

Roger Cribb

'Ethnoarchaeology' is perhaps the most over-defined term in our vocabulary. Of the many definitions available, that employed by Lees (1979:266) seems most appropriate: "the study of contemporary societies using the time and space perspectives central to archaeological research". (See also Binford 1978:330). It is in its potential for understanding the transformations operating on human cultural behaviour to produce the archaeological record that ethnoarchaeology holds out its greatest promise. In providing a controlled environment in which both data sets can be observed, it offers the best hope for building the kind of middle-range theory by which static observations may be rendered meaningful in terms of dynamic processes (Binford 1981:198). In asking questions such as "... what is the nature of the relationship between cultural behaviour and its archaeological representation?" (de Boer and Lathrap 1979:103), ethnoarchaeologists are addressing an issue of fundamental concern to the discipline as a whole.

However, it is important to realise that the relationship between archaeological statics and cultural dynamics is never direct. Ethnoarchaeology is at its most productive not in the search for correspondence or analogies, but rather as a means of interpreting or translating between the dynamics of human behaviour and the static impressions which it is likely to leave for the archaeologist to uncover. To pursue this analogy further, the effort of interpretation involves much more than a one-to-one correspondence between two vocabularies. Ultimately it entails the transfer of meaning from one idiom or grammatical structure to another, complicated by the fact that one of these idioms may be much poorer in its potential for elaboration than the other. In mediating between two observational fields which differ so widely in terms of their formal, spatial and temporal dimensions, as well as their richness of information, the focus must necessarily fall not so much on correspondence or analogy as on establishing the ground rules for interpretation. Key questions will concern finding the appropriate units of analysis in each case and identifying those variables which are relevant to both contexts.

#### Occupation Floors and Ethnoarchaeology

Nowhere are these problems of interpretation more apparent than in the attempt to relate the structure of an archaeological site to that of a fully functioning human settlement. To begin with, the exigencies of archaeological excavation generally impose severe constraints on the scale of the spatial field within which behavioural clues might be sought. Even more daunting is the problem of attempting to match an archaeological time scale to that likely to be employed in ethnographic observations of activity on a site. Nevertheless the concepts of activity area and occupation floor have gained increasing acceptance over the past decade, assisted by a battery of statistical techniques

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for the detection of two-dimensional patterning in distributions of artefacts and other items (Hietala and Stevens 1977; Hodder and Orton 1976; Kintigh and Ammerman 1982; Orton 1982; Whallon 1973, 1974).

The identification of an occupation floor presupposes the existence of data about the spatial relationship of elements in a horizontal plane. It also entails either of the following assumptions:

- 1) That the archaeological residues represent a single occupational event.
- 2) That the spatial patterning in these residues over successive occupations is preserved through the consistent relocation of activities in the same position.

It is in meeting the requirements of the second of these assumptions that most of the difficulties of the occupation floor model lie. Ascher (1968) long ago drew attention to the problem of post-depositional disturbance and mixing which results from the continuation of activity on a site in the process of formation, tending towards a condition of entropy even before the site is abandoned to the effects of natural agencies. Gould (1980:107) has referred to this as the 'principle of interference'. Schiffer's (1976) model of formation processes mediating between a dynamic 'systemic context' and static 'archaeological context' is consistent with this view. The formation process model implies that spatial structures generated in systemic context will undergo progressive disorganisation, leaving little if any spatial integrity in the archaeological context. Implicit in this model is the assumption that the archaeologist's goal is the reconstruction of activities or behaviour as these occur in systemic context.

In a recent paper, Binford (1981) has suggested that such an objective may be misplaced, that in fact it is precisely those cultural formation processes which systematically distort the primary record of behaviour that should constitute the chief object of our inquiry. According to this view, certain kinds of cultural formation processes (or C transforms) connected with the 'maintenance of life space' (Binford 1981:201) may actually enhance rather than degrade the information content of the archaeological record. This claim need not conflict with the laws of entropy. Continual inputs of energy in the form of sweeping, clearing, cleaning and dumping activity, which may obliterate the direct evidence of activities such as cooking, eating or artefact manufacture, nevertheless have the effect of reducing entropy and creating new structures. What may be viewed as distortion according to a short-term, behavioural perspective becomes the basis for new structures of greater stability, preserved through the rules which govern the utilisation of life space. The object of inquiry shifts from single events and actions to the system of constraints by which a community orders its day-to-day activity, which persists over a longer time scale more attuned to archaeological analysis. That cultures vary profoundly in their use of space, their tolerance of crowding and their

mode of expression of social relationships through physical spacing has long been known (e.g. Fletcher 1977; Fraser 1969).

The presence *in situ* of primary refuse, defining the exact location of an activity, seems to be confined to the most ephemeral of sites (Murray 1980; Schiffer 1972). Such patterning was found by Hayden (1979) in the course of ethnographic excavation of two Aboriginal campsites abandoned for a number of years. It has been suggested that the proportion of secondary as opposed to primary refuse (Schiffer 1972) may depend on the degree of sedentism (Murray 1980) and that in sedentary communities there may exist a negative relationship between the distribution of secondary refuse and that of the activities from which it arises. One ethnoarchaeological study of a Shipibo Indian community found that:

Kitchen refuse, broken pottery and other debris resulting from daily activities are cleared centrifugally away from the household and accumulate immediately beyond the perimeter of the clearing. In isolated households, the effect over time is a doughnut-shaped midden... Within a sedentary community, primary refuse, where sites of use and discard coincide, is probably ephemeral and midden accumulates exactly where behaviour is minimal (de Boer and Lathrap 1979:129).

Arcs of refuse centred on the hearths from which the refuse was derived were recorded by Binford (1978) at an Eskimo hunting stand.

General models relating the distribution of refuse to architectural features are, however, few. The concept of the 'household cluster', devised by Winter (1976) and Flannery (1976a) and adapted by others (Bogucki and Grygiel 1981) involves only the co-occurrence of dwelling and features (hearths, pits, burials, midden) without specifying the nature of the configuration. The 'modular unit' used by Clarke (1972) as the basic spatial building block in his analysis of the Iron Age settlement pattern of Glastonbury involves mainly architectural components, with scant attention being paid to the distribution of refuse. Perhaps the most explicit attempt at the kind of synthesis envisaged here is the 'ring model' of Yellen (1977) based on the replication of adjacent configurations of hearth, hut, midden and special activity loci.

#### The Characteristics of Nomad Sites

In the course of research into the archaeology of nomadic pastoral sites in the Near East, I undertook an ethnoarchaeological study of contemporary nomad campsites both occupied and abandoned. The relative absence of nomad sites from the archaeological record has long been attributed to the poverty and perishability of nomad material culture and the ephemeral nature of nomad occupation (Childe 1936:81). Neither

of these arguments was supported by my own observations of nomadic campsites in Anatolia, most of which contained much the same material inventory as local villages and many of which contained substantial stone-built fixtures such as tent walls, detached hearths and animal corrals.

What did emerge was that nomad camps were organised in a fundamentally different way from most sedentary settlements. Camps were open in plan with tents arranged in loose rows or clusters, frequently aligned in the same direction but sensitive to variations in terrain and direction of slope. Campsites appeared to lack the organic structure of even the smaller sedentary settlements. Usually the physical ground plan reflected the kinship or other social relationships that obtained between households.

In evaluating the archaeological potential of nomad sites, it soon became clear that their extensive nature and shallow stratigraphy made them unlikely candidates for excavation by chronology-oriented, mound-hunting Near Eastern archaeologists. The location of nomad camps in mountainous and inaccessible terrain further reduced the likelihood of their falling within the archaeologist's survey net. According to Hole (1978, 1979), who has also addressed the problem of nomad site visibility, the solution lies in understanding the factors governing site location:

... our chief practical problem in finding nomad camps is to pick a spot on the surface of the earth to examine. If we can land on a site we ought to be able to find evidence of it (Hole 1979:209).

Small comfort if, having located a site, we are unable to identify it as nomadic through insufficient understanding of the ways in which nomadic sites differ from sedentary ones (e.g. Crawford 1978:130).

It became clear that the paucity of nomad sites rests primarily on a failure of method. Such shallow, low-density sites require open area excavation and the use of an analytical framework which includes concepts such as the 'occupation floor' (Flannery 1976b; Whallon 1973, 1974). The problems of investigating a suspected nomad campsite through piecemeal excavation have been illustrated in the case of Tepe Tula'i in Khuzistan (Hole 1974). A series of test pits encountered midden deposits and what appeared to be stone-lined tentsites, but insufficient horizontal exposure made it impossible to relate the former to the latter and so to understand the structure of the settlement.<sup>1</sup>

Contemporary campsites provide an ideal laboratory for the study of occupation floors in the process of formation. From a practical viewpoint, the seasonal use of nomad sites permits a flexible ethnoarchaeological approach combining observations of the same campsite during occupation, abandonment and reoccupation, thereby covering a fair proportion of the trajectory of 'time's arrow' in the course of its

flight (Ascher 1968).

#### The Domestic Complex

The strong regularities in the layout of campsites extended to the organisation of space within and around each individual tent. Differences in the location of public and private domains, seating arrangements, hearths, kitchen areas and storage arrangements observed in widely dispersed campsites emerged as variations on a single pervasive theme. This regularity is largely the result of human responses to the constraints imposed by tent architecture itself rather than any culturally transmitted preferences about dwelling arrangements (Faegre 1979:7). Centuries, perhaps millennia of orderly migration, packing, stacking and repacking household impedimenta, and making long disused campsites livable, have honed the nomad's domestic arrangements down to a basic repertoire, maximising economy of movement and efficiency in the use of space.

A tentsite occupied for any length of time will contain minimally a stone storage platform at the rear, and an internal hearth. The public or male domain, where guests are entertained, is situated at one end while the kitchen area or women's domain, occurs at the end containing the hearth. Female work areas tend to spill outside the tent itself into a kind of forecourt which also contains a hearth. On a sloping surface the tent interior and the forecourt are levelled through cutting and filling. Ash from the hearths is dumped immediately beyond the external work areas and beyond this spreads the midden.

I will refer to this characteristic combination of dwelling, work areas and midden as 'the domestic complex'. Such a pattern need not be confined to nomad settlements. It occurs also in some villages of open settlement plan, though frequently these turn out to be villages of recently settled nomads (Donmez 1964; Sumner 1979; Watson 1979). For the most part, traditional sedentary villages in the Near East tend to huddle together, each dwelling or courtyard abutting directly onto its neighbour. Under these conditions refuse and ash are generally transported to communal midden zones surrounding the settlement (Kramer 1979:fig.5.2; Sweet 1974:fig.4; Watson 1979:298). Only in the case of nomad camps or other open-plan settlements would we expect all the elements of the complex, including midden, to be juxtaposed in a single unit.

The open structure of the camp is in itself a reflection of the desire of each household to maintain a certain minimal living space and physical independence, counterbalanced by the need for proximity to other households for reasons of security and sociability (Bates 1973:122-4; Hole 1978:151; Barth 1961:42; Digard 1975:122-3). The most efficient resolution of these two opposing tendencies is to place the units side by side and a little apart, resulting in the appearance of rows of tents arranged end to end.

#### An Example: Campsite SV-1

I will illustrate the use of the domestic complex model with an example. Located high in the Taurus Mountains of southern Anatolia, SV-1 is the summer camp or *yayla* of a group of semi-nomadic Turkmen who winter in a lowland village (Cribb 1982:ch.5). While their main economic focus is on sheep herding, they also cultivate vegetables and citrus fruits in irrigated fields on the outskirts of the camp. The campsite lies on the floor of a narrow hanging valley at about 1500m.

The tents used are of the barrel vaulted type -- a semi-cylindrical frame of wooden hoops joined by horizontal poles covered by material of felt or goat hair and surrounded by a wicker screen. The floor is levelled through cutting and filling and is freshly plastered with each occupation. At one end of the tent is a stone-built and plastered wall guarding a hearth of the same material, while at the other end is a large wooden box on a raised platform. A stone storage platform on which the family's belongings are stacked runs down both sides. The entrance is at the hearth end of the structure. A few families had replaced the tent structure with stone walled huts roofed with poles, mud and straw, though in all cases the internal and external arrangements were identical to those found in tents.

From the hill above the campsite the essentials of each domestic complex could be clearly discerned. Except where the terrain made this impractical, the tents were aligned along an east-west axis, faced south and tended to form into rows. About 5m from each entrance was a stone-built external hearth along with a levelled forecourt and kitchen area. Beyond the external hearth was an ash dump and wood-chopping area defined by a scatter of wood chips, surrounded by general refuse and debris.

The whole domestic complex may be summarised by the stylised pattern shown in Figure 1. It occupies approximately a 20m by 10m rectangle, divided into a living zone and a discard zone of roughly equal area, the former consisting of architectural features and activity areas, the latter of refuse. Note that the entire complex may be reduced to two axes, the 'A' axis defining the alignment of the tent and the 'B' axis defining that of the complex as a whole. While there were variations on this general pattern -- for instance the axes may be slightly askew -- all the dwelling units at SV-1 could be fitted into this mould. Furthermore, in only a few cases did the complexes touch or overlap.

In archaeological terms, we are dealing with a set of architectural remains consisting of stone platforms, hearths and plastered floors (or sequences of floors) in known and predictable association with a midden deposit. Attention will now be focused on spatial patterns that occur within the discard zone.

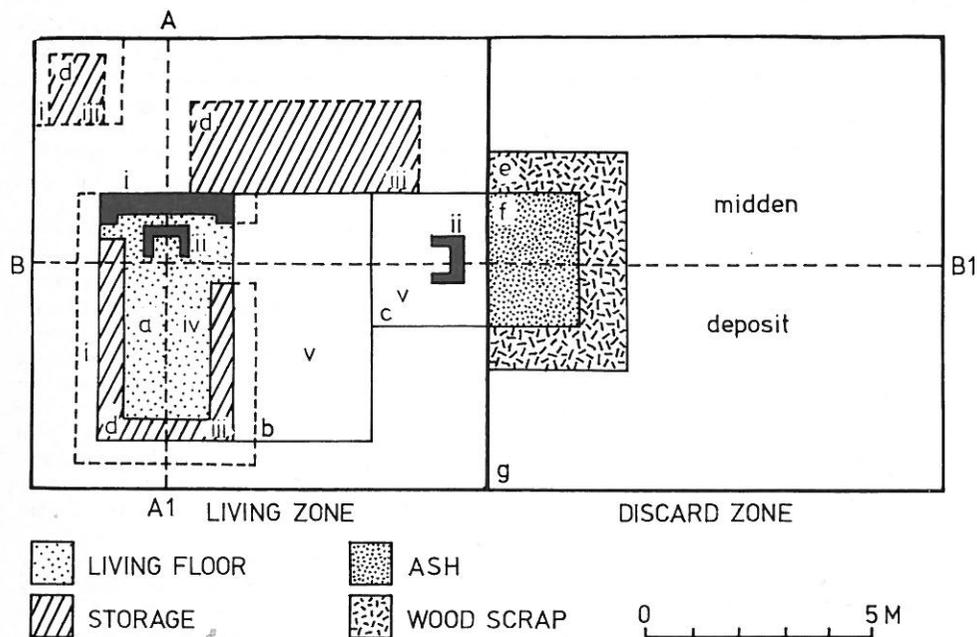


Figure 1: Formal composition of stylised domestic complex at SV-1. Zones: a. dwelling, b. forecourt, c. external kitchen, d. external storage, e. wood chopping area, f. ash dump, g. midden; structures: i. walls, ii. hearth, iii. storage structures, iv. plastered floor, v. stamped earth floor.

#### Quantitative Analysis of Discard

A thorough surface recording was made of all items (bone, ceramic, glass, metal, plastic, rubber, textile and binding) occurring within a 15m by 15m area which included the discard zone of an abandoned tentsite (number 3). Organised into a 2m grid system, the quadrats were subjected to principal components and cluster analysis (Ward's method) in terms of the proportion of different materials contained in each.<sup>2</sup> The results of the cluster analysis, shown in Figure 2, showed a degree of spatial coherence in that similarly constituted quadrats tended to occur adjacent to one another. This spatial coherence was maintained even when perishable items (such as wood, textiles) were excluded from analysis (Figure 2b). Whether these spatial patterns were the result of differential sorting in the process of discard or post-depositional disturbance by animals or humans is uncertain. What is interesting is that, although the midden represents an accumulation of 'secondary'

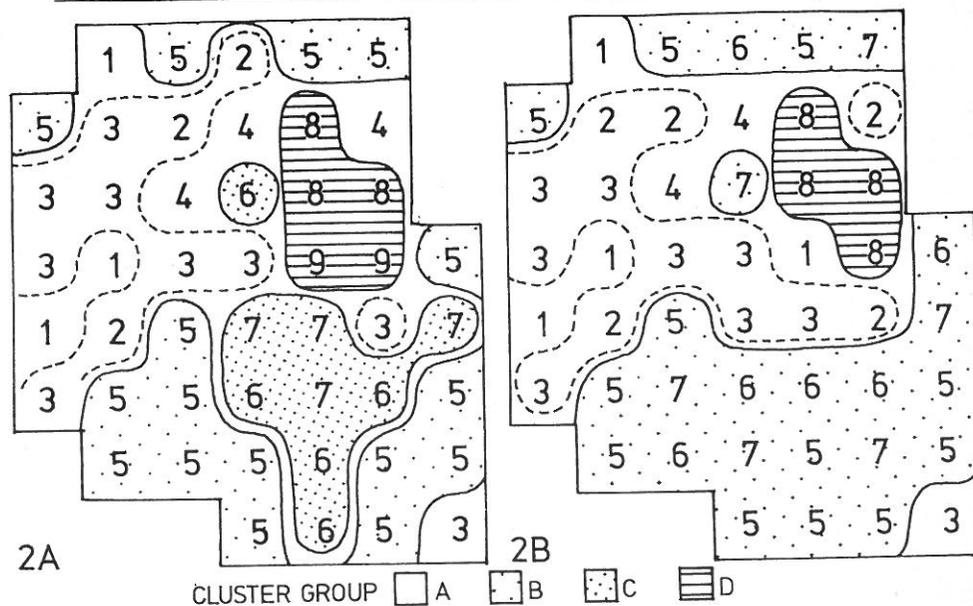
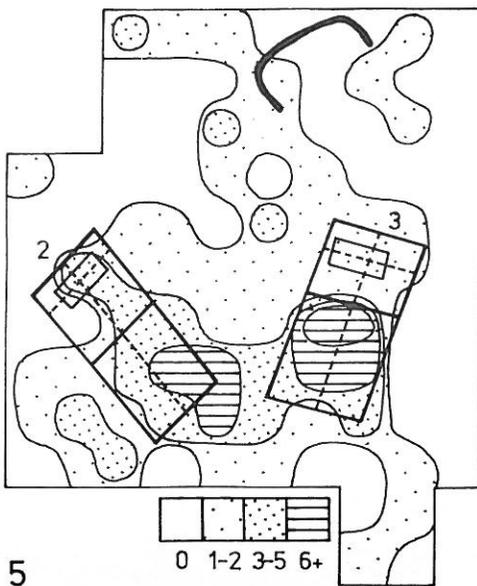
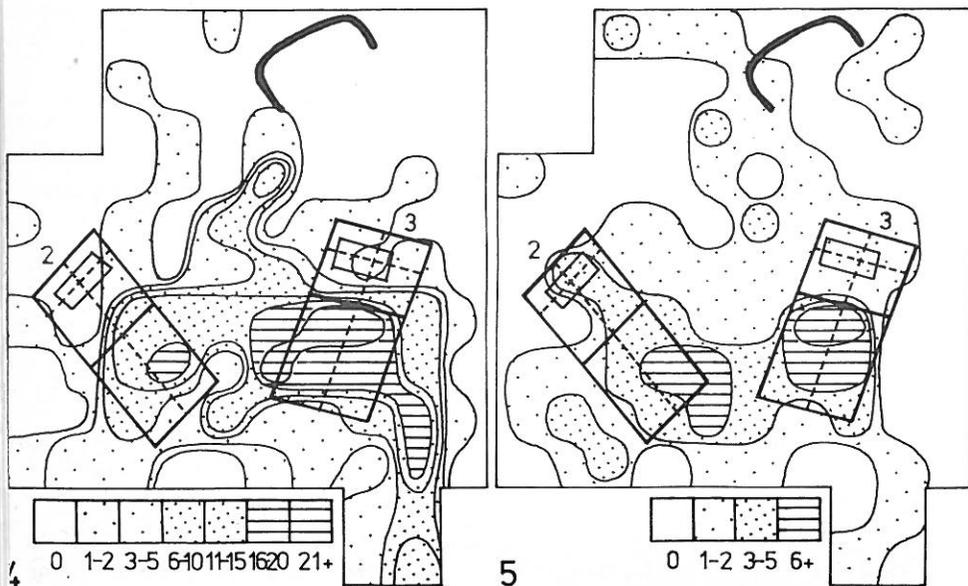
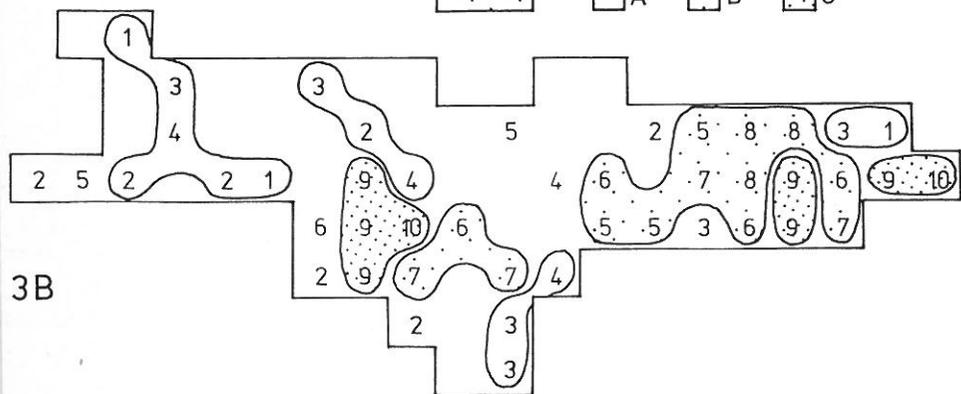
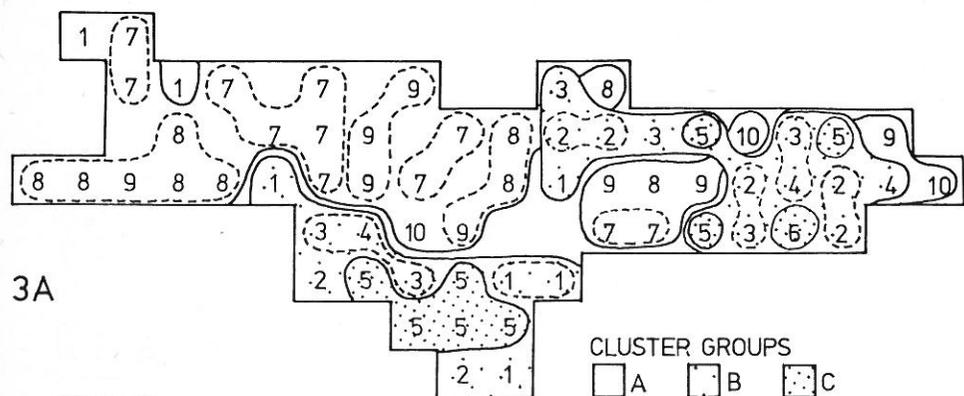


Figure 2: Cluster analysis of spatial patterns of discard by 2m quadrats, recording zone A. This corresponds to the discard zone of domestic complex number 3, SV-1. A. All materials (bone, pottery, glass, plastic, metal, rubber, textiles and bindings). B. Durables only (bone, pottery, glass, plastic and metal).

refuse, it nevertheless contains identifiable spatial patterns.

These patterns, however, are of structural rather than behavioural significance. In terms of the domestic complex model, Figure 2 suggests that the origin of the refuse lies to the upper right, where in fact an external hearth, kitchen area and tentsite occur (see Figures 4 and 5). In another part of the site a similar surface recording was made in an area of midden arising from two adjacent tents. As indicated in Figure 3, it was possible, on the basis of the two very similar patterns produced by cluster analysis, to suggest the presence of two discard zones and hence two associated living zones.

It was also possible to distinguish separate domestic complexes on the basis of single item distributions or overall densities. Figure 4 shows the relationship between the density of faunal remains and domestic complexes 2 and 3.<sup>3</sup> In Figure 5 the same has been done using all artefacts. In both cases the peaks of highest density overlapped with the respective discard zones -- the location of the latter having



been deduced from the position of architectural features, combined with the direction of slope.

The ability to predict the location of a tentsite from the presence of a midden, and vice versa, confers practical advantages within the context of a particular site. For instance, on a slight slope middens will lie downhill from tentsites. The aforementioned tendency for tents to form parallel rows -- not well developed at SV-1 due to uneven terrain -- opens up further possibilities in excavation strategy. Under optimal conditions (flat surface, slight slope) domestic complexes will be packed side by side, forming parallel rows of living zones and discard zones -- a straight version of the 'ring model' (Yellen 1977).

One major problem remains. Who is to say that whatever patterns may appear in architecture or refuse will not be destroyed in the course of subsequent reoccupation of the site? Observations of nomad behaviour at SV-1 and numerous other sites suggest a high turnover in personnel at campsites from year to year. Of the available tentsites, only a few may be occupied in any one year. At SV-1, out of 28 identifiable tent/hut-sites, 11 were occupied in 1980 and 9 in 1981. Nevertheless each family has its customary tentsite (cf. Watson 1979:263) and, once established, an existing tentsite with a levelled platform and fixtures such as stone walls or platforms and hearths holds obvious advantages over virgin ground. Once established on an existing tentsite, a household will tend to recreate the same patterns of discard as existed previously. Like tentsites, campsites also demonstrate continuity. What was a campsite in one generation is likely to continue as a campsite in subsequent generations due not only to the presence of fixtures and facilities but also to a constant set of locational criteria which tend to favour certain spots (Hole 1978; Cribb 1982:ch.8).

While tending to preserve two-dimensional structures, this mode of accumulation is not likely to aid the definition of stratigraphy. The middens arising from various occupational events are likely to be conflated, while in the tentsites themselves the re-use of fixtures such as stones will result in their being 'translated upwards' out of context (Binford 1979:264). Low overall rates of accumulation will mean that such sites, while having limited appeal in terms of chronology, are likely to provide optimal conditions for open area excavation (Flannery 1976b:50).

Figure 3: Cluster analysis of spatial patterns of discard by 1m quadrats, recording zone B, SV-1. A. All materials (as for Figure 2). B. Durables only (as for Figure 2).

Figure 4: Density of items of animal bone (ova-caprine, bos, equid) by 5m quadrats, area A, SV-1. Locations of domestic complexes 2 and 3 are indicated. Feature at top of study area is a stone-built corral wall.

Figure 5: Density of artefacts (metal, pottery, tentcloth, glass) by 5m quadrats, area A, SV-1. Locations of domestic complexes 2 and 3 are indicated.

### Conclusions

The 'domestic complex' is not an explanatory model but an investigative tool which may serve to optimise the recovery of data from a certain kind of site. Of course, not all extant campsites conform exactly to the pattern described in Figure 1, and it would be unreasonable to expect this in the case of ancient campsites. Nevertheless, in evaluating archaeological data and choosing an excavation strategy, it would be well to bear in mind that some transformation of the same basic elements may be encountered. The model itself is simply a device by which otherwise scattered bits of information may be drawn together into a single holistic scheme. Translated into archaeological idiom, it provides guidelines in the choice of excavation strategy and suggests the appropriate level of resolution in the interpretation of spatial patterning in archaeological elements and features.

### Notes

1. In view of the conditions under which the excavation was carried out -- it was a 10-day rescue operation -- this lack of rigour is understandable. Some of the Luri workmen employed on the excavation were ex-nomads and were able to provide insights into the location and interpretation of features as the excavation was in progress. For example they were able to predict the location of the fireplace in relation to a stone 'storage platform' (Hole 1974).
2. This method of spatial analysis is similar in principle to a method called 'unconstrained clustering' developed by Robert Whallon of the Museum of Anthropology, University of Michigan.
3. The discard zone of domestic complex number 3 in Figures 4 and 5 corresponds to the analytical area shown in Figure 2.

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Address: Department of Anthropology and Sociology  
University of Queensland,  
St. Lucia,  
Queensland 4067,  
Australia

Glynis Jones

In recent years, there has been a growing interest in the study of past agricultural practices from the archaeologically recovered charred remains of crop plants. It is no longer considered sufficient to provide a list of the species from each site, area or archaeological period and attempts are being made to understand some of the techniques used for the cultivation of crops. What is lacking is a sound methodology for linking archaeologically recovered plant remains to past human agricultural activities. This problem has been emphasised in a wider archaeological context by Clarke (1973), Schiffer (1976) and Binford (1977) who have stressed the need for the development of, respectively, 'interpretive theory', 'behavioural archaeology' and 'middle-range theory' or 'middle-range research' (Binford 1981) for relating past human dynamics to contemporary static observations. Though the distinction between general and middle-range theory is not always clear, it does have some utility as a framework for the critical examination of some problems of archaeological method. In this paper, therefore, ethnoarchaeology will be used as a means of generating a middle-range methodology for the interpretation of archaeological plant remains (see also Hillman 1973, 1981).

Only some of the aspects of middle-range research distinguished by Clarke and Schiffer will be discussed here (see Figure 1). In the first place, only the predepositional correlates, i.e. the relationship between agricultural practices and the plants themselves, will be considered. A further distinction can be made between the husbandry practices applied to crops in the field and the processing sequence to which they are subjected after harvest. The former are best tackled by reference to ecological rather than ethnographic models and so will not be considered here. I will be concerned, then, only with the problem of crop processing (see Figure 1), which provides a suitably compact study that can be used to illustrate some of the more general benefits and problems of using ethnoarchaeology to generate a middle-range methodology.

One of the main reasons for studying crop processing is that it acts as a 'filter' on archaeological plant material and must, therefore, be controlled in any further interpretation of this material. This 'taphonomic' (cf. Efremov 1940 and Figure 1) role of crop processing studies was stressed by Dennell (1972) who noted that the effect of crop processing activities, and therefore of archaeological context, on the composition of archaeobotanical samples should be taken into account before any attempt is made to reconstruct a prehistoric crop economy. For instance, husbandry practices, such as choice of soil, tilling methods, time of sowing, fallowing, rotation, irrigation and so on all have an effect on the weeds which grow in cultivated fields and so are potentially detectable by archaeobotanical analysis of weed seeds.