by relatively specialized workshops should be characterized by a lower degree of variability in terms of raw materials, dimensions of debitage and manufacturing stages than less specialized



production units in which different production cycles are normally performed. On the basis of these assumptions, we proceeded to a systematic sampling of industrial assemblages corresponding to different stages of postdepositional sedimentary evolution, in the attempt of outlining a set of preliminary compositional models (potentially definable on a quantitative basis) of empiric categories such as 'primary activity area', 'secondary dump', 'tertiary dump' and others. We also collected samples of primary debitage from comparable manufacturing stages in different workshops, with the purpose of observing the material expression of their relative degrees of specialization. Quantitative analysis of these samples is currently carried out at Madison, Rome and Baroda.

### *STRATIGRAPHIC FORMATION PROCESSES: THE RADIUS OF SEDIMENTATION AND REMOVAL OF DEBITAGE*

The study of formation processes of sites and activity areas is currently considered a primary source of archaeological information (SCHIFFER 1972; 1987; GIFFORD 1982; WOOD & LEE JOHNSON 1982; and many others). Starting from archaeological research on early hominid sites (e.g. KROLL & ISAAC 1984; TOTH & SCHICK 1986), studies centred on the reconstruction of stratigraphic formation processes have questioned the validity of many general assumptions shared by archaeologists in the interpretation of the archaeological record. Recently, field research in the Harappan city of Mohenjo-Daro has shown the potentiality of this type of studies even in the extremely complex stratigraphies of 3rd millennium B.C. urban sites (BALISTA & LEONARDI 1987; PRACCHIA 1987; LEONARDI 1988; BONDIOLI *et al.* 1991). Specific studies on stratigraphic processes affecting the formation of sediments containing indicators of craft activities are anyhow very uncommon. For our purposes, the possibility of providing a reliable archaeological interpretation of a deposit containing an assemblage of tools and residues from a manufacturing sequence depends upon a careful definition of stratigraphic analytical units and the overall structure of the deposit.

An important step, in this frame, is the attempt at reconstructing what we could define as the *sedimentation/removal radius* of an industrial unit, i.e. the distances travelled by the discarded material moving from its primary spot of deposition to secondary and tertiary dumps. This aspect may be relatively easy to control in ethnoarchaeological terms, but extremely problematic within the trenches of an excavation. Nonetheless, it is by defining this spatial range that we can define a reliable analytical context, observing and studying the progressive post-depositional transformations of the lithic assemblages, and, ultimately, reconstruct the amount of refuse produced and lost, in every stage of sedimentation and removal processes, by a craft workshop.

Our study of Khambhat bead making industries suggested that in some specialized workshops, strictly devoted to the production of few types of luxury beads, and subject of high levels of administrative control, industrial refuse is closely monitored, immediately recollected and re-invested in other production cycles. In similar cases, lots of refuse materials may be kept in the workshops premises for short times, being soon reworked on the spot or traded to other craftsmen engaged in the production of less valuable beads, in some cases distinguished by a lower social status. The 'central' position of such workshops within the urban network of Khambhat also involves strict spatial constraints, such as the absence of large open areas for intensive stockpiling of low value chipped material; the space used by each craftsman is defined with extreme precision, and maintained through monotonous, standardized procedures. These workshops, in archaeological terms, would be characterized by a 'double' radius: an inner, very restricted radius, defined by the systematic recycling of the debitage within the premises of the workshop itself; and an outer, wide and looser long-distance sedimentation/removal radius, interfering with the radius (and the trashing grounds) of a system of peripheral production units. Some of the 'central' workshop may dispose their residues, through transport by other craftsmen or servicemen, for distances of hundreds of meters or even kilometres, to the peripheral units where recycling takes place.

In a simplistic opposition, the peripheral units, when involved in less specialized types of production, subject to less intensive forms of administrative control, and having access to open spaces for stockpiling and dumping the debitage, could be characterized by an intermediate radius of sedimentation/removal. Such a radius, with a gross estimate, might extend in most cases for 50 to 100 m from the workshop area.

On the other hand (at least in traditional roofed workshops with unpaved floors) the absence of nearby secondary dumps may be balanced (in archaeological terms) by the growth of thick floor layers of small flakes and sediments deposited in a *de facto* situation (in the sense of SCHIFFER 1972), that is abandoned on the spot after having escape major removal processes. At any rate, these deposits rarely present 'primary' activity areas, but grow as a continuous downpour of secondary, scarcely patterned episodes of local abandonment.

By contrast, some of the peripheral workshop areas we examinated were studded of 'primary' chipping areas and long-standing dumps of agate debitage occupying large sections of their extension. These workshops were characterized by the absence of the strict spatial constraints affecting the former type of units. Their location, although in some cases relatively central, granted access to vacant lots owned by local religious authorities and made accessible by religious and family connections. These areas were used for installing temporary chipping stations, and showed an intermediate sedimentation-removal radius: definitely larger than the inner radius we identified within 'central' workshops, but much more restricted than the outer long-distance radius we described for the first type of cases.



## *EXCAVATION OF A HIGHLY SPECIALIZED 'CENTRALIZED' WORKSHOP*

We could observe for some years, with various intervals, the processes of formation of the floor of a workshop strictly specialized in the production of a restricted range of carnelian beads, and distinguished by a very effective economic and administrative control on all the performed stages of production. The workshop is a rather small rectangular room at the cross of two streets, and it gives direct access to the house of the owner. The room is used for primary and secondary chipping of the carnelian blanks, as well as for temporary storing of raw material and flakes to be reprocessed. Another activity commonly performed is administration, carried out by a person in charge (the same craftsman is responsible for the delicate process of agate firing); he was frequently seen counting blanks one by one and recording them in the workshop books. Agate blanks (in this as well as in the other workshops) are shaped by chipping the nodules with the 'indirect-reverse' percussion technique adopted by the stone cutters of Khambhat, in which agate is hold against the sharp point of an oblique iron stake and carefully chipped by striking it with a soft hammer made with the point of a buffalo horn. In this workshop, the craftsmen sit in a horse-shoe arrangement in front of the main access, and each occupies a fixed position. In chipping, small amount of flakes fly from the door into the street, where they are removed by the municipality sweepers (with the exception of the few flakes trapped in small cavities or scars, representing the only type of permanent 'primary activity area' forming in this workshop). The floor is covered with rectangular pieces of sack cloth (*burlap*), forming a kind of 'living grid' that, although frequently removed and re-arranged, tendentially reproduces the same spatial pattern. The sacks, as a matter of fact, delimit the individual working space; at the end of a working stage, every craftsman recollects its rough nodules and blanks and recovers all the refuse within the sack. This is then lifted, and the debitage poured in the stockpile containing this specific type of material. When the sack is lifted, it works as a very finemeshed sieve, and all the fine silica fraction falls into the floor. Other larger flakes tend to escape along the borders of the sack and are captured into the floor sediments. The matrix of these sediments, in the observed case, included also a finer silty component possibly introduced by trampling, by aeolian accumulation or introduced with the sacks containing the raw nodules. The processes of accumulation are so effective that between winter 1989 and winter 1990 the level of the floor grew about 5-7 cm higher, with a total amount of sedimentation of 0.5-0.7 cubic meters. The growing deposit had to be contained, along the west side, with a continuous edge of fired bricks.

The iron stakes used in chipping are sunk into this type of sediments for a depth of 20-30 cm. When the stake gets loose, the percussion properties are affected. The craftsmen use to revolve the tool and hammer it down to secure its stability; sometimes the tool is extracted, resharpened on a large stone kept at left of the main entrance, and reinserted

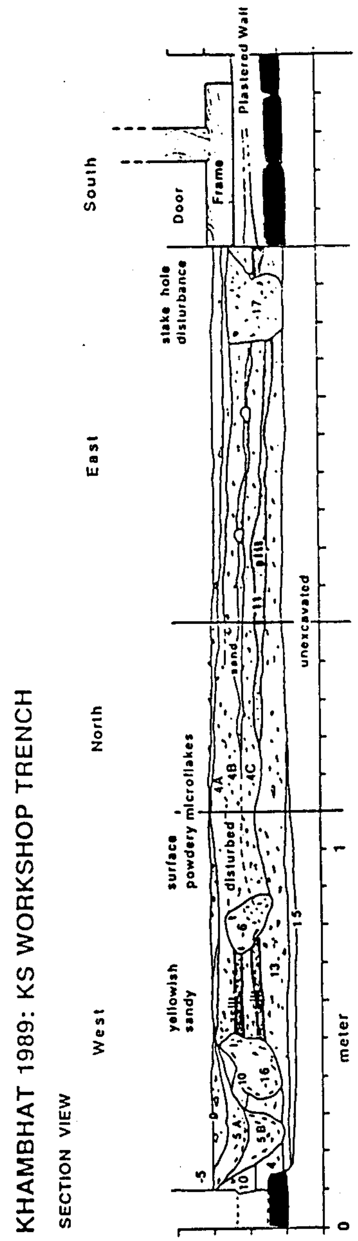


fig. 1 Section representing the 4 walls of the trench excavated in a highly specialized workshop of Khambhat. 5A, 5B, 16, 17 are the stake holes produced by the indirect inverse percussion technique; the upper sandy layer represents probably a trampling surface connected to a main rebuilding episode, while SU 11 is a silty surface possibly connected to large scale removal of carnelian flakes and levelling of the workshop floor. The upper layers are exclusively formed by tiny carnelian flakes; in SU 15 we found bead blanks probably dating to 40-50 years ago.



in place. Every day, at the end of the work, a glass of water is poured in the holes, to increase the compactness of the walls of the stake holes.

When in 1989 we had the permission to excavate a small trench in the workshop, we expected to find some evidence of the processes we had observed, i.e. (a) traces of the gradual, extensive accumulation of industrial sediments (given the rate of floor growth, we also expected to meet negative interfaces produced by episodes of removal of floor deposits for purpose of maintenance); and (b) traces of the negative interfaces of the stake holes.

In order to avoid interference with the normal activities of the workshop, we limited the excavation to a single day of work. The trench had to stop to a depth of 30-35 cm, before the end of the accumulation of lithic material; at this level we uncovered bead blanks of types no more produced in Khambhat and dating, according to the workshop informants, to 40-50 years ago (see below). If this is true, even taking into account effects of floor compacting, we have to suppose that huge amounts of floor deposits had been removed. This would explain the rather abrupt contact between layers with old types of beads and blanks and the contemporary refuse.

The section of figure 1 shows the stratigraphy of the excavated part of the workshop floor. The growth of the deposit containing flakes, microflakes and mixed fine fractions is rhythmically interrupted by two micro-layers of compact silty materials. We ignore the exact nature of these layers, but, most probably, they represent interruptions in the deposition of industrial residues marked by extensive negative interfaces due to removal of the upper part of the floor sediments. The fine, compact silty surfaces encountered in the trench are compositionally similar to the silt filling the stake holes, whose formation is ascribable to the pouring of water. According to our informants, the maintenance of the workshop floor is accomplished at regular intervals by removing part of the sediments, levelling the surface and spreading water, activities performed with special rituals. The sandy lens visible in the section of figure 1 is directly connected to the wall of the workshop, and most probably represents a trampling surface associated with a major phase of rebuilding and restructuring the setting of the workshop.

The holes of the stakes, both old and new, were particularly evident, and could be referred to two different living surfaces. A major disturbance right of stake hole -6 probably represents an area where several stakes were sunk in different times, transforming the deposit in a relatively homogeneous layer.

The carnelian flakes included in these upper layers were very homogeneous, both in terms of stone quality and size. No bead blank or rough out found its way into these stratigraphic units. When we reached a depth of 40-45 cm, still probably far from the bottom of the floor layers, the picture suddenly changed: we found several rough-outs belonging to types of beads that actually are not any more manufactured in Khambhat, but could be compared to beads kept by merchants and craftsmen as antiques in their private collection, reportedly dating to about 50 years ago. A possible interpretation of this evidence of abrupt technological and cultural change is that the decreasing standards of control on the flow of craft production might be due to the disruption of the normal relationships of production caused by the political crisis undergone by the subcontinent in 1947 (VIDALE *et al.* 1991).

### *EXCAVATION OF A WORKSHOP OF AN INDEPENDENT CRAFTSMAN-ENTREPRENEUR*

The second workshop belongs to an independent craftsman, involved in the production of a wide range of ornaments and objects in various types of agate, jasper, and other semiprecious stones. The workshop is composed of a wooden fenced courtyard, partially covered by a light roofing structure in wood and metal. In this space, the craftsman carries on a substantial part of the manufacturing sequence, from the preliminary firing of the raw stone nodules and lumps primary and secondary chipping and grinding. Two main chipping areas were visible close to the fence's entrance; under the roof, along a wall, we mapped piles of raw material, stored manufacturing tools and other objects. In the area were visible two wooden grinding desks with electrically powered emery wheels, as well as some spots where stone-firing kilns had been or were active. The eastern wing of the fenced area was completely covered with stockpiles of stone flakes from previous manufacturing cycles, ready to be reprocessed in case of specific requirements of the market. These piles grow when the craftsmen working for the workshop (the owner, his relatives or hired agate workers) recollect the debitage produced in the day and dump on the spot. When the owner hires other craftsmen for chipping stones outside the main area of the workshop, a hired sweeper may collect the stone flakes into baskets and bring the refuse back to the workshop.

Our excavation was carried out across the major stockpiling heap of the workshop. The trench was 4 by 0.60 m long. The upper layers were almost completely formed by stone flakes, without any matrix component, and this rendered the recording of our sections rather difficult and sometimes conjectural, stratigraphic limits being (particularly in the upper horizons) relatively uncertain.

The section of the trench (fig. 2) shows some episodes in the life of the workshop. The older layers we excavated, about 1 m below the surface of the lithic pile, belong to an old trampling surface with scattered brick bats and building debris. The first stone flakes fell on this surface, marking the beginning of the craft activities in the area. This stratigraphic unit could be dated precisely to 1974, when the craftsman fenced with wood an old street surface.

These layers were later sealed by a thick greyish deposit of emery and white agate powder produced by grinding bead rough-outs on electric wheels. These layers contained blanks of large white-banded agate beads (*dudhya*). Evidently, in this area of the workshop was installed a grinding desk. This happened in 1981, when the whole city was suddenly involved in the production of large white agate beads required in large amounts by the African market.

Then, a agate-firing kiln was constructed in the southern extension of the trench, over a layer of scattered flakes. The section of the kiln area shows the effects of the abandonment and decay of this installation, with loose lenses of ashes, large sherds of the vessels used for firing the stones, and large pyroclastic flakes. According to the craftsman, this kiln was built and used in 1986.

The upper layers of agate flakes grew from 1986 to 1989. The section shows the progressive shifting in time of the various individual heaps. While the lower layers appear as regularly growing formations, the upper layers show strong disturbances, possibly due to negative interfaces (post or stake holes). Over the flakes, in two different episodes, the craftsmen piled small heaps of brick bats to be used for building their kilns. The lower pile of bricks appears completely covered by agate flakes dumped in a second moment; but the craftsmen claim to know exactly the location of every part of the pile.



### *PRELIMINARY EXPECTATIONS*

Using these preliminary examples as very general predictive models, we would expect the floor of a specialized lithic workshop focusing on the production of few types of luxury goods, and distinguished by efficient forms of administrative control to show the following features:

1) evidence of intensive stockpiling within the workshop, for recycling purposes, of few varieties of valuable debitage carefully subdivided in various inner technological-economical categories. This debitage could appear both in form of unexhausted piles *in situ* and as residues left by the removal of the piles themselves;
2) relatively homogeneous floor stratigraphies, formed and affected by a very limited set of components and variables (and, as in our case, industrial refuse, silt, stake holes, water, dynamics of horizontal extensive growth and the hypothesized tabular negative interfaces);
3) stratigraphic and microstratigraphic sequences showing a certain degree of continuity in the main patterns of occupation of the working space;
4) absence or extreme rarity of 'primary' working areas *in situ*, and evidence of repetitive maintenance operations, most often in form of extensive negative interfaces;
5) when the deposit has a long chronological span, evidence of substantial chronological gaps after some of these negative interfaces. One may expect periods of continuous

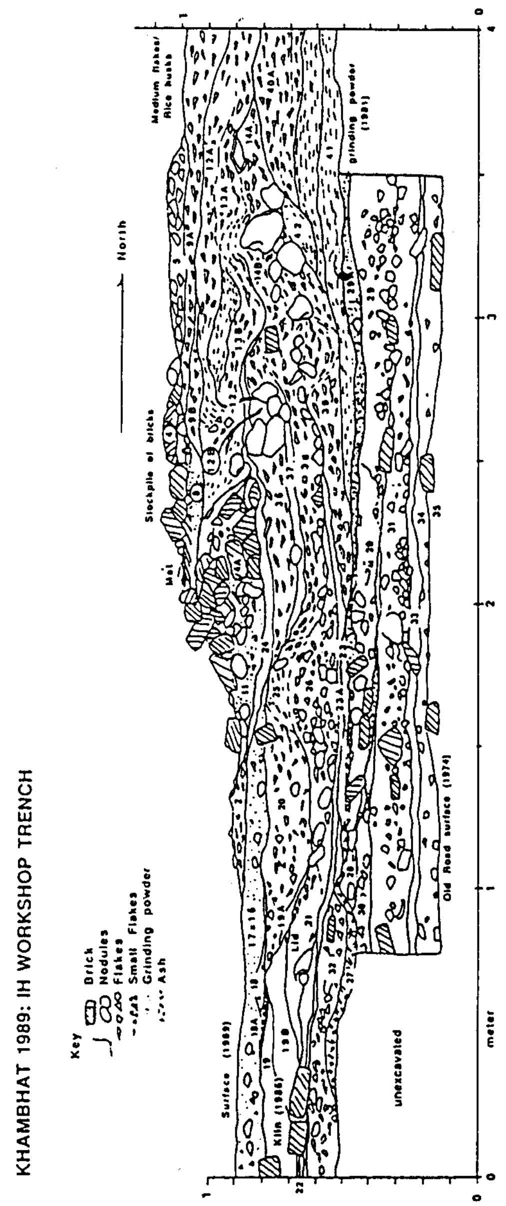


fig. 2 Section of a stockpile of lithic flakes in the workshop of an independent craftsman-entrepreneur. SU 35 is an ancient street surface scattered with building debris; the shaded areas mark layers (SU 29-30) composed exclusively of whitish agate powder produced by grinding; SU 21-19 belong to an abandoned and decayed agate firing kiln; 4 and 4A are piles of bricks conserved in the workshop for building other kilns. Note the negative interfaces left by poles of the roof or by chipping iron stakes.



sedimentary growth, interrupted by periods of intensive removal of the floor deposits, in turn replaced by new periods of gradual sedimentation. These new phases of growth, probably, will follow major episodes of architectural rebuilding (for example, restructuring of floors and walls).

Furthermore, as we previously stated, such stratigraphic features should be considered as affected by a double concentric radius of sedimentation and removal of lithic debitage: an inner radius determined by the movement and the reduction of the residues within the workshop, and a long distance radius delimited by the continuous transport to peripheral working areas of large amount of agate flakes. Archaeologically, such a pattern would be inferred by a careful use of arguments *ex absentia*, and a parallel evaluation of the possible implications of extensive negative interfaces in the floor stratigraphies.

In the opposite cases, a corresponding set of expectations could be listed as follows:

1a) evidence of extensive stockpiling of less valuable debitage within the workshop. The piles should be composed of various merceological types of stones, and should show a certain degree of mixing;

2a) partially inhomogeneous stratigraphies, determined and transformed by a wider range of anthropic and possibly natural factors, but also by negative stratigraphic units variable in shape and more limited in extension;

3a) stratigraphic sequences showing rather variable patterns of exploitation of working space;

4a) presence of occasional 'primary' working areas *in situ*, and less clear, irregular evidence of localized removal operations aimed at maintaining parts of the working space;

5a) evidence of a more continuous process of sedimentation, with shifting poles of growth; sedimentary gaps could be ascribed, in some cases, to this type of spatial dynamics of shifting, rather than to the extensive negative interfaces encountered in the first workshop.

## Discussion

Ethnoarchaeological excavations provide very effective links between the observation of living systems (in this case, in terms of technological behaviour) and the formation of material correlates (in this case, sediments and interfaces) in the archaeological record. By observing the formation processes of recent industrial sediments, and comparing their output with the features of older buried horizons we may hope to reconstruct part of long-range processes of transformation which can be used to interpret archaeological features.

This approach disproves the common view that, because ethnology is limited to a synchronic dimension and archaeology is essentially diachronic, the two disciplines are incapable to find a common ground. Moreover, by integrating ethnohistoric information in the framework of archaeological interpretation it is possible to test the validity of many archaeological inferences, as well as to gain substantial information on the logic of self-representation expressed by the craftsmen themselves. In our case, we could exploit not only oral information, but also the 'museal' collections organized by some of the craftsmen who carefully preserved in special showcases products, tools and semifinished items that are no more part of their current inventories.

It is important to stress that the expectations listed in the previous sections refer to the specific cultural and technological context of Khambhat bead making. While some attributes might be generalized by future and comparative research, others are strictly context-dependent (for example, it is clear that some of the differences we pointed out are at least partially explained by the opposition between the closed, roofed environment of work of the 'central' workshop and the relatively open working area of the second case). At any rate, using a structuralistic metaphor, besides the functional level of the 'meaning' of each contextual factor, it is the overall logic of stratigraphic formation in the workshops of Khambhat that may provide useful approaches to the interpretation of our future excavation trenches.

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