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Human Behavioral Organization in the Middle Paleolithic: Were Neanderthals Different?

ABSTRACT Interwoven with the debate regarding the biologic replacement of Neanderthals by modern humans is the question of the degree to which Neanderthals and modern foragers differed behaviorally. We consider this question through a detailed spatial analysis of artifacts and related evidence from stratified living floors within a 49–69 k.y.a. rock shelter site, Tor Faraj, in southern Jordan. The study involves a critical evaluation of living floors, the identification of site structure, and the decoding of the site structure in an effort to understand how the inhabitants of the shelter organized their behaviors. The site structure of Tor Faraj is also compared to occupations of modern foragers in ethnographic and archaeological contexts. When the information from the excavation of Tor Faraj is considered with evidence from other late Middle Paleolithic sites, there seems to be little basis for the claims that constraints in the behavioral organization of Neanderthals led to their replacement by modern foragers. [Keywords: Neanderthals, Middle Paleolithic, emergence of modern humans, site structure, behavioral organization]

ARGUABLY, THE MOST CONTROVERSIAL ISSUE in paleoanthropology today involves questions related to the emergence of modern humans (Bar-Yosef and Pilbeam 2000; Clark 1999, 2002; Clark and Willermet 1997; Klein 2000; Wolpoff 1999).[1] Here we consider one issue in particular: alternative views of human biocultural evolution during the late Pleistocene as encompassed by competing "continuity" and "replacement" models.

The prevailing view is that sometime after about two hundred thousand years ago, humans spilled out of Africa following a much earlier wave of dispersion. But unlike the earlier exodus that led to the spread of *Homo erectus* groups throughout the Old World, this putative, second expansion was composed of hominids that had evolved physical, as well as cognitive and behavioral, traits very similar to those of modern humans. Moreover, according to the replacement model, the adaptive advantages held by modern human groups enabled them to outcompete and ultimately supplant indigenous populations of archaic humans throughout the Old World. Thus, intertwined with this notion is the idea that modern humans were able to achieve greater success in competition with indigenous archaic populations because of their advantages in cognition and behavioral organization. Most advocates of the replacement model do recognize how early misconceptions have come to depreciate our views of archaic behaviors as expressed in the negative connotation of *things* Neanderthal (Trinkaus and Shipman 1993). But many researchers nevertheless point to a wide array of archaeological data as evidence of what is thought to represent real cognitive and behavioral differences between archaics and moderns (see d'Errico et al. 1998 and replies).

Although recent studies of mitochondrial DNA (mtDNA) recovered from Neanderthal skeletons appear to bolster the argument of biologic replacement, behavioral issues remain largely unresolved. Analysis of mtDNA extracted from Neanderthal skeletons from three different sites shows substantial differences between the control-region mtDNA sequences of Neanderthals and parallel sequences traced for living humans. The studies include skeletal materials from: (1) the original, Feldhofer Cave site (c. 40 k.y.a.) in Germany's Neander Valley (Krings et al. 1997, 1999); (2) Mezmaiskaya Cave (c. 29 k.y.a.) in the northern Caucasus of Russia (Ovchinnikov et al. 2000); and (3) Vindija cave (> 42 k.y.a.) in Croatia (Krings et al. 2000). Many view these mtDNA differences as evidence that Neanderthals

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separated from the human linage over 365 k.y.a. (Krings et al. 1997; Krings et al. 1999; Ovchinnikov et al. 2000), some hundred thousand years before living humans are indicated through DNA analysis to have held a common ancestor in Africa (Klein 2000; Krings et al. 1997; Krings et al. 1999). While these studies appear to furnish strong support for the replacement model, other researchers are critical of inferring species differences to Neanderthals and modern humans based on the mtDNA evidence alone (Adcock et al. 2001; Enflo et al. 2001; Wolpoff 1999: 759–760).

Beyond the DNA data, fossil finds and archaeological materials associated with the Middle to Upper Paleolithic transition, falling within the period from c. 40–28 k.y.a., have been interpreted across Europe as an expression of a modern human expansion that ultimately led to the extinction of Neanderthals (Bar-Yosef and Pilbeam 2000; Boquet-Appel and Demars 2000; Mellars 1996). Proponents of the replacement model argue that Neanderthal groups were progressively replaced outright, both biologically and culturally, in the wave of modern human expansion. Other scholars, however, point to fossil (Duarte et al. 1999) and behavioral (d'Errico et al. 1998) evidence that is thought to indicate hybridization and acculturization. This alternative view sees the disappearance of Neanderthals as a consequence of their being genetically and culturally swamped by the invasion of a much larger, endless stream of modern humans. Regardless of whether Neanderthals are seen as an evolutionary offshoot meeting a dead end or as a subspecies, population isolate that came to be absorbed back into the biocultural evolutionary mainstream of *Homo sapiens sapiens,* the question of behavioral distinctions between these populations remains a central issue.

The research reported on here centers on reconstructing the ways in which the archaic, late Middle Paleolithic occupants of a 49–69 k.y.a. Jordanian rock shelter, Tor Faraj, organized their behaviors when using the shelter (Figure 1). Although diagnostic human fossil remains were not recovered, the age and specific artifact assemblage association (Levantine Mousterian B-Type) are the same as those of other Levantine Mousterian deposits in which Neanderthal remains have been found. The research is especially relevant to understanding how the behaviors of the shelter's archaic residents compare to those of modern foragers in parallel settings. Notions of a behavioral revolution leading to the Upper Paleolithic and modernity some forty to fifty k.y.a. have prompted many researchers to suggest that Middle Paleolithic groups organized their behaviors in profoundly dissimilar ways from those of modern foragers (Binford 1989; Soffer 1994; Stringer and Gamble 1993). Even the existence of the nuclear family as a basis of social organization has been questioned (Soffer 1994). Many researchers have suggested that these putative differences in behavioral organization may represent differences in the complexity of the site structures tied to

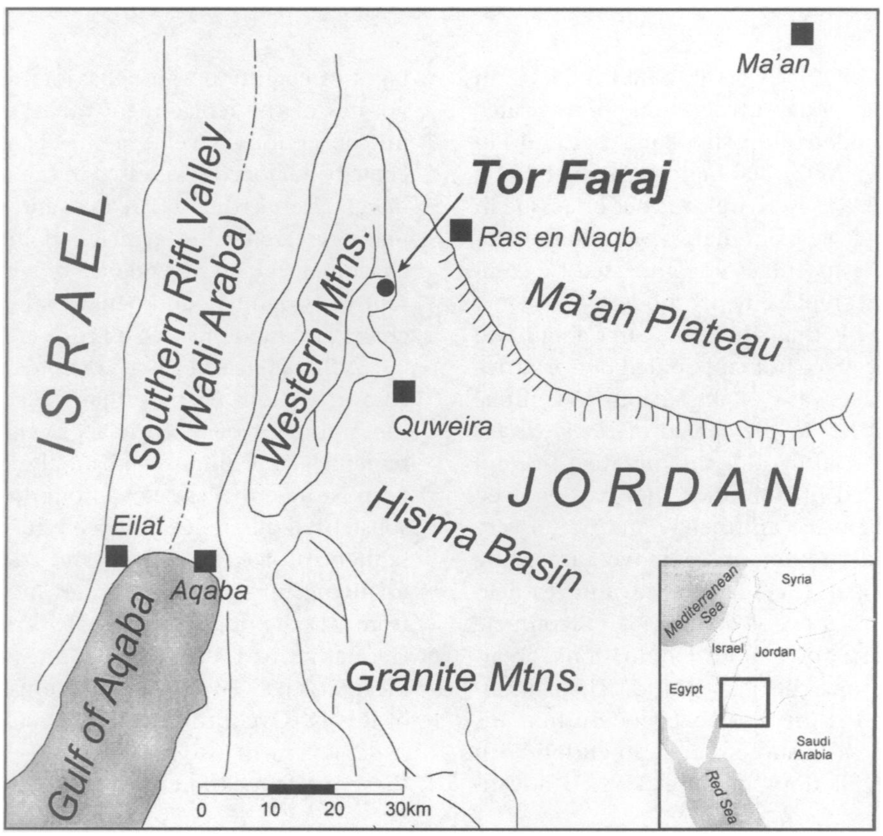

FIGURE 1. Map of region showing the location of the site, Tor Faraj.

archaic and modern forager occupations (Binford 1996; Henry 1998; Mellars 1996, 1998; Pettitt 1997; Vaquero et al. 2001; see also Wolpoff 1999:697–699 for review).

Analysis of the site structures (i.e., the contextual relationship of artifacts, hearths, and associated evidence) of two stratified living floors buried within the deposit of Tor Faraj provides an opportunity for reconstructing Middle Paleolithic intrasite behavioral patterns in unusual detail. This, in turn, allows for evaluation of many of the ideas related to Middle Paleolithic behavioral organization.

Unique Aspects of Tor Faraj

The presence of prehistoric living floors is uncommon within rock shelter deposits, especially over areas as large as those exposed at Tor Faraj (67 m^2) and for Middle Paleolithic occupations in general. The research is also exceptional in that it integrates the intrasite evidence of the current study with an earlier areawide (> 32 km^2) investigation that emphasized between-site comparisons (Henry 1994, 1995, 1998). This integrative effort allows us to understand the activities that were undertaken in the shelter and how these were spatially segregated. Moreover, it enables us to place these site-specific behaviors in the larger context of Middle Paleolithic land-use practices as expressed in settlement-procurement patterns that were followed throughout this mountainous region of southern Jordan.

Earlier research indicates that the adaptive strategy of the Middle Paleolithic foragers of the area involved transhumance, a pattern that continued through the terminal Pleistocene into the Holocene and even modern, historic times (Henry 1994, 1995, 1998). This involved seasonally scheduled and elevationally governed movements from near sea level in the Rift valley to high elevations, reaching 1,700 meters above sea level, on the Ma'an Plateau. Embedded in the cyclical migrations were shifts in the residential mobility and sizes of foraging groups. These demographic shifts also corresponded to changes in procurement strategies. This was expressed in (1) long-term winter encampments in which groups coalesced into larger social units that were supported through distant, logistical provisioning and (2) ephemeral warm-season camps in which groups dispersed into small social units that were sustained through local, opportunistic provisioning. Within this pattern of transhumance, the occupations at Tor Faraj appear to have represented that segment of the cycle associated with long-term, aggregated, winter encampments.

As suggested in previous publications (Henry 1995, 1998), the presence of such essentially modern forager land-use practices in the Middle Paleolithic runs counter to many of the notions concerning a behavioral revolution that ushered in modernity and the Upper Paleolithic. The research at Tor Faraj provides an opportunity to test such ideas in two ways. First, it allows for checking the integrity of the local land-use model by comparing the site structure of the occupations at Tor Faraj with the *complex* structure predicted by the model for long-term, aggregated, winter encampments. Secondly, the site structure defined within the living floors at Tor Faraj can be compared directly to archaeological and ethnographic examples of occupations of rock shelters by modern foragers. If the Levantine Mousterian occupants of the area were organizing their behaviors in an essentially modern fashion, we should expect the site structure identified at Tor Faraj to meet the expectations linked to the local settlement-procurement model and resemble those site structures that are common to modern foragers.

Research Design

The research involved three sequential tasks: (1) identifying living floors within the deposit of the shelter; (2) defining site structures within the floors on the basis of the contextual spatial relationships of artifacts, manuports, ecofacts, geochemistry, and hearths; and (3) reconstructing the prehistoric behaviors of the shelter's residents by decoding the site structures. This last step involved comparisons of the site structures of Tor Faraj with site structures reported for rock shelters occupied by modern humans in both archaeologic and ethnographic contexts.

Methodology

The excavation and analytic methodology centered on a detailed spatial definition of a wide range of behaviorally meaningful evidence. The deposit was dug in 5cm levels within a 67 m^2 excavation block, controlled by 0.25 m^2 grid units. Most of the block rested behind the shelter's drip-line, but about 18 m^2 were excavated on the terrace beyond the drip-line (Figure 2). A laser theodolyte, linked to a data storage unit (Set 6, Sokkia Total Station), was used to record 3,095 chipped stone artifacts (> 30 mm long axis), 19 hearths, and rocks in three-dimensional space. Another 10,522 specimens of small lithic debris (< 30 mm long axis) were recorded by grid unit. A detailed attribute analysis was undertaken on each plotted specimen and a separate study was conducted on samples drawn from the small debris assemblage. Additionally, a microscopic edge-wear study was conducted on plotted specimens from an exceptionally rich excavation level (Level 190 below datum). Sediment samples for phytolith and geochemical analyses also were collected from hearths and from each grid unit for Level 190.

DEFINITION AND CONFIRMATION OF A LIVING FLOOR

A crucial step to studying site structure involves establishing the spatial integrity of the behavioral residuals of a prehistoric occupation. If these residuals have experienced significant postdepositional disturbances and are not in their primary contexts, a study of their structure is meaningless. In forming natural sediment traps, rock shelters would appear to represent ideal settings for artifacts and other evidence to be preserved in their primary contexts. But protected sites are subject to a wide range of processes,

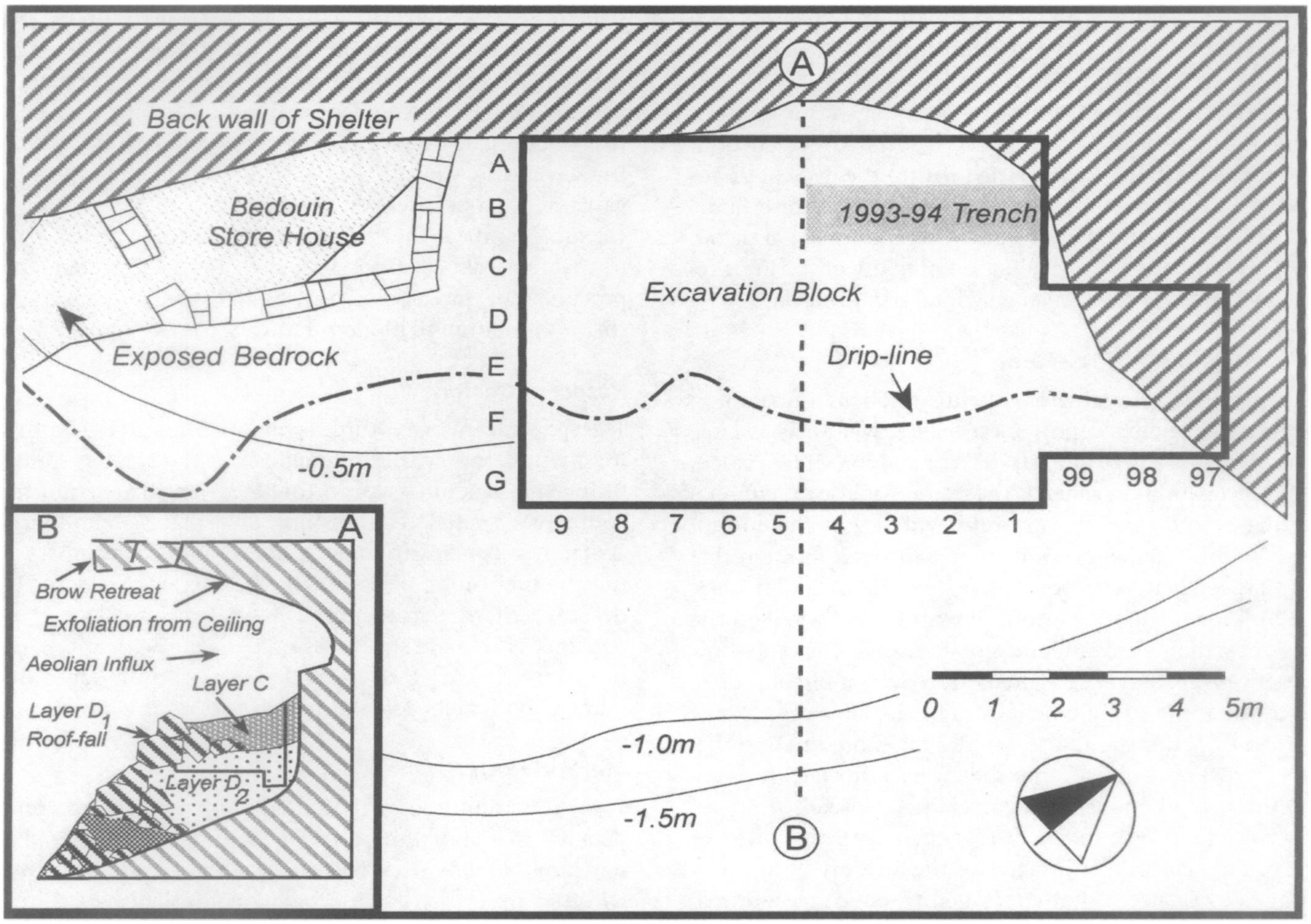

FIGURE 2. Map of site showing excavation plan and stratigraphic cross-section A–B.

both natural and cultural, which lead to postdepositional spatial distortion (Petraglia 1993; Straus 1997).

In efforts to evaluate the integrity of living floors or paleosurfaces within rock shelter deposits, researchers have identified several lines of evidence that assist in establishing the degree to which archaeological materials may have experienced postdepositional disturbance. Analyses of the condition of artifacts, the ratio of small-to-large fakes (debris to debitage/tool categories), the spatial distributions of behaviorally meaningful artifacts, the distributions of artifacts in three-dimensional space, the distribution of refitted artifacts, the orientation of the long-axes of elongated artifacts, and the specific sedimentary processes that formed the artifact-bearing deposit have been used singly or in combination to establish the integrity of living floors (Dibble et al. 1997; Petraglia 1993; Straus 1997).

Sedimentary Processes

The processes by which sediments accumulated at Tor Faraj were especially conducive to the preservation of archaeological evidence in primary context. This involved differential weathering of sandstone bedrock that created an undercut in the cliff face, episodic weakening and collapse of the brow of the overhang, and an accumulation of predominantly wind-borne sediments behind the natural wall formed by the collapsed brow. The stratigraphy revealed in the upper part of the 3.5–4 m deep deposit shows no indication of an interruption of sedimentation. Four strata associated with the Levantine Mousterian occupation were identified underlying a modern anthropogenic layer (A) and a layer containing both modern and prehistoric materials (B). Layers A and B are associated with the use of the shelter by Bedouin herders. The undisturbed prehistoric deposit includes layers of aeolian sand (C and D_2) separated by a layer of rockfall (D_1) near the drip-line. Another strata of fine sand (E) was exposed underlying Layer D_2 in a deep sounding. Subtle changes in grain size, color, and degree of carbonate cementation suggest that sedimentation occurred under increasingly moister conditions with depth. A suite of five chronometric determinations (amino acid racemization, uranium series, and thermoluminescence) brackets layers C–D_2 of the deposit to 49–69 k.y.a. with an average age of c. 55.1 ± 5.6 k.y.a. This age range is remarkably consistent with the chronometries of other Late Levantine Mousterian (B-type) occupations (Henry 2003:59).

Bedding planes displayed by aeolian sediments, carbonate laminae, and disintegrated roof-fall trace a nearly level-bedded stratigraphy running parallel to the back-wall and beds inclined from 0-5° running perpendicular to this line. Hearths and ash lenses furnish additional confirmation of a nearly level to very gently sloping floor from the back to the front of the shelter. The contacts between the fine sand-silt deposits of Layers C and D_2 are conformable, suggesting that their deposition was not separated by an extended period of surface stability or erosion. The laminae tracing the pulses of sedimentation within layers are typically fine grained and show some cross-bedding. But, in lacking coarse-grain lag deposits associated with extensive winnowing and long diastems, the deposit appears unlikely to have been exposed to sustained wind erosion. Moreover, the fragile hearths and ash lenses would not have remained intact had the deposit been subjected to extensive erosion, bioturbation, or anthropogenic disturbance by successive Middle Paleolithic encampments in the shelter.

Stratigraphic Densities of Artifacts, Hearths, and Rock Fall

Within the shelter's deposit, artifacts, hearths, and rock fall trace two occupational horizons that represent paleo-surfaces or living floors: Floor I: 160–170 cm BD, Layer C & D_1, and Floor II: levels 180–195 cm BD, Layer D_2 (Figure 3). The stratigraphic distribution of artifacts, hearths, and rocks display a pronounced bimodality in their densities with a trough in the 175 cm level and peaks at the 170 cm and 190–195 cm levels.

Orientation of Artifacts

Orientations of artifacts were recorded along their long axes in the direction of their smallest ends and grouped into twelve 15° sectors. Post-depositional erosion from sheet-wash would be indicated by orientations disproportionately skewed toward the source of flow or perpendicular to the direction of flow depending on flow-rate (Schick 1986). A minor "spike" in the orientations of artifacts from Tor Faraj does point upslope, toward the back of the shelter, but this accounts for only 17.8 percent of the specimens and other orientations are relatively balanced (ranging from 6 to 11 percent) in their representation. A similar orientation pattern (with spikes of 17–19 percent) at the French site of Abri Dufaure is interpreted as evidence for an intact, undisturbed deposit (Petraglia 1993). Artifact orientation data thus indicate that the deposit is in primary context with only minor postdepositional disturbance from low energy sheetwash.

Artifact Refit Study

Two hundred forty-seven artifacts were refitted into 87 constellations with an average artifact separation of slightly more than 1 m horizontal distance and 7.5 cm vertical distance. A more telling statistic, relative to the stratigraphic integrity of the deposit, is that only five artifacts (representing two percent of the refitted artifacts) show vertical separations exceeding 15 cm. The refits also inform us about the integrity of Floors I and II, in that only five refitted artifacts bridge the two living floors and these are the same five specimens that exceed 15 cm vertical separation. Moreover, three of these five specimens are

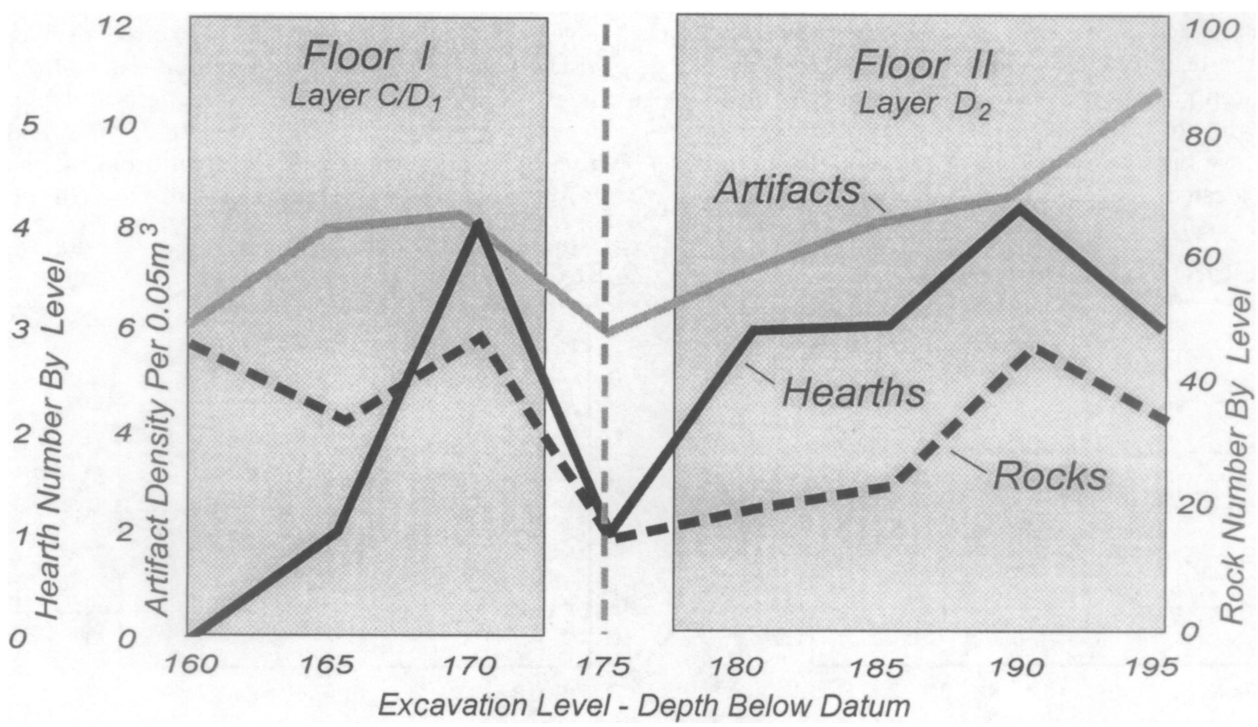

FIGURE 3. Diagram showing the stratigraphic variation in artifact density and hearth and rock frequency by 5 cm excavation level.

stratigraphically inverted, relative to the other artifacts forming their constellations, and appear to have come from a small area disturbed by Bedouin construction activities in the northwest corner of the excavation block.

Spatial Associations of Behavioral Residue

In addition to forming the foundation for the examination of site structure, spatial distributions of behavioral residues also furnish a means of establishing the integrity of living floors. A living floor should display behaviorally meaningful data that are nonrandomly distributed (Dibble et al. 1997). There are several lithic data sets (chips, cores, Levallois points, side-scrapers, and notches) at Tor Faraj that exhibit strong patterns of spatial distribution that make sense only as a consequence of human behavior. When viewed in the context of the spatial distributions of hearths, manuports, phytoliths, and phosphorous concentrations, it is evident that the spatial patterns seen in lithic artifact categories resulted principally from the behaviors of the occupants of the shelter and not from natural forces.

SITE STRUCTURE

The site structure of Tor Faraj is traced through the contextual relationship of natural features, cultural features, artifacts, and associated plotted data (e.g., phytoliths and phosphorous). Hearths, the only cultural features recorded at Tor Faraj, were identified mainly by ash and charcoal fines, although some also displayed burnt sandstone and chert artifacts and fire-reddened sediment. They were predominantly round-oval in form and occupied small basins scooped out of the floor of the shelter. Their spatial distribution for each of the floors shows a very similar pattern. All of the hearths fall behind the drip-line in which they are concentrated in the shallow alcove located at the juncture of the north and west walls (Figure 4). A closer look at the alcove area shows a line of hearths that follows a swath located 0.8–1.5 m from the wall and a centrally placed set of hearths positioned 1.6–3.6 m from the wall in the mouth of the alcove.

Spatial patterns of various artifact categories, microbotanical data, and phosphorous concentrations are overwhelmingly tethered to hearths. Plots for the largest of these groups (small debris or chips) define four concentrations thought to represent activity areas (A, B, C, and D). These areas appear to have been positioned largely in the same locations within the shelter for successive, discrete occupational episodes as reflected in Floors I and II (Figure 4). Beyond the statistical advantage of yielding very large samples for delineating spatial distributions, chips are more likely to trace the precise locus of the activity that produced them than are larger artifacts. This is because their small size would have precluded them from being reworked or recycled, as often occurred with larger lithic artifacts, and this would have reduced the likelihood that they would have been moved about over an occupation floor. An attribute study of small debris reveals differences between the activity areas relative to lithic processing and formation processes. Greater emphasis on hard-hammer percussion and initial lithic processing associated with core shaping is indicated for Area D of both floors and Area A of Floor II. Soft-hammer percussion and final processing linked to secondary retouch dominate the other activity areas. High densities of burnt chips corroborate the locations of hearths, identified as features during excavation, and also suggest that Area D may have served as a location for dumping ash from the cleaning of hearths.

The spatial distribution of debitage, the second largest artifact category, strongly resembles that shown by chips for each floor and the different classes of debitage (e.g., blades, flakes, primary elements, core trimming elements) largely conform to the spatial distributions of debitage as a whole. Cores on nodules and cores on flakes (157 specimens) show an interesting spatial pattern differing from debitage as a whole (Figure 5). In Floor II, cores fashioned from nodules are conspicuously absent from that portion of Area B that rests along the backwall, although this area

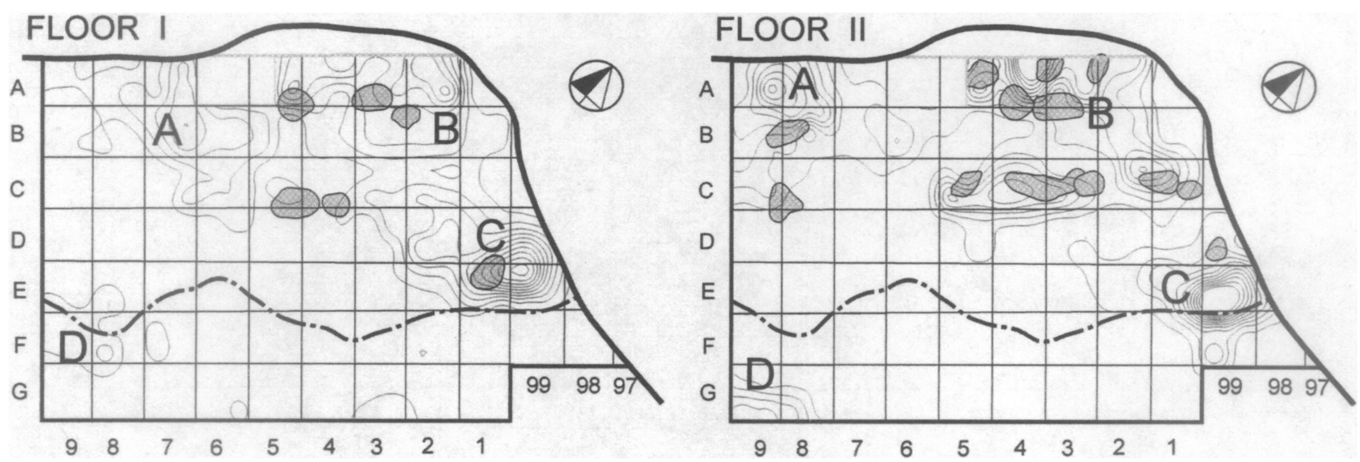

FIGURE 4. Excavation plan showing the distributions of hearths and flint chips by living floor. Contour lines represent 20 specimen intervals.

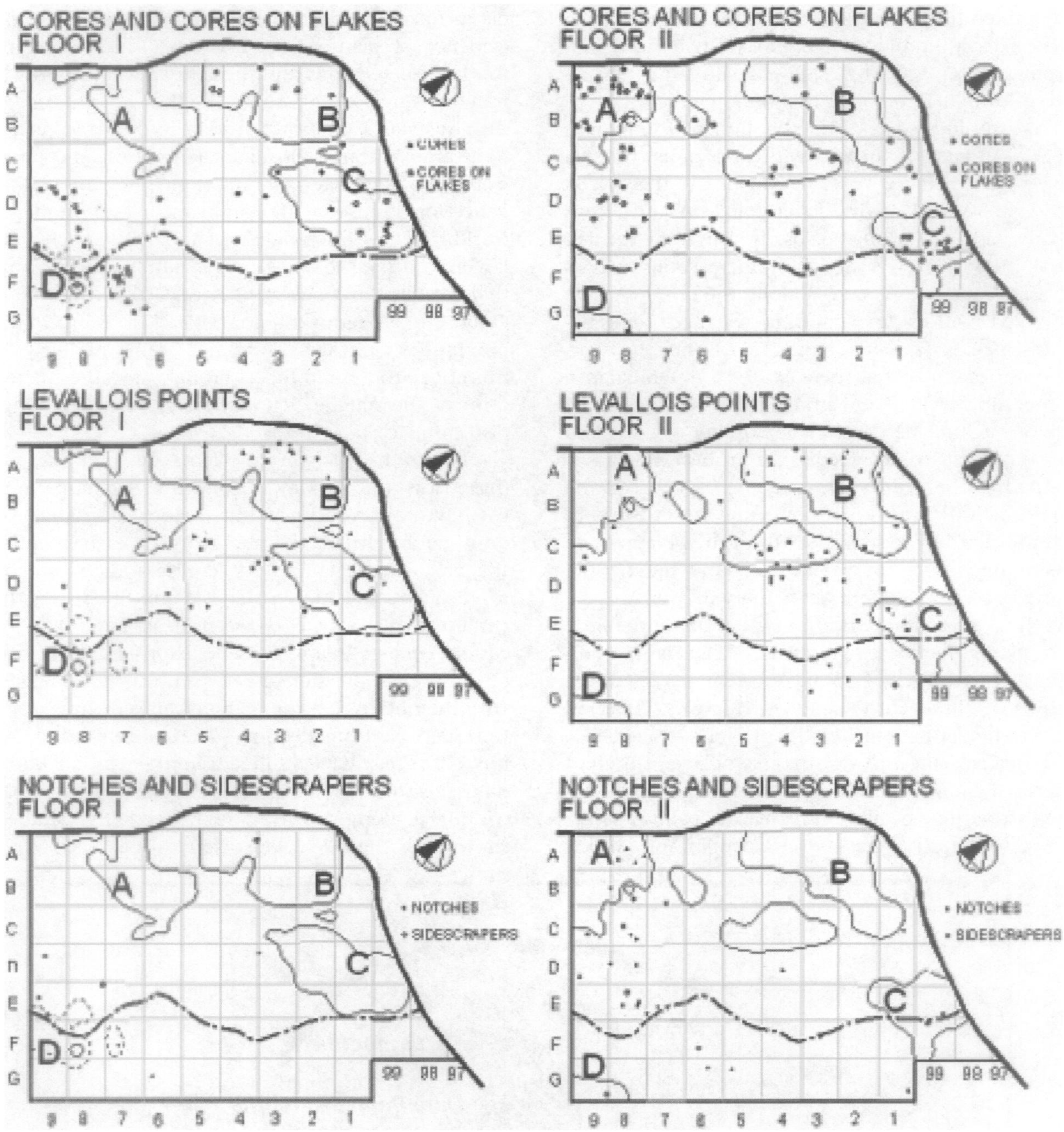

FIGURE 5. Excavation plan showing the distributions of various artifact classes by living floor.

is rich in other artifacts. For the rest of Floor II, cores on nodules largely co-vary spatially with the concentrations of chips and other artifacts. In Floor I, the pattern in Area B is repeated in that only two cores were recorded along the back-wall. And, again, cores largely co-occur with the other artifact concentrations, although they are proportionately more highly represented in Areas A, C, and D. When the distributions of cores on flakes, artifacts representative of recycling thick flakes, are examined, they show a clear correlation with the spatial patterns of cores on nodules (Figure 5). An exception to this is found in cores on flakes being recovered from both floors along the backwall in Area B. Proportionately, Areas A and C show the highest representation of cores on flakes.

Tools (495 specimens) display spatial distributions for each of the floors that strongly match the distributions of debitage, but at the more specific level of tool class, Levallois points, side-scrapers, and notches show distinctive spatial patterns. Retouched and unretouched Levallois points are concentrated in the alcove of the shelter for both floors (Figure 5). Notches (30 specimens) are concentrated within a roughly 2 m–wide zone stretching from the backwall in Area A to the drip-line. Side-scrapers consist of only a few specimens, but in both floors these are mostly confined to the Area D and the southwestern portion of the excavation block (Figure 5). In their virtual absence from Areas A, B, and C, side-scrapers display a spatial pattern strongly resembling that of notches.

A microscopic use-wear analysis, limited to Floor II, Level 185, identified 119 artifacts with signs of use (Hietala and Longo 1996; Hietala 2003:225–228). Most of these (c. 80 percent) were associated with activity areas A and B, but this apparent association may be partly skewed by the fact that those artifacts too weathered for microscopic analysis largely came from areas C and D along the drip-line. The study revealed subtle differences in use-wear attributes between hearth centered areas across Floor II, but the overarching findings imply that there existed a rough balance in the processing of plant and animal materials dominated by those of medium hardness. The working of grass and green wood (inclusive of reeds and rushes) was most strongly tied to the hearth-line near the backwall of the shelter, as was hide processing, bone, and antler work. In contrast, the centrally located hearths of Area B appear to have been used more for wood work and butchering. Butchering was also the dominant activity in Area A.

Phytoliths furnish important information on the wide variety of plants that were exploited at Tor Faraj in addition to tracing the distribution of plant remains across the shelter (Rosen 2003). Thirty sediment samples, collected from excavation units and hearths of Floor II, yielded a rich and diverse silica phytolith assemblage. Different types of starch grains were also identified.

The distributions of phytoliths of date palm *(Phoenix dactylifera),* seed husks, grasses (monocots), and woody plants (dicots), along with starch grains provide important evidence of plant-related activities in the shelter. Phytoliths of date palms and those of seed husks are concentrated in Area B, around the central hearths, suggesting that this was a location where date fruit and plant seeds were prepared and consumed (Figure 6). The phytoliths from date palms at Tor Faraj constitute the earliest evidence for the use of the date plant by any human group world-wide (see also Madella et al. 2002). Starch grains are largely confined to three concentrations forming a swath that stretches from west of Area C to north of Area D. Only the westernmost concentration is in immediate proximity of a hearth. The starch grains are likely derived from nuts, roots, and tubers brought into the shelter. One form of the starches is identical to reference samples of pistachio.

Phytoliths of woody plants (dicots) and grasses (monocots) also display very distinct spatial patterns. Dicot phytoliths are concentrated along and outside of the drip-line and in a small pocket in the eastern end of the shelter's alcove (Figure 6). In contrast, the monocot phytoliths are restricted to inside the drip-line where they occur along the backwall between Areas A and B and on the eastern edge of Area B. These locations along the backwall of the shelter, positioned between hearths, are consistent with the notion that the high densities of grass phytoliths were derived from bedding. The concentration of dicot phytoliths may have resulted from the seasonal burning of natural shrubs or brush used in the construction of a windbreak along the drip-line. Experimental studies have shown that high densities of phytoliths of woody plants

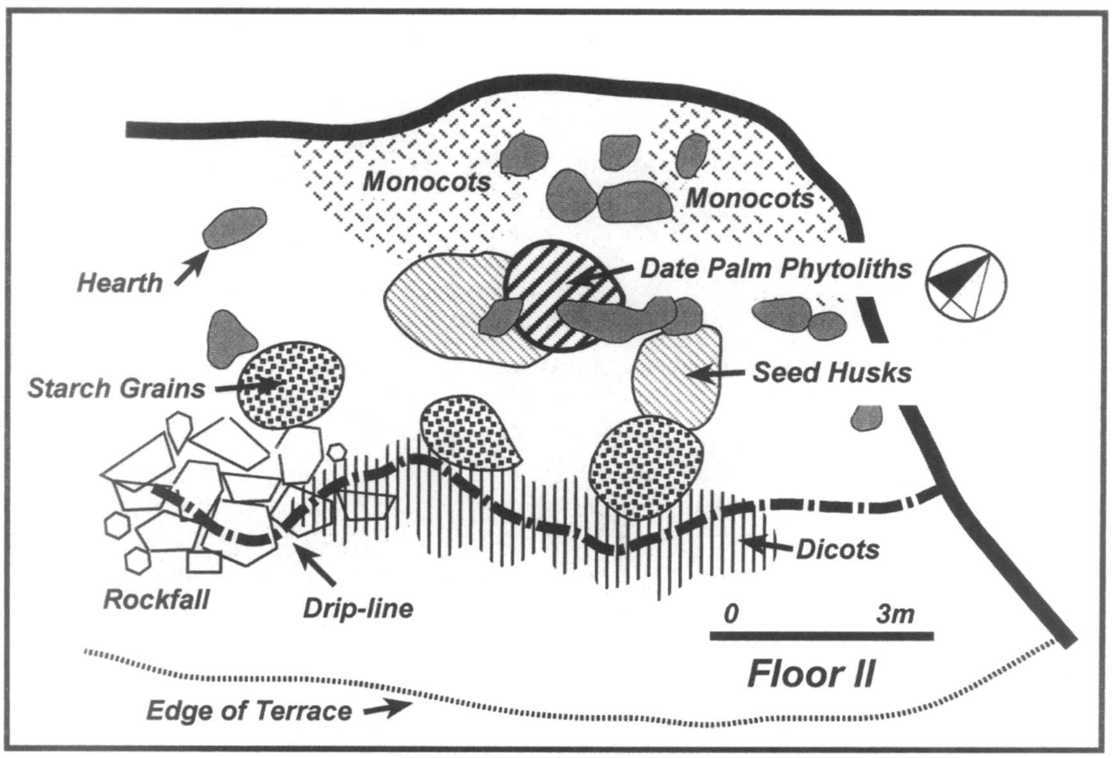

FIGURE 6. Excavation plan showing the distributions of phytoliths, starch grains, and hearths for Floor II.

are normally restricted to ash deposits, as is shown in Arlene Rosen's data from the hearths at Tor Faraj and Rosa Maria Albert's data from Middle Paleolithic deposits in Kebara and Tabun Caves in northern Israel (Albert et al. 2000; Rosen 2003).

Phosphorous (P), shown to provide a residual signature of organic materials, (especially bone) in archaeological deposits, was evaluated for 50 sediment samples from Floor II (Harris 2003). When P values are examined, high concentrations are shown along a swath extending from beyond the drip-line into the alcove following the northern wall of the shelter. Low P values dominate the central and much of the southwestern portion of the floor. At a more detailed scale, peaks in the concentration of P occur in activity areas B and C and co-occur spatially with hearths. An exception to this pattern is seen in a P peak that rests against the back wall and just beyond the drip-line of the shelter.

INTERPRETING SITE STRUCTURE AT TOR FARAJ

An understanding of the organization of activities in the shelter largely centers on the distributions of hearths. In providing warmth, light, and heat for cooking, it is not surprising that hearths have been identified as the central features of occupations around which other activities are often framed (Binford 1983, 1996; Galanidou 1997, 2000; Thomas 1983:524–526; Vaquero and Pastó 2001). At Tor Faraj, hearths are positioned inside the drip-line and along two parallel swaths that follow the back wall of the shelter.

In his study of Gatecliff Shelter, David Thomas (1983: 524–526) observed a similar phenomenon that he explored by comparing the distances between hearths, walls, and the drip-line for several stratified occupations. He found a strong statistical relationship between the distances between hearths and the back wall of the shelter, but a much weaker relationship between hearths and their distances to the drip-line. While the floor area of the shelter changed through time, in concert with the changing configuration of the back wall, a hearth-line was established about 4 m from the wall during successive occupations. From this, he concluded that the hearth positioning created a relatively warm and smoke-free swath for working and sleeping along the shelter's wall.

To explore this notion of a constantly positioned hearth-line in sheltered sites, much larger cross-cultural samples were studied (Henry 1998, 2003:285).[2] While these showed hearths to be located nearer to shelter walls than reported for Gatecliff, the distance to the nearest wall nevertheless appears to be the strongest predictor of hearth positioning as indicated by the smaller standard deviation (1.3) when compared to the standard deviation of 2.2 for drip-line distances (Table 1).

Hearth Patterns at Tor Faraj

When the data from Tor Faraj are compared to the cross-cultural sample, the hearth to nearest wall distance averages only 1.8 m—specifically, 0.5 m less than that of the cross-cultural sample (Table 1). Clearly, a distance of 1.8 m between hearth and wall would not provide adequate space for many activities, but what about sleeping? When the cross-cultural sample is restricted to only those hearths adjacent to bedding or sleeping areas, there is a substantial reduction in the space between hearth and wall, registering only 1.3 m. Also, the frequency distribution of hearth to wall distances for the cross-cultural sample shows a bimodality in hearth-lines: a line centered > 1–1.5 m from the nearest wall and another line of hearths situated > 3–3.5 m from the nearest wall (Figure 7). The hearth distribution from Tor Faraj strongly resembles this twin hearth-line pattern in that 12 (63 percent) of the hearths fall within a band positioned between 0.8–1.5 m from the nearest wall and the rest are concentrated along a line located c. 3 m from the nearest wall (Figure 7).

A comparison of detailed plans of four ethnographic occupations of shelters that also contain physical evidence for bedding areas shows a line of "sleeping" hearths, located near the wall, and another hearth used for domestic or communal activities located further out from the wall (Figure 8). And although lacking the physical evidence of bedding areas, the hearth arrangement reported for Gatecliff Shelter (Horizon 9) resembles the pattern seen in the ethnographic examples. Lewis Binford (1996:234) has suggested that such sleeping areas and hearths that are alike in scale and layout inform us about the social organization of a shelter's occupants as they represent the most visible archaeological signature of family units in site structure.

The site structures of the ethnographic and Gatecliff examples illustrate the segmented, modular layout described by Binford (1996). Sleeping areas (Binford's family modules) follow the back wall of a shelter accompanied by nearby "sleeping" hearths and a hearth (or hearth cluster) positioned further away from the back wall and near the center of the protected living space. In serving as the focal point for group or communal activities, as opposed to the more private space of the sleeping areas, these hearths are typically centrally positioned and placed nearly equidistant from the family modules. The spatial layout and positioning of the sleeping modules relative to communal areas within an encampment therefore mirrors the social distances between family or sleeping-eating units and the group as a whole.

When the plans for Floor I and Floor II from Tor Faraj are compared to the floor plans from these ethnographic and archaeologic modern forager occupations, strong similarities can be seen (Figure 8). Both floors display a line of presumed sleeping hearths positioned near the wall and a cluster or line of presumed communal or domestic hearths that are centrally positioned further from the wall. While the two floors display a very similar overall hearth arrangement, the hearth pattern of Floor II is somewhat more complicated because of what likely represents a palimpsest of hearths tied to two or three occupational episodes (Henry 2003:258–259).

Table 1. A comparison of dimensional data for hearths in rockshelter occupations drawn from cross-cultural samples and Tor Faraj. Note the close Nearest Wall Distance for sleeping hearths and the inverse correlation between Numbers of Hearths and Distance between Hearths.

Hearth Sample	N	Number of Hearths per Occupation		Distance between Hearths (m)		Distance to Nearest Wall (m)		Distance to Drip-Line (m)	
		Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Cross-cultural: Global	101	4.6	3.0	2.4	1.3	2.3	1.3	2.8	2.2
Cross-cultural: Sleeping Hearths	10	4.3	1.5	2.4	1.7	1.1	0.6	4.0	2.5
Cross-cultural: Sites with 6–11 Hearths	31	8.3	2.2	1.4	0.7	2.1	1.1	2.5	1.4
Tor Faraj sample	19	9.5	4.9	1.1	0.6	1.8	1.0	3.4	1.3

Beyond the hearth pattern, Floor II displays several other lines of evidence that are consistent with the site structures shown in the examples of modern forager occupations. Phytolith, use-wear, and lithic technologic evidence indicate that the centrally located area at the mouth of the alcove in Area B was used for food preparation, cooking, maintenance tasks, and mostly end-of-stream (i.e., retouching, refurbishing, and maintenance) lithic processing. A large sandstone slab thought to have been used as an anvil or table was found next to the central hearth cluster in this area. This position, well back from the drip-line, would have offered good protection from eastern winds and precipitation in addition to providing late afternoon sunlight. Also, in locating the central hearth cluster about 3 m from the nearest wall of the shelter, the occupants allowed room for the formation of a swath of sleeping spots (defined by concentrations of grass phytoliths) and accompanying hearths between the central hearths and the shelter's backwall. Such positioning also would have allowed those engaged in sleeping and other tasks along the backwall nearly equal access to the central hearth-cluster.

Artifact Patterns and Conceptual Labels

Other patterns that cross-cut the activity areas of the shelter have to do with the production and use of Levallois points and the presence of notches and side-scrapers. The concentration of cores in Areas A and D indicates that initial core shaping and delivery of Levallois points were undertaken in this area of the shelter (Figure 5). But the points appear to have been used, maintained, stored, and discarded to a markedly greater extent in Activity Areas B and C (Figure 5). A similar activity area dichotomy is suggested by the distributions of side-scrapers and notches as they are almost exclusively found in Areas A and D. Although we are unable to link the side-scrapers and notches to specific functions, their distributions furnish additional evidence that many of the activities undertaken in Areas A and D differed significantly from those in the alcove.

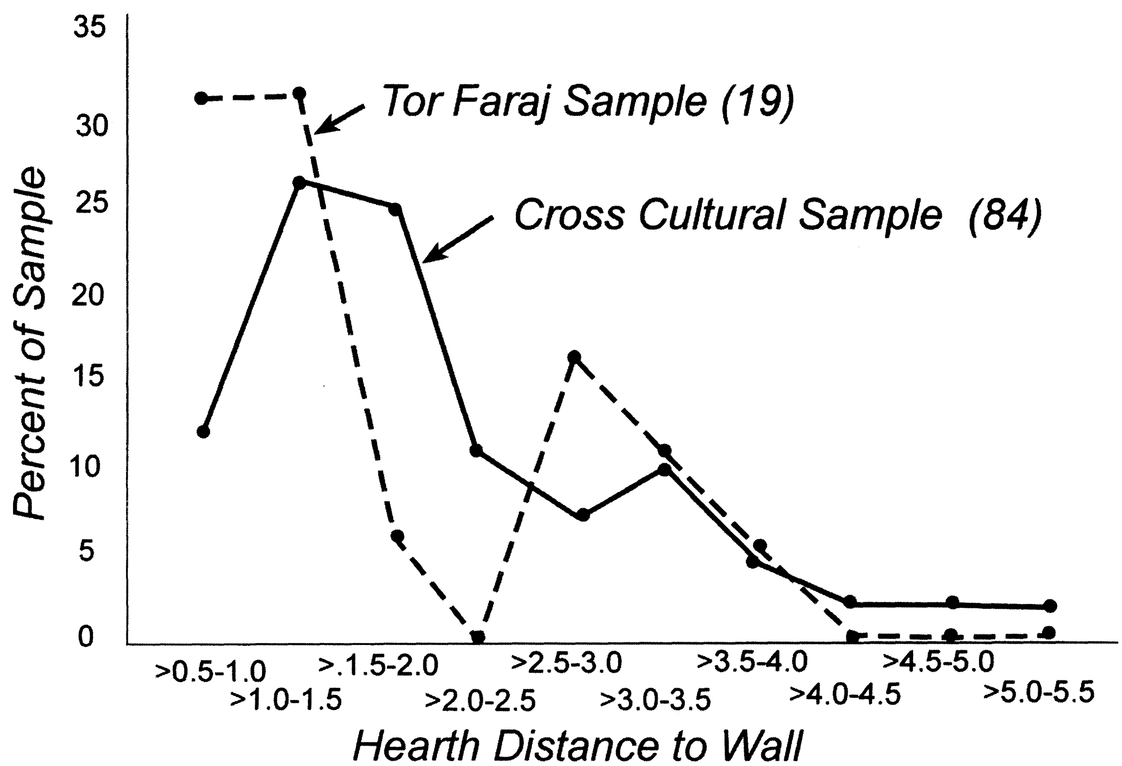

FIGURE 7. A comparison of hearth locations from Tor Faraj with a cross-cultural sample. Note the bimodal distributions in each of the samples.

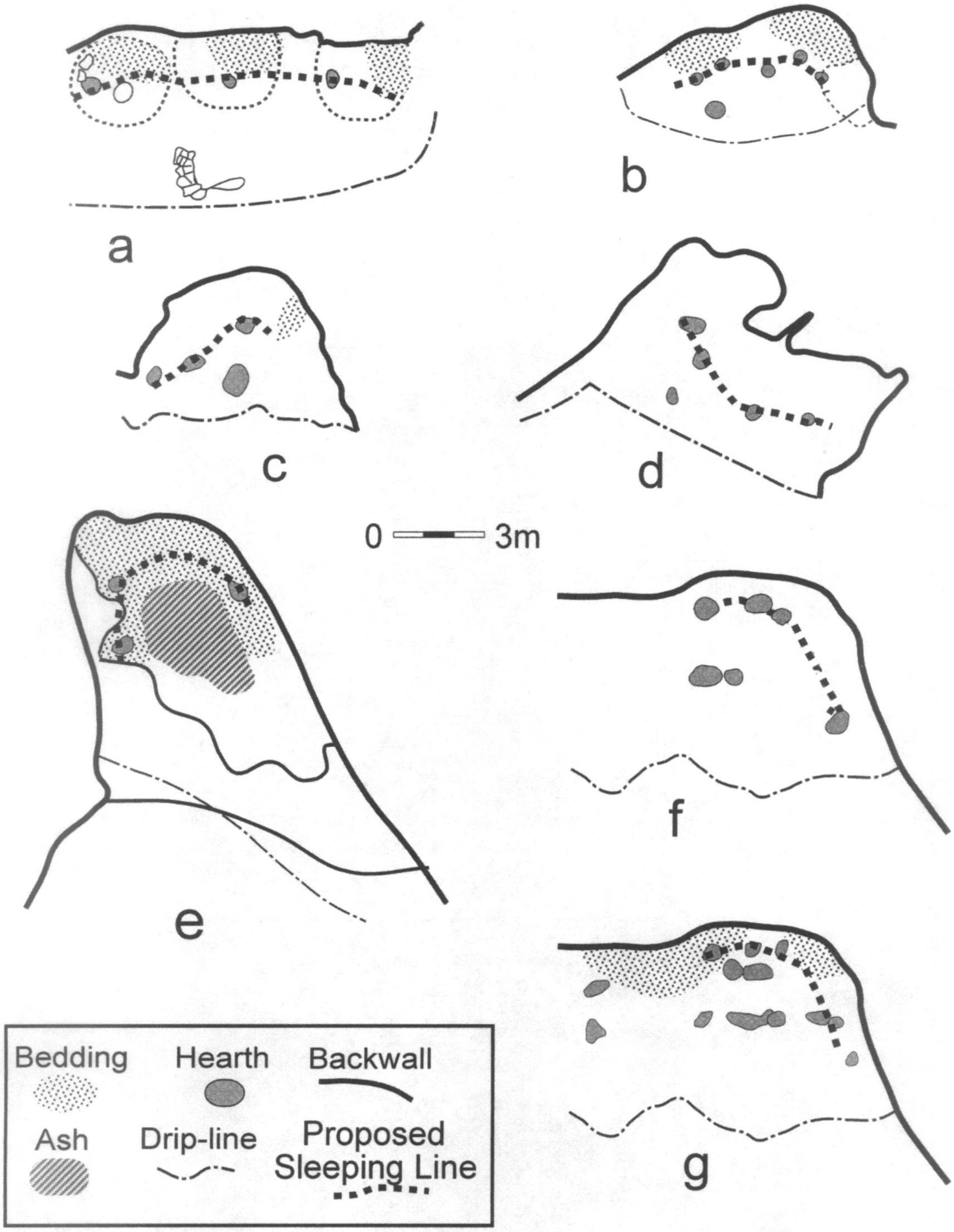

FIGURE 8. Comparison of Tor Faraj (Floor I–f, Floor II–g) distributions of hearths, ash, and bedding with ethnographic and archaeological examples associated with modern foragers: (a) Big Elephant Cave, Africa (Clark and Watson 1962); (b) Vedda Rockshelter, Bendiyagalge, Ceylon (Binford 1996; Seligman and Seligman 1909); (c) Yungubalibanda Shelter 6, Australia (Nicholson and Cane 1991); (d) Gatecliff Shelter, Horizon 9, Nevada, USA (Thomas 1983); De Hangen Cave, South Africa (Parkington and Mills 1991; Parkington and Poggenpoel 1971).

The spatial co-variation of cores on nodules and those on flakes also underscores the ways in which the inhabitants of the Tor Faraj segregated their activities. From the perspective of lithic reduction, the flakes would have been produced as later removals, used, and even rejuvenated before being abandoned across a living floor. But when recycled as cores, they were conceptually "relabeled" and spatially repositioned to the areas where initial processing was habitually undertaken. This observation is especially important for it shows how a certain part of the shelter (Area D, Floor I; Area A, Floor II) was seen as a place for undertaking initial manufacturing tasks regardless of whether chert nodules or recycled flakes were used. Other activities linked to communal tasks (central hearth Area B), sleeping

(Areas A–B), and dumping (Area D) also appear to have had conceptual labels specific to spatial loci as evidenced by the regularity in their segregation and positioning across the shelter (Figure 9). This conceptualization of the use of space differs markedly from proposals that practical considerations (e.g., protection from the elements and avoidance of noxious refuse), ergonomic requirements (e.g., hearth spacing), and ad hoc positioning of activities were solely responsible for archaic site structure (Mellars 1996; Pettitt 1997).

Site Structure: Simple versus Complex

In comparing the behavioral organization of archaic and modern foragers, researchers have focused on the relative complexity of site structures (Binford 1983, 1996; Henry 1998; Kaufman 1999; Marks 1988; Mellars 1996; Simek 1987; Stringer and Gamble 1993; Vaquero et al. 2001; Wolpoff 1999). The *simple* site structure of archaic occupations is generalized as displaying: (1) an intensive activity area tied to a central hearth or a few redundant activity areas tied to a small number of hearths and (2) evidence of temporally continuous and spatially overlapping activities. In contrast, the *complex* structure of the occupations of modern foragers is described as exhibiting: (1) discrete, nonredundant activity areas in which most, but not all, are tied to hearths and (2) evidence of temporally segmented and spatially segregated activities.

Although the specific behavioral inferences of the site structure of the Tor Faraj living floors may be debatable, it seems clear that the contextual spatial arrangement of artifacts, manuports, ecofacts, and features across the two floors is much more similar to a complex than a simple site structure as currently defined in Middle Paleolithic research. Not only does the complex site structure of Tor Faraj show clear differences with the simple site structures described as typical of the Middle Paleolithic (Mellars 1996; Pettitt 1997; Stringer and Gamble 1993), it strongly resembles those structures reported for numerous shelter occupations associated with modern humans. If site structure mirrors behavioral organization, then we have to assume that the Middle Paleolithic occupants of the shelter were organizing their activities essentially along modern lines.

Other researchers also have identified modern elements of behavioral organization in the Middle Paleolithic, but generally in the context of intersite or settlement patterns (Feblot-Augustins 1993; Kaufman 1999; Kuhn 1995; Marks 1988; Roebroeks et al. 1988). Intrasite studies of Middle Paleolithic sites are rare and most do point to simple site structures, but occupations with more complex structures have been reported. In contrast to the small, ephemeral occupations thought typical of the Middle Paleolithic, the recent excavation of the Spanish rock shelter, Abric Romaní, exposed stratified levels containing large (200–300 m^2) complex living floors with numerous hearths (Vaquero and Pasto 2001; Vaquero et al. 2001). Level Ja is especially impressive with over 40 hearths distributed across a floor area of 300 m^2. Several hearth-centered activity areas are defined along with refuse disposal areas and butchering locations. The sizes and numbers of activity areas are interpreted as expressions of "large groups formed by several social units" (Vaquero et al. 2001: 111). Level Ja also shows some remarkable similarities to

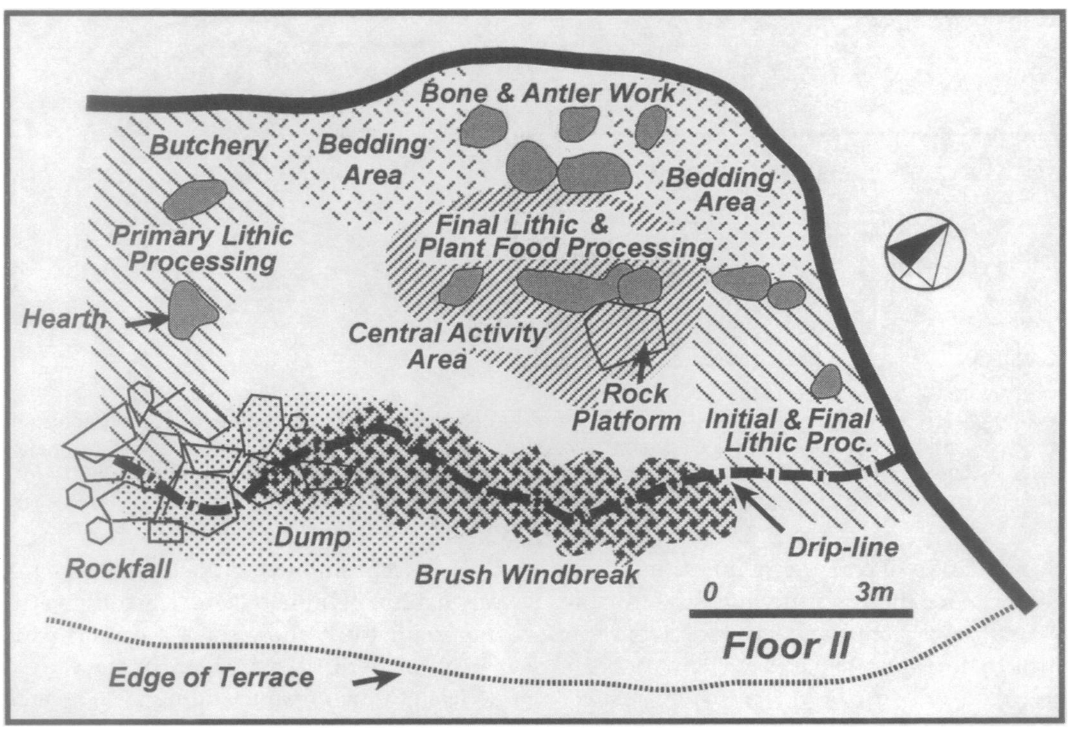

FIGURE 9. The arrangement of activities within the shelter as reconstructed from the structure of the site's occupations.

the site structure observed at Tor Faraj. The dual hearth lines seen at Tor Faraj and in the modern forager examples are present. The line nearest the back wall is formed along a swath positioned some one-to-two meters from the wall and a second line follows a swath placed some five-to-six meters from the wall. Although the second hearth line is located farther from the back wall than at Tor Faraj (1.6–3.6 m compared to 5–6 m), the distance measures of the near-to-wall line of hearths and the overall arrangement of hearths in the shelter are very similar to those of Tor Faraj. And as at Tor Faraj, manuports composed of limestone blocks thought to have been used as butchering anvils are also reported from Abric Romaní.

CONCLUSIONS AND IMPLICATIONS

The results of the investigation of Tor Faraj challenge the traditional notion that Neanderthal campsites were limited to those that displayed a simple site structure and by inference reflect a less complex behavioral organization than followed by modern foragers. A critical evaluation of the site's deposit, features, and artifacts confirmed the presence of two relatively large, stratified living floors. A high resolution spatial analysis that involved relational comparisons of hearths, manuports, artifacts, plant microfossils, and geochemical signatures defined several discrete, nonredundant, mostly hearth-centered activity areas. These are thought to have represented sleeping areas, a central domestic area, a refuse disposal area, and primary lithic processing areas. The notion that the Middle Paleolithic occupants of the site placed distinct conceptual labels on certain places within their camping space is supported by tracing the use of the same location for primary lithic processing at different reduction stages that must have been separated by hours or days. Similarly, bedding areas, food processing and preparation areas, and refuse disposal areas appear to have been largely devoted to discrete rather than general or overlapping uses.

Not only do the living floors at Tor Faraj conform with a complex site structure that is generally thought to first appear with the transition to the Upper Paleolithic and signal modern foragers, the floors—especially the configuration of hearths and bedding areas—also show an uncanny similarity to specific site plans recorded for ethnographic and archaeologic rock shelter occupations of modern foragers. These similarities in site structures thus suggest that the Middle Paleolithic occupants of Tor Faraj organized their behaviors relative to the use of camp space along fundamentally modern lines. While this represents only one of several cognitive and behavioral-organizational domains (e.g., subsistence, settlement-procurement, symbolic expression) that are debated within the human origin controversy, it is one that heretofore has received little empirical attention.

Although complex site structures are uncommon in the Middle Paleolithic, perhaps simply reflecting the general rarity of Middle Paleolithic occupations amenable to intrasite study, the strong parallels observed in the living floors at Tor Faraj and the Spanish rock shelter site of Abric Romaní indicate that such complex intrasite patterns cannot be explained as site-specific or even regional anomalies. The occupations of both sites, however, do fall relatively late (40–70 k.y.a.) in the Middle Paleolithic sequence and are roughly synchronous with shifts toward more modern foraging practices recognized in southern Europe (Stiner and Kuhn 1992). Whether these apparently synchronous appearances of modern foraging patterns in site structure, settlement, and subsistence represent a transitional episode or are merely coincidental remains to be determined. What is clear, however, is that the putative linkages between biology and behavior, as claimed for Neanderthal behavioral organization, subsistence, and land-use, can be dismissed. Alternatively, we may want to give greater attention to proposals that technological innovations (e.g., bone tools, series blade efficiency, and, perhaps, even development of new propulsion devices such as the atlatl or bow-and-arrow), not biologically linked cognitive differences, were responsible for the rapid expansion of modern groups at the expense of Neanderthals (Bar-Yosef 2000; Bar-Yosef and Kuhn 1999; Hayden 1993; Jelinek 1994).

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NOTES

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1. *Modern humans* is used in the traditional sense of referring to biological representatives of *Homo sapiens sapiens* and to their associated behaviors which are commonly thought to be first recognized with the Upper Paleolithic. We recognize that there are a number of problems with this traditional view, especially relative to the behavioral realm (see Clark 2002), but for clarity have elected to follow it.

2. The cross-cultural sample includes 101 hearths identified on the floor plans of 21 occupations from 20 sites reported by Flannery 1986, Thomas 1983, Nicholson and Cane 1991, Kind 1984, Hahn 1984, Clark and Walton 1962, Seligman and Seligman 1911, Binford 1996, Gorecki 1991, and Parkington and Poggenpoel 1971.

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