The Archaeological Structure of a Bedouin Camp

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Ethnoarchaeological studies of hunter–gatherer site structure are compared to a case of semi-nomadic pastoralists, the Bedul Bedouin of Petra, Jordan. Findings/hypotheses include: refuse is not deposited where activities took place; hearth contents represent the terminal activities at sites and are not a general indicator of diet; duration of occupation is reflected in the distribution and density of small refuse; locations of structures or use areas have relationships to refuse location; a possible archaeological indicator (rock, “laban” platforms) of dairying/animal domestication is identified; there are cross-cultural relationships between the segregation of activities and food storage strategies; excavations need to be areally broad and located according to ethnoarchaeological hypotheses.

Keywords: ETHNOARCHAEOLOGY, SITE STRUCTURE, SITE FORMATION PROCESSES, PASTORALIST ARCHAELOGY.

The archaeological study of intra-site spatial organization, or site structure, has been stimulated and to some degree revolutionized by ethnoarchaeology. Documentation of site formation among living peoples has challenged assumptions about the potential to identify activity areas and tool kits, and questioned the use of such data to interpret the overall spatial organization of sites. Considering some of these shifts in conceptualizations of site structure, this paper presents ethnoarchaeological data on the structure of a household of semi-nomadic/sedentary pastoralists in the Near East. These data contribute to efforts to define the study of site structure and to the development of more realistic questions aimed at improving the means of archaeological inference.

Much ethnoarchaeological literature on site structure has been cautionary, showing that past assumptions about the relationships between refuse and activities can be wrong. In recent years, ethnoarchaeological studies are suggesting redefinitions concerning which data are important and which questions are approachable. Some ethnoarchaeological studies (e.g. Ammerman & Feldman, 1974; Gifford, 1977; Yellen, 1977; Binford, 1978a; Kent, 1984) have shown, contrary to others (e.g. MacNeish et al., 1972; Wilmsen & Roberts, 1978; Bunn et al., 1980), that there is variability in the degree to which activities are segregated at sites; that refuse is often not deposited where an activity took place; and

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that the frequency of occurrence of an activity is not necessarily reflected in the artifact assemblage.

In a comparison of site structure literature to data from hunter-gatherer situations, O'Connell (1987) discusses these changes and argues for a view that examines the variability in site structure to learn about certain behaviours. This is the opposite of past approaches in that variability was once seen as an obstacle to characterization, hence was the nemesis of those who would address site structure.

Site structure studies now focus on documentation of the variables that affect refuse disposal, variations in the placement of activities and the sources of variability in the resulting archaeological patterns. For example, rather than seeking to identify specific activities with the necessary but modest goal of site specific reconstruction, O'Connell (1987: 103–5) suggests that variations in the degree of activity segregation can reflect differential reliance on food storage. In this way, knowledge about site-specific structure can help elucidate economic issues that ultimately have regional significance. In another area potentially important for archaeological interpretation, there is evidence that duration of occupation (not necessarily synonymous with sedentism versus nomadism) is reflected in refuse patterns (e.g. O'Connell, 1987: 100).

These advances in ethnoarchaeological studies are encouraging, but unfortunately current archaeological methods are not well suited to the retrieval of data relevant to the above-mentioned issues (O'Connell, 1987: 104–6). There is a need for broader recognition among archaeologists of the data requirements necessary to take advantage of the advances made by ethnoarchaeology to interpret site structure in archaeological situations. Also, much of the site structure work is based on cases of hunter–gatherer economies. Thus, there is a need for broader tests by ethnoarchaeologists of the hypotheses developed so far.

The answer lies in further research aimed at identifying the factors that determine the distribution of activities within sites, and assessing their effect on archaeological site structure. This is best done ethnoarchaeologically, in situations where both the behavior and its archaeological effects can be observed simultaneously (O'Connell, 1987: 105).

It is possible to study the use of space from several perspectives. In several hunter–gatherer cases, knowledge about the use of space has been used as a means of understanding the structure of the material remains at a site to aid in the interpretation of adaptive strategies, typically regarding economics. This contrasts with studies (e.g. Layne, 1987, on a Bedouin case) where the use of space itself is the focus of interpretation, and economic, social and settlement factors are used to try to understand the use of space. Both perspectives aid our understanding, but as a means of improving archaeological interpretation the former perspective employed by those who study hunter–gatherer situations has great potential utility. Using such a perspective, this paper documents site formation by a household of Bedul Bedouin in Petra, Jordan (Figure 1).

Studies by Banning & Köhler-Rollefson (1983, 1986) and Banning (1986) demonstrated that there are numerous abandoned pastoralist camps with identifiable remains in the Petra region. Banning & Köhler-Rollefson (1986) also provide ethnographic descriptions of pastoralists in the northern portion of the Petra Basin and relate these to some of the general archaeological consequences of their lifeways. The present study explicitly addresses the archaeological implications of site structure by observation of a camp currently in use and compares this case to others from around the world for which similar data are available. At the least, these kind of data can aid the interpretation of abandoned camps and lead to a better understanding of the archaeology of pastoralists in the Petra area. Perhaps more importantly, these data have implications for site structure studies.
in general by adding a contrasting case to the hunter–gatherer economies already documented. The study reported here is one of several initiated during the Petra Basin Ethnoarchaeological Project in May and June, 1986 (Russell & Simms, n.d.).

**The Bedul (Bdul) Bedouin**

The Bedul Bedouin are a group of about 600 people living in the rugged sandstone formations of the Petra Basin in central western Jordan (Figures 1 & 2). They are rapidly being settled through government programs, but some continue to practise a semi-nomadic life-style, herding goats and inhabiting rectangular goat hair tents. Settlement stability is variable, with some people hardly moving at all and others moving camp several times per year. Portions of most families also establish short-term camps related to specific agricultural or herding tasks.

Food production is primarily local. Traditionally, the Bedul dry-farmed wheat and barley, preparing the fields with donkey-drawn ards, harvesting by hand, threshing the grain on prepared floors using animal traction and winnowing the grain with forks. In recent years, machines have been used to thresh the harvest, and tractors are increasingly
used to plow the fields. However, the use of tractors is limited by the rugged terrain which prohibits machines from gaining access to all fields. Goat herding, the basis for the production of soured milk (laban), a dried yogurt “cheese” and a limited amount of meat, is the other main food production pursuit. The balance of the food supply comes from small gardens and a limited amount of food obtained from the wider economic system.

While some Bedul remain semi-nomadic, there have been several stimuli which have contributed to increased sedentism. Preliminary data indicate that the closing of political borders after 1948 intensified agricultural pursuits. The recent growth of a tourist industry is also associated with the concentration and stabilization of Bedul encampments in the Petra region, despite the increased impact of goat herds on local forage. Some Bedul supplement their income by serving as horsemen and guides for tourists visiting the Nabataean/Roman ruins of Petra, a world-famous archaeological area. Now, as more Bedul live in the government-constructed settlement, termed Wahidat Bedul, those living in the hinterlands tend to remain closer to their relatives in Wahidat when possible.

Some might argue that the Bedul are not “traditional” because of agricultural activities, their involvement in the tourist economy of Petra and the government settlement program, but it is this situation that in some ways maintains a more conservative and traditional life-style among some segments of the Bedul. While Bedouin are being settled in government-supplied housing across Jordan, segments of the Bedul resist, in part, because settlement would mean increased competition over a limited (and currently reduced) number of foreign tourists, a critical economic factor as pastoral options decline due to reduced mobility.
From the standpoint of site structure studies, the notion of a traditional or "typical" Bedouin settlement stereotype is irrelevant and potentially misleading because such a perspective diverts attention from the study of variability (cf. Banning & Köhler-Rollefson, 1986: 166). The mobility, settlement patterns and economics of nomadic pastoralists have varied greatly through time in response to changes in the physical and social environment (Johnson, 1969; Gifford, 1977; Hole, 1978; Smith, 1980; Russell, 1987). For example, a report on ancient and recent Bedouin sites in Saudi Arabia (Zarins et al., 1980: 23) comments on the "remarkable" differences between the gross features of modern Bedouin sites and those several thousand years old. Assuming that certain aspects of economy/adaptive strategy have changed, the only remarkable thing would be site structure that had not changed. Thus, it is necessary to ascertain which variations in site structure are significant for archaeological interpretation and generalization. It is necessary to look beyond the gross features of a site into the patterning of refuse disposal, perhaps even micro-refuse. In other words, one goal of site structure studies is to discover the kind and degree of patterning necessary to identify behaviours for comparisons within and between cultures (including comparisons outside of the Middle East). Given the nascent state of site structure studies, any study of Bedouin site structure from this perspective can aid our understanding of site formation and spatial patterning in material remains.

**Qublan’s Camp and Methods of Recording**

The household described here is that of Qublan Salim, an elderly Bedul, approximately 72 years of age. Qublan is an influential member of a prominent lineage among the Bedul. During Qublan’s life, the Bedul settlement and subsistence pattern has apparently changed many times, from wide-ranging camel and goat pastoralism, to semi-nomadism and even near sedentism constrained by dry farming and the tourist economy (contra Banning & Köhler-Rollefson, 1986: 166). Spatial and temporal variations have also occurred in their use of tents, caves and dry-laid masonry habitation/storage structures situated on the canyon ledges. This study recorded the refuse structure of Qublan’s black tent encampment during the month of June 1986 and effectively documents site structure for April–June, the time the camp had been at that location.

"Bayt Qublan" (the home of Qublan) was situated below al-Habis, a 75 m high sandstone butte west of the camp. The site was in a shallow saddle on the crest of a ridge at an elevation of 880 m above sea level. This location is near the centre of the ancient and (largely buried) city of Petra and about 3 km from the government-sponsored settlement. Water is available from a spring 0.5 km away. Forage is sparse and the goats are often taken up precipitous trails to forage in the cracks and along the ledges of the sandstone buttes surrounding the Petra Basin.

The camp was regularly occupied by seven members of a nuclear family including Qublan, a wife, two adult unmarried sons, an adolescent son and two pre-adolescent female twins. Qublan’s other children known to the ethnographers variously live nearby (eldest son’s closest camp 0.3 km away), in Wahdat (married daughter), elsewhere in Jordan (son in Jordanian army), or elsewhere in the Middle East (son in Bahrain). The camp size was never smaller than five people, was most often between six and eight, and occasionally over 10.

The ethnographers were based at Qublan’s camp but were absent much of the time. It is possible that the presence of the ethnographers affected the degree of household cleanliness. However, since these data result from the mapping of refuse, the patterns reported here also document debris accumulated over the 2-month period the camp had been in use prior to our arrival. More importantly, as we travelled among numerous tent encampments and a great deal of individual variability in household cleanliness was apparent, the
basic patterning of the material remains described here appeared to hold. Thus, from an archaeological standpoint, the documentation at Qublan’s camp serves as a quantified and graphic example of a pattern that can be observed qualitatively at camps of some duration. These patterns transcend idiosyncracies in household cleanliness and exist in spite of the presence of the ethnographers. This information is relevant to an archaeological perspective. Finally, documentation of features at Bedouin camps in Syria and Jordan (Jarno, 1984; Layne, 1987) report some repetition in the gross layout of such camps and certain consistencies in the use of space under similar economic circumstances whether the camp is situated in a traditional tent, or a cinder block structure. Building on these kinds of studies, this project adds data on the distribution of small refuse, a class of material culture likely to be found in an archaeological excavation. These data may be broadly applicable to those attempting to use site structure studies to improve the means of archaeological inference on something other than a particularist level.

The camp plan is shown in Figure 3. The camp features and refuse zones were mapped to scale using a compass and tape. The tent is 15 m long × 4 m wide × 1.7–2.1 m high, constructed of segments of hand-woven, coarse goat hair, 40–70 cm wide by 3–6 m long, and supported by 15 moveable poles placed according to the sun and wind. Fourteen guy ropes hold the tent in place. The tent opened to the west during our stay, but before our arrival had been rotated to an easterly exposure for 1 week to adjust for wind and shade needs. This change did not affect the location of the main camp features discussed here, although an interior hearth on the western side of the tent was used less due to the obstruction created by the back curtain of the tent. Other physical features of the camp include: one exterior and two interior hearths; interior kitchen and bedding storage; a
men's sleeping area; an exterior tarp-covered storage area; additional storage in the sandstone outcrops west of the camp; a goat tether area with an associated dung deposit; chicken coops; hearth refuse areas; and a secondary refuse dump. Another feature is a platform consisting of several flat stones in the kitchen storage area on which are stored laban in goat skin bags. This common feature among Bedouin sites is archaeologically significant in that it may be a durable material referent of animal domestication and dairying.

A grid system of 1 m squares controlled the plotting of artifact location, type, size and quantity. Artifacts c. 0.5 cm and larger were recorded. The initial maps were made 4 d after arriving in camp. Subsequent observations were made every few days to track the continued development of the site and to ascertain the level of patterning in the material record that best-matched consistent behaviours forming the site. All observations were made over a 3-week period.

**Site Structure**

Prior to erecting a tent, some surface preparation is typical if rocks occur on the chosen campsite. Qublan's camp, as well as numerous abandoned camps in the Petra area, show that rocks are cleared away in an area slightly larger than the tent (also see Banning & Kohler-Rollefson, 1983), leaving a distinctive border of rocks as at Bayt Qublan. Figure 4, depicting only the features of an abandoned camp and the density distribution of remaining small debris illustrates this effect.
The spatial structure of activities and refuse disposal can best be described as a series of four zones with loci of specific activities embedded within these zones.

**Zone 1: tent interior**
Most daily household activities take place in the shade of the tent including cooking, laundry, laban churning, equipment repair, daytime meals, conversation, daytime sleeping and women’s nighttime sleeping (see Banning & Köhler-Rollefson, 1986: 162). This area is cleaned frequently. Artifacts to be re-used are picked up and moved outside the perimeter of the tent or stored in boxes. Zone 1 is swept daily or every other day using branches from a small shrub (*Ephedra* sp.). Before sweeping, the size of most debris in this zone is between 0.5 and 3 cm at an average density of five artifacts per square metre. After sweeping, the density and average debris size decreases, but some debris within the above size range and larger can become embedded in the floor and escape sweeping. Debris larger than 3 cm that escapes sweeping tends to be linear such as sticks and twigs, but other debris also escapes sweeping, including flat archaeological ceramic sherds (Nabataean ceramics are ubiquitous), cigarette filters, paper, plastic and metal fragments. Sweeping often tends to brush surface sediments over debris as much as it actually reduces the density of material through physical removal. Even more of the very small debris (less than 1 cm) escapes sweeping, and small debris is what one would find in zone 1 of an abandoned camp (and probably micro-refuse as well, often less than 1 mm in size, and not explicitly addressed by this study). Larger debris is simply picked up by hand and thrown outward. The practice of sweeping and cleaning leaves the interior of the tent with a relatively debris-free appearance.

**Zone 2: tent exterior within cleared area**
This is the innermost zone of secondary disposal resulting from sweeping and cleaning of zone 1 (Figure 3). The size range of debris is from 1–10 cm, averaging 3–5 cm at a density of 10–50 artifacts per square metre. Occasional large debris such as wood pieces, logs, iron grating, metal fragments, wooden boxes and cooking pans are scattered in zone 2. Small debris accumulates near the linear alignments of rocks as material is swept out of the tent (Figures 3 & 4). Sweeping moves in all directions but is biased toward the east or rear of the tent. Larger debris is scattered throughout the zone, but is also biased toward the east. The reason for the directional bias and for the use of zone 2 as a secondary disposal area may be related to the presence of tents with guy ropes. The tent guy ropes cross zone 2 and inhibit human movement around the perimeter of the tent. Zone 2 is typically crossed from the west as people enter or exit the tent, but few activities are conducted in zone 2. Therefore, zone 2 is a convenient secondary disposal area, biased towards the east or rear of the tent, despite the proximity of zone 2 to the living area.

While zone 2 is a disposal area with few activities conducted there, it also serves as an expedient equipment storage area. Some items tossed into this zone (e.g. cooking pans, plastic or metal items) remain usable and are retrieved when needed for another task.

**Zone 3: variable secondary disposal**
This zone contains the largest debris and several embedded loci of refuse disposal such as hearth and kitchen refuse. The ground surface is rocky and deflated by wind erosion. Relative to zones 1 and 2, the debris size is larger, but with a broader size range of 1–50 cm. Density is highly variable from less than one to 15+ artifacts per square metre (Figure 4). Artifact density is even higher in the specific refuse loci within zone 3.

The distribution of refuse in zone 3 results from secondary disposal in *ad hoc* locations, and redeposition by dogs, wind and humans (e.g. debris scattered by children). Debris includes apricot, olive and date pits, cans, metal fragments, batteries, paper, fabric,
bones, glass fragments and archaeological ceramic sherds. Within zone 3 are three loci of secondary hearth disposal and a concentrated secondary dump that utilizes an exposed Nabataean room downslope (Figure 3). These loci will be discussed separately. Secondarily deposited debris, especially bone, is removed from the hearth dumps by dogs and scattered throughout zone 3 which extends 30 m southeast of the tent.

Exposed Nabataean rooms about 50 m east of the tent were used as human defecation and urination areas.

**Zone 4: sandstone outcrops**

Disposal occurs in this area for several reasons. The rocks are used for goat and chicken butchering. Some bones, hides and entrails are simply left on and among the rocks. Dogs inhabit the rocks and redeposit the bone and entrails from butchering. They also remove bones from the hearth refuse dumps in zone 3 and redeposit them in zone 4. The rocks trap a variety of wind-blown refuse from across the camp. Human activities such as tea brewing, cooking and other work are sometimes carried out in the shelter of the rocks. The donkey(s) is tethered in zone 4 at night.

The material remains of these activities are characterized by a wide range of debris size, with higher concentrations adjacent to the rocks and scattered patches of charcoal from fires. Debris includes bone, hide, hair, feathers, fabric, paper and less of the heavier, durable debris common to zones 2 and 3. The rocks trap aeolian sediments as well as camp debris, and the increased rate of deposition seems to bury small artifacts in contrast to the rocky and deflationary surface environment over the remainder of the camp area.

The area west of zone 4, usually more than 50 m away, is used as a human defecation and urination area. The only other debris present in those areas had blown there.

**Hearth refuse dumps**

Three concentrated heaps of hearth debris including ash, charcoal and a variety of unburned debris are located south and southeast of the tent (Figures 3 & 4). Unburned kitchen debris is often disposed of in the hearth refuse areas even though it was not thrown in the fire. Durable food items such as bone, apricot, olive and date pits, peels and egg shells were only rarely found burned (< 10%), although they were observed in the hearth refuse areas. Other unburned debris deposited in these areas from general cleaning activities includes fabric, plastic fragments, cans and archaeological ceramic sherds. A variety of non-hearth debris between 2 and 3 cm in size is deposited in the hearth refuse areas by inclusion in the container that was used to scoop out the hearth pits or by independent batch dumping. This unburned material is often coated with ash. The resulting heaps of refuse are between 0.6 and 1.8 m in diameter and 20–25 cm high, and consist of lenses of sandy sediment from scraping the hearth bottom alternating with layers of ash, charcoal and partially burned goat dung.

Bone density is higher in the hearth refuse dumps, but there was less total bone in those areas than was found scattered throughout the remainder of zone 3. The sample size of bone from the site is very small ($N = 12$), but anatomical type did not vary between zones because dogs redeposit bone initially disposed of in the hearth refuse dumps and in zone 4. Only larger bones were present because the dogs consume most discarded bone (see Banning & Köhler-Rollefson, 1986: 164). Some of the larger bones redeposited by dogs exhibited carnivore damage visible to the naked eye, while many did not.

The choice of dumps used is primarily based on proximity, resulting in the largest dump being the closest to the tent. However, the direction one is moving while scraping the hearth seems to be the next most important determinant of dump choice. If one is facing southeast while scraping the hearth, that direction of travel is maintained until reaching
the dump. Finally, wind strength and direction are also factors in the choice of a hearth dump site.

All of the hearth debris appeared to be from the most recent use of this site. Observation of abandoned open camps in the area yielded little evidence of coherent areas of hearth refuse. One explanation for this is that with the passage of time, such unconsolidated dumps are scattered by aeolian action making them difficult or impossible to recognize as coherent entities.

Hearths
There are two hearths within the tent and one in zone 4 at the base of the sandstone outcrop (Figure 3). They are scooped into the surface sediments and are not lined with rocks in this case. Other small fire areas from tea brewing are scattered around the camp area, but these represent one or two episodes, do not involve ground preparation and their contents usually blow away. Fires are usually made of wood and brush with dung added when longer cooking times are required. Hearths are not typically used to burn garbage, and very little burned food debris or refuse is found in the secondary disposal areas.

The hearths within the tent show no consistent functional differentiation. All activities are carried out at both and the choice of hearth is often dependent on where people are gathering to eat. Two eating areas are used at this camp, one around the central interior hearth during the day and one in the men’s sleeping area at night. Both hearths and sometimes all three are used if large groups are present. The number of hearths in use at once is not only dependent on group size, but on the kind of meal being prepared and whether any other food processing, such as laban thickening or bread making, is occurring simultaneously.

Secondary refuse dump
This dump is located 35 m southeast of the tent, downslope and within a partially exposed Nabataean room. Large batches of refuse not disposed of in the hearth dumps or simply thrown out into zone 2 or 3 are brought to this dump. It is 3 × 2 × 0.5 meters high and consists primarily of paper and cans. Debris size is larger on average than anywhere else and typically ranged between 5 and 30 cm. Most of the dump consists of durable packaging material of goods purchased from the wider economy such as round cans, various sizes of rectangular tins (e.g. sardine or oil cans), paper boxes (e.g. candy or cheese boxes). This dump was only used intermittently and appeared to have accumulated during more than one occupation in the vicinity. Had there been no flow of goods from the market economy, it would have been much smaller or non-existent.

Goat, chicken and storage areas
The herd of 35–40 goats are tethered in this area at night. The loose, churned surface sediments are covered with goat droppings that are periodically collected for fires (see Banning & Köhler-Rollefson, 1986: 162). Few artifacts were observed here and they were very small. Activities occurring here include the manufacture of dried laban and sleeping, primarily by men and occasionally by women. Men also slept adjacent to the goat tether area.

The chicken coops consisted of some wooden boxes with rocks placed across the openings at night to secure chickens (see Banning & Köhler-Rollefson, 1986: 162). The chickens roamed across camp during the day and no other debris was associated with the chicken coops.

The tarp-covered storage near the men’s sleeping area contained sleeping and sitting pads, rugs, blankets, dried laban balls, bulk local tobacco and sacks of flour. At the south end of the tent is kitchen equipment and foods such as cooking oil, fruits, vegetables and
laban in goatskin bags stored on rock platforms. Caves in the rocks west of the camp are used for storing laban, samn (clarified butter), hay and equipment for a horse used for tourists. Food and durable goods are often stored in the refurbished Nabataean tombs so common in Petra (Bienkowski, 1985), but our 1986 survey of the hinterlands of Petra show that the Bedul also store a variety of goods in remote locations with no current habitation nearby (Russell & Simms, n.d.)

Discussion and Conclusions

Several observations about the structure of Bayt Qublan hold significance for archaeological interpretation. After identifying the patterns at Bayt Qublan, as opposed to some of the above descriptions that are probably idiosyncratic, selected comparisons to other cases of site structure are discussed.

Secondary disposal takes several forms including sweeping or throwing to adjacent areas (zone 2); throwing, or repeated movement to outlying areas (zone 3); transport by dogs or wind (zones 3 & 4); re-use of items temporarily discarded in zone 2 and occasionally zone 3; or batch transport to focal locations (hearth refuse dumps and secondary refuse dump). In general, and to summarize, the following patterns differentiate these areas. Zone 1 has small to very small items with a low density of debris over 3 cm in size. Zone 2 has the highest density of any zone. The debris there is larger than in zone 1, but items of 3–5 cm are the most common with only a few larger items. Zone 3 also has the most patchy distribution of debris, the largest sizes and the greatest diversity of material type. Zone 4 exhibits diversity in size, patchiness in occurrence and a variety of material types. The hearth refuse dumps have mostly small-sized material, similar to zone 2, but at a higher density than zones 2 and 3.

Inferences about activity areas and hearths

Activity areas, other than a loosely conceptualized notion of a household area, would not be archaeologically perceptible at Bayt Qublan. The only activities conducted outside of the household area are laban drying, butchering and storage. Laban drying leaves no archaeological referent, while butchering and storage do. However, the debris from butchering is so destroyed or scattered by dogs that it would be difficult to see a butchering area in the bone assemblage. The action by the dogs in this circumstance shows that if dogs are present, only larger anatomical parts will remain. Similarly, other household activities do not produce coherent patterns of debris. The location of debris is not usually associated with the area in which the activity was conducted. For example, rocks are retrieved from zone 2 or 3, used as hammers and anvils while repairing boxes, the donkey pack frame, etc., only to be tossed back out after the activity is finished. At best, only the last few activities conducted at a site will be identifiable as "activity areas", and these leave so few activity-diagnostic debris that identification might be impossible. In the cases where a pattern in activity-diagnostic debris can be identified, such information should probably not be used to characterize the function of the entire duration of occupation, but seen as a precise level of data on the terminal activities at the site.

The distribution of refuse at Bayt Qublan is consistent with the conclusion from comparisons of the Alyawara, Ikung and Nunamiut cases that refuse location is not necessarily an indicator of activity location (O'Connell, 1987; also Murray, 1980, and Kent, 1984, for other comparisons). Indeed, the case of Bayt Qublan suggests that refuse location (with the possible exception of micro-refuse) is an indicator of where activities were not carried out. Figure 4 shows that the density of refuse is low in the household/tent area where most activities are conducted. The situation at Bayt Qublan is also consistent with the observation that "refuse is not necessarily produced in co-variant sets in proportion to the frequency with which particular activities are performed" (O'Connell, 1987: 105). These
data further challenge those who would utilize quantitative studies of "tool kits" to ascertain the frequency of activity occurrence (e.g. Carr, 1984).

Similar to the identification of activity areas on routinely swept use surfaces, hearth contents will only represent the last day or two of occupation at a site. Hearths are frequently cleaned and can hardly be used to characterize long-term camp activities or overall diet (even though archaeologists commonly do so when interpreting macro-fossils and faunal remains from hearths). In this respect, hearths are akin to coprolites in the reconstruction of past diets, being a precise source of information about specific meals rather than a general indicator of diet (Fry, 1976: 9).

Secondary refuse disposal and duration of occupation
The use of a portable structure that is treated very much as a permanent home causes secondary refuse disposal to occur almost immediately upon encampment. Thus, in contrast to the !Kung and Alyawara cases, where short occupations do not cause secondary disposal to occur (e.g. O'Connell, 1987), duration of occupation is not necessarily reflected by the presence or absence of secondary disposal. This does not mean that knowledge about duration of occupation is beyond reach. Secondary disposal occurs with sweeping and hand removal of debris to zone 2 and the hearth dumps. The hearth dumps do not appear to be durable and may at least partially blow away between occupations at a site. Thus, duration of occupation will best be reflected in the accumulation of small (less than 0.5–3 cm) artifacts in zone 2 (a secondary refuse disposal area) and possibly in the accumulation of hearth refuse. On the other hand, the archaeological recognition of a secondary disposal pattern at any site may not be possible until a site has been occupied for several weeks. This makes the archaeological outcome the same, that secondary refuse disposal indicates longer duration of settlement, even though the behaviour producing the pattern is not as consistent among cases as the Alyawara and !Kung data alone suggest. If the pattern of secondary disposal commencing immediately is indeed related to the use of a portable, re-usable structure, it may apply to such structures in general, for example, tepees used by equestrian societies in North America.

In archaeological situations, where light structures and use surfaces are often difficult to define, perhaps another way to use data indicating secondary refuse disposal is to suspect that a habitation structure, or at a minimum a household activity area, must be nearby when secondary disposal is found. The structure or household activity area will most likely occur in a zone of the smallest refuse (especially micro-refuse on surfaces where sweeping has occurred). In an archaeological situation, once the area of secondary disposal is encountered, as indicated by increases in the variability of debris size and density, investigation should determine if small artifacts occur in higher density along one side of the disposal area (sensu O'Connell, 1987: 92). If present, this would most likely indicate the direction toward the location of a structure or household activity area, since small items will have been swept out of the household area toward the secondary refuse location. Figure 4 illustrates this pattern at Bayt Qublan. The above points show how ethnarchaeological data can not only identify expectations in the archaeological record that can focus excavation, but can identify which excavation data (in addition to the routine bagging of artifacts) may be important to observe (in this case, debris sizes, ongoing measurement of densities and directionality in these variables).

Refuse, laban platforms and other features of abandoned camps
Once a camp is abandoned, many larger items are taken away because they are still usable. A surprising variety of larger debris in zone 2 and to a lesser extent zone 3 is usable (e.g. cooking pans, plastic items, metal debris) and abandoned camps show little large debris remaining. Thus, the distribution of small debris will identify secondary refuse areas. The
location of micro-refuse, or relatively little refuse, identifies the sheltered household areas (Figure 4).

In addition to the debris, an important feature remaining at some abandoned camps is a laban platform (Figure 3). The presence of laban platforms may be a relatively durable archaeological referent for the identification of early milk production associated with animal domestication. Similar rock features occur at many abandoned camps in the Petra region (Banning & Köhler-Rollefson, 1983: 84; plate; Banning, 1986: 3; figure 6; Russell & Simms, n.d.), and a recent study in theoretical behavioural ecology (Russell, 1988) suggests that dairying should be expected early in the process of animal domestication.

Another durable feature of abandoned camps would be the rock alignments resulting from site preparation. Hearth contents may blow away in time if the hearth is not buried, but the hearths themselves should be recognizable through the identification of burned sediments. Features such as hearth dumps and the goat tether area would become unrecognizable over time, judging from abandoned open camps observed in the Petra area.

The paucity of burned food debris is archaeologically significant because burning is a commonly used means of recognizing items introduced into the archaeological record by humans. If only burned bone, seeds and egg shells were accepted as humanly introduced at this site, the collection would be less than 20 items, even though three goats, numerous chickens, dozens of eggs and untold numbers of apricots, olives and dates were consumed in the month of June. On the other hand, much food refuse is deposited with the hearth refuse causing it to take on a thin coating of ash. In cases where excavated artifacts are not routinely washed by archaeologists, the presence of ash would be a more reliable indicator of human introduction than burning. This may not apply to sites in constrained spatial settings, such as caves, where ash can be ubiquitous.

Site structure and regional food storage practices
The patterns at Bayt Qublan show similarities and differences when compared to the hunter-gatherer cases of the Alyawara (O'Connell, 1987), the !Kung (Yellen, 1977) and the Nunamiut (Binford, 1978a,b, 1983). Most activities are unsegregated as with the Alyawara and !Kung, but some special food processing and the previously mentioned regional Bedul food storage practices show affinities to the Nunamiut case. Storage at Bayt Qublan occurred within the camp, but remote storage, often several kilometres from the nearest habitation, has been widely practised by the Bedul (Russell & Simms, n.d.). As a means of classifying settlement differences as related to differing logistic systems (and escaping some of the problems of the nomad versus sedentism perspective), the Nunamiut have been labelled “collectors” (Binford, 1980). Collectors exhibit greater segregation of activities because of the need to process specific foods for storage and their overall settlement pattern is more diverse. Collectors contrast with “foragers” such as the Alyawara and !Kung in the expression of the above patterns. The Bedul camp proper exhibits the characteristics of foragers in that there is little archaeological evidence for specific activities except goat butchering (similar to the !Kung and Alyawara). However, the Bedul conduct specialized activities such as wheat and barley threshing away from camp, and numerous small archaeological sites functionally distinct from residential bases such as Bayt Qublan may be associated with these agricultural pursuits. These Bedul sites and those reflecting the practice of remote storage indicate similarity to the Nunamiut case.

O'Connell (1987: 103–4) has suggested that the degree of segregation of activities at residential bases may be one of several referents indicating an increasing reliance on food storage. The data from this study are consistent with this prediction with the added notion that a regional perspective, incorporating more than residential bases, is necessary to confidently identify the degree of food storage. The situation at Bayt Qublan suggests that
the use of data from residential bases alone cannot conclusively identify either food storage, or a collector economy such as the Bedul. Taken singularly, or together with similar data from all Bedul residential bases, Bayt Qublan and the Bedul in general would be analogous to the !Kung and Alyawara forager cases. However, those data used in conjunction with surveys of Bedul storage sites common in the Petra area (Russell & Simms, n.d.), clearly show the Bedul represent a case of collectors.

*Excavation strategies and question development*

Studies of site structure have even more direct implications for field and interpretive methods in archaeology. In addition to the suggestions about interpretations of hearth and household debris, these data agree with the proposition that most archaeological excavations are too small to identify meaningful patterns of refuse disposal. O’Connell (1987: 105–6) suggests that exposures on the order of thousands and tens of thousands of square metres are necessary. However, the potential for an interactive relationship between ethnoarchaeology and archaeology is encouraging. For example, the size of Qublan’s camp, excluding defecation areas, is 2000 m². If excavation were perfectly located and emphasized horizontal exposure as opposed to the all too common sondage method, or the exclusive use of trenches, recognition of the pattern at Bayt Qublan would require a minimum excavation slightly larger than the perimeter of zone 2, a total of 200 m². Excavation areas of this magnitude are large but certainly not unreasonable. However, the accuracy of excavation in a situation such as this would in many ways be dependent on the knowledge of and ability to recognize patterns of refuse disposal. By applying expectations about the character of the material record, excavations can be more intelligently located. This ability can only be developed through ethnoarchaeology followed by attempts to find the appropriate level of archaeological questioning and application.

In addition to providing patterns for field excavators to learn to recognize, continued ethnoarchaeological study, adding geographic and economic diversity to the sample, is the only way that questions appropriate to archaeological data about spatial organization can be identified. Ethnoarchaeology has moved beyond the recognition of the inadequacies of the archaeological record, but the task now is as much about question identification beyond a particularist level as it is about figuring out sophisticated ways of addressing the questions we always thought the archaeological record should answer.

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**References**


