

GHUWAYR I, A PRE-POTTERY NEOLITHIC B SETTLEMENT IN SOUTHERN JORDAN: REPORT OF THE 1996-2000 CAMPAIGNS

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Introduction and History of Investigations

Five seasons of the joint University of Nevada-Las Vegas (UNLV) and Jordanian Department of Antiquities interdisciplinary excavations at the small but elaborate Pre-Pottery Neolithic B (PPNB) community of Ghuwayr I in the remote Wādi Faynān (وادي فينان) of southern Jordan (Fig. 1) have recently been completed. This report represents a summary of these investigations, providing preliminary data on the excavations and addressing the place of Ghuwayr I within a wider Levantine Neolithic world.

Ghuwayr I was first investigated by M. Najjar in 1993 (Najjar 1994) as part of the "Archaeometallurgical Investigations in Southern Jordan" study, a joint Jordanian-German project examining ancient metallurgical activities in the region (Hauptmann 1990). This early investigation demonstrated that Ghuwayr I was a modest sized PPNB village covering approximately 3 acres (or ca. 1.2 hectares) or less. Of particular interest was the spectacularly preserved architectural features, including intact walls standing over 2 meters high, several of which had been exposed by a wadi-cut at the western edge of the site.

Renewed investigations were initiated in 1996 by Simmons and Najjar (1996), during which a brief re-examination of the site indicated that additional multidisciplinary excavations were warranted. This resulted in three major seasons conducted during the winters of 1997/98 (Simmons and Najjar 1998a,b), 1998/99 (Simmons and Najjar 1999), and 1999/2000 (Simmons and Najjar 2000). In addition, a brief Ground Penetrating Radar investigation was conducted during the summer of 1998. Finally, Najjar undertook a limited study during 2002 to excavate a small area damaged by flood waters.

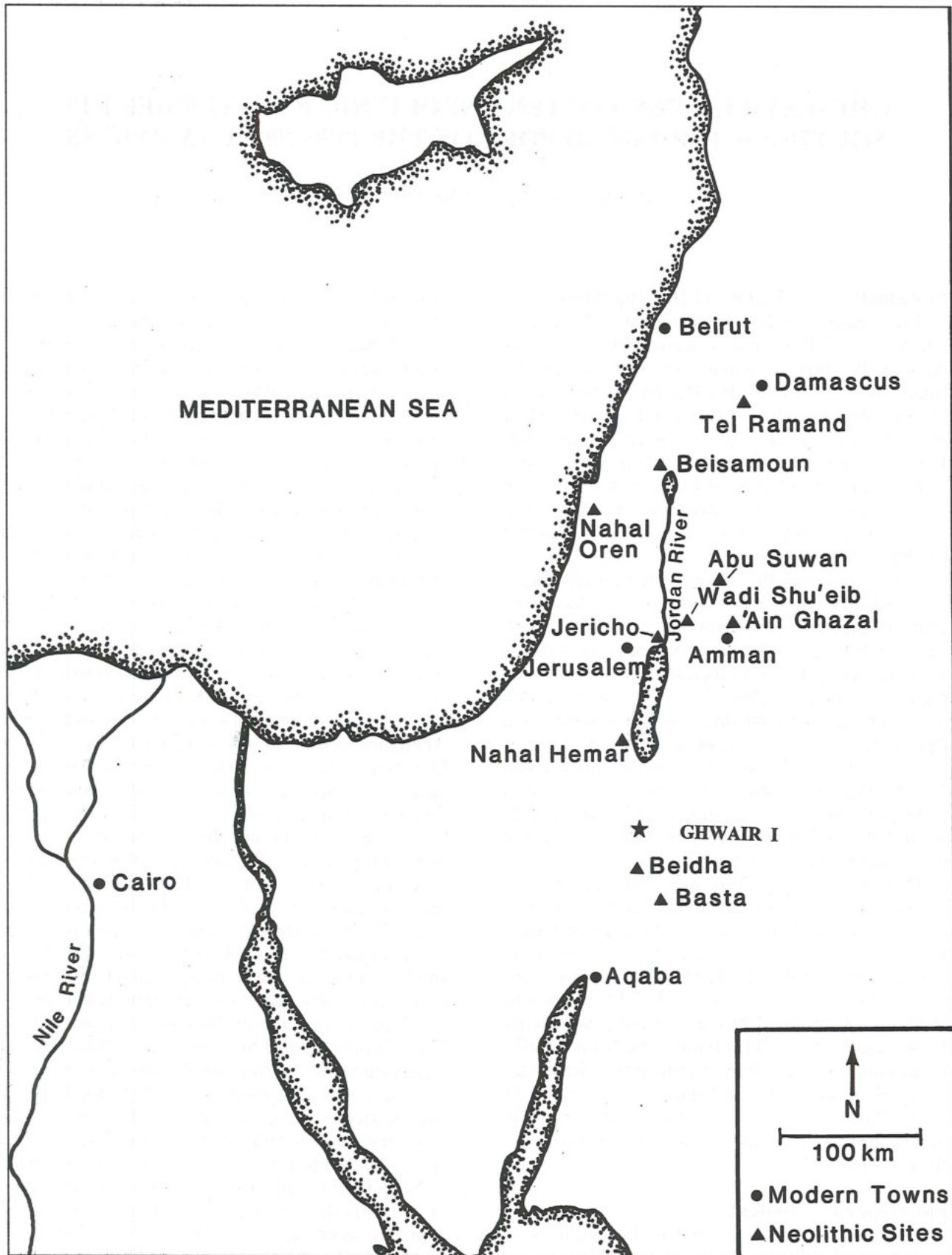
Environmental Context

Ghuwayr I was some 200km to the southwest of 'Amman and 120km north of 'Aqaba. It is located on a low-lying hill on the southern bank of the in-

tersection of Wādi al-Ghuwayr (وادي الغوير), which joins the larger Wādi Faynān system that drains to the 'Arabah. The site is at an elevation of some 320 meters above sea level. The northern end of it slopes down gradually to the bed of Wādi al-Ghuwayr. The eastern and the western slopes have to some extent been cut away by post-occupational erosion in the form of wadis; this is particularly pronounced in the western end. The southern extent of the site backs up to a relatively steep hill.

Today the region is characterized by extreme aridity, although during the winter large amounts of precipitation can occur, often in the form of intense rainfall. Vegetation is sparse and typical of the arid portions of the southern Levant. *Acacia* spp. and *Chenopodiaceae* characterize areas around the site, and the immediate vegetation may be considered as an open xeromorphic scrub. Pistachio and Phoenician juniper, especially, occur at elevations over 600m, and evergreen oak is abundant over 1100m. Elevations lower than 200m are semi-desert shrubland and pseudo savanna (Neef 2003). Without irrigation, farming would be impossible. If viewed from modern conditions, the environmental setting of Ghuwayr I certainly could be characterized as "marginal" and harsh. Of course, paleo-environmental conditions undoubtedly were different, although Ghuwayr I appear to fall outside of the so-called "Levantine Corridor" (e.g., Bar-Yosef and Belfer-Cohen 1989), being located on the edges of this hypothetical "core" environmental area.

Despite its current harshness, however, the Wādi Faynān system has supported substantial human occupation. During the Bronze Age and later, this was a major region for copper production, and large settlements are located throughout the region (e.g., Hauptmann 1990; Levy *et al.* 2002). Even during the Neolithic, we know of at least two other PPNB sites located in the region, some 20km. to the west of Ghuwayr I, and recent survey in that region has recorded more (Adams 1991; Levy and Adams 1997; Raikes 1980). In addition, an earlier Neolithic (PPNA) site (WF-16- Finlayson and



1. Map of the southern Levant, showing Ghuwair I and other major sites.

Mithen 1998; Mithen *et al.* 2000), as well as a later Pottery Neolithic site (Tall *Wādī Faynān*) (Najjar 1992; Najjar *et al.* 1990; Simmons and Najjar 2002) are located even closer to Ghuwayr I. Thus the current barrenness of the environment may be more apparent than real.

Research Design

Over the past 20 or so years, research at Neolithic communities in Jordan has literally rewritten our understanding of the trajectory of early village life in the Levant (e.g., Rollefson 1987; 1989; Kuijt 1995, 2000b; Simmons 1995; Simmons *et al.* 1988). What has perhaps most dramatically changed our perceptions of the Levantine Neolithic have been excavations at major core centers, or so-called "mega-sites", such as 'Ayn Ghazāl (Rollefson and Kafafi 1997; Rollefson *et al.* 1992; Simmons *et al.* 1988), Wādī Shu'ayb (Simmons *et al.* 2001) Baṣṭa (Nissen 1990; Nissen *et al.* 1991), as-Sifiya (Mahasneh 1997 a,b), and 'Ayn al-Jammām (Waheeb and Fino 1997). Such communities, often exceeding 20 acres, dwarf contemporary Jericho, and must have housed large populations. While much attention has justifiably focused on these large, near "urban" communities, the importance of much smaller communities, perhaps originally best exemplified by sites such as Bayḍā (Kirkbride 1966; 1968), can not be overlooked. These have complemented our knowledge of the range of Neolithic settlement diversity. Ghuwayr I is one such site, and three principal issues structured our investigations.

First, a major goal of our investigations was to place Ghuwayr I within a wider context of early village life in the Levant, and to do so from a potential Neolithic "core/periphery" perspective (cf. Algaze 1986; 1989). In particular, we wished to examine whether Ghuwayr I, located in the apparent periphery of the Neolithic world, functioned as a "frontier outpost" with minimal amenities, or if it was an elite, but small, center. Ultimately we wish to compare small settlements such as Ghuwayr I with larger Neolithic core centers. Thus, a question to ask was: were small communities linked to the larger settlements in some economic (or other) fashion, or did they operate as independent entities?

A second project objective was to initiate paleoenvironmental and paleoecological reconstruction. Ghuwayr I appears to be located in a marginal, harsh environment, and we wish to determine if its occupants contributed to environmental degradation, as has been proposed for larger mega-sites (e.g., Kohler-Rollefson 1988;

Kohler-Rollefson and Rollefson 1990; Rollefson 1996; Simmons 1997).

Finally, we wished to better determine the parameters of a village located on the edge of the Levantine Corridor, and presumably on the outskirts of the Neolithic world. This objective involved the basic archaeological issues of seeking to better define Ghuwayr I's boundaries, architectural layout and social indicators, material culture, economy, and chronology.

Geomorphology

R. Mandel (University of Kansas) conducted a preliminary geomorphological analysis of Ghuwayr I and its immediate environment. He has identified three landforms upon which the site is located: an alluvial fan, a colluvial apron, and a high Pleistocene terrace. Most of the western third of the site is associated with the alluvial fan that formed at the mouth of a small, high-gradient wadi that joins Wādī Ghuwayr from the south. It was this wadi that initially exposed well-preserved architecture at the site. A lobe of the fan extends out onto the high Pleistocene terrace. The PPNB horizon is sealed beneath ca. 1m of stratified fan deposits on the western edge of the site. Most of the eastern two-thirds of the site is associated with a colluvial apron that formed at the foot of the wadi wall. The colluvial unit is ca. 50-150cm thick and thins away from the northern third of the wadi wall. PPNB features are sealed beneath and within the colluvium. The northern third of the site is associated with a high Pleistocene terrace underlain by gravel-rich alluvium (the Upper Ghuwayr Beds). The surface of this terrace is the highest geomorphic surface other than the bedrock walls of the wadi. The PPNB horizon is sealed beneath a very thin veneer (less than 40cm) of slope wash that covers the terrace surface.

Mandel also has documented a paleosol near the site and is presently working on the depositional sequence of materials at the site. His study will place Ghuwayr I within a wider geological context and will address site formation and post-occupational processes and well as assess the site's economic potential. He also will study the possibility that the inhabitants of Ghuwayr caused severe environmental stress, as has been suggested for larger Neolithic core settlements.

Areas Investigated

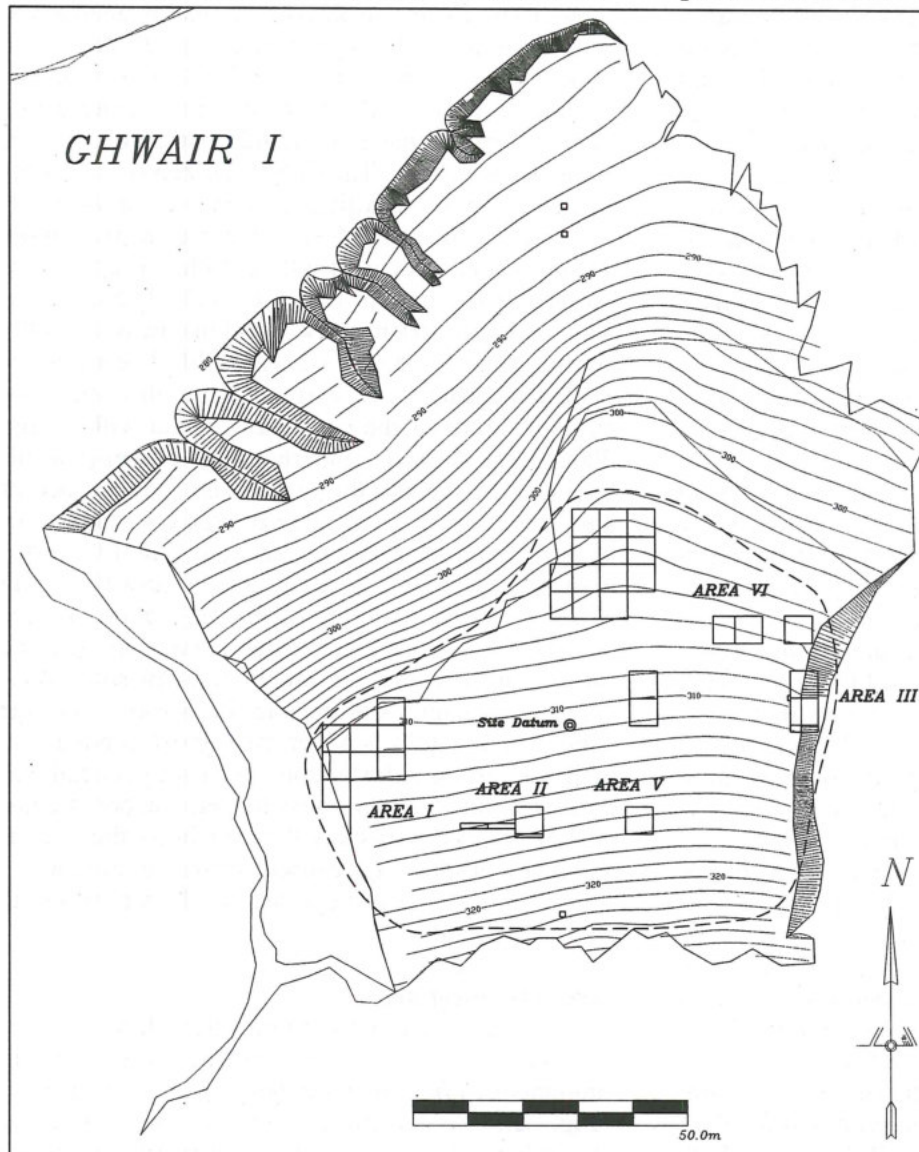
The renewed efforts at Ghuwayr I have focused on six distinct areas of the site, with varying amounts of effort being expended in each of these (Fig. 2). Architectural remains are indicated throughout the site's surface, primarily by white

wadi cobbles that were used for construction. These stand in stark contrast to the angular black cobbles forming much of the colluvium. A total of 518 square meters (including two 1 x 1m geological test pits but not counting Najjar's emergency flood investigations in 2002), of varying depths have been excavated during the current studies. Approximately 250 square meters were exposed in 1993; thus a total of ca. 768 square meters have been uncovered at Ghuwayr I. The most extensive investigations have been in Areas I, II and IV, while more limited excavation has been conducted in the remaining areas. These regions are described below.

Area I: Area I was in the western end of the site, where erosion has exposed portions of several intact rooms. This is a principal area of the site, where well-preserved architectural remains ex-

ceeding a depth of three meters had been previously defined during the 1993 investigations. Each of the renewed excavation seasons has included expanding Area I. Our new studies here have concentrated on a structural feature referred to as "Room 1" and its adjacent constructions (see below). A total of 200m² have been excavated in Area I.

Area II: Area II is located in the south-central portion of Ghuwayr I. In 1996, a 5 x 5m unit revealed a complex series of walls here, many of which were massive and parallel, running laterally across the site (east-west). In 1997/98, these were further investigated. Water erosion also exposed a portion of wall that was partially visible on the surface. We excavated between this wall and the previously exposed one, and to our surprise, the depth here was



2. Site topographic map, showing areas investigated. Dashed line indicates estimated settlement boundary.

considerable, despite surface indications suggesting otherwise. A large layer of ashy deposits was exposed, and beneath this is another series of walls. This adds up to a total depth of over five meters below the present ground surface, thus far the deepest area of the site. These results indicate a much more complex stratigraphy and building sequence than expected.

Finally in Area II, we expanded a small sounding excavated in 1996. This is nearly adjacent to the base of the mountain forming the southern edge of the site. Initially we felt that deposits here were sterile, but the new excavation revealed the presence of artifacts, but not architecture, at a depth of ca. 2m. A total of 36m² was excavated in Area II.

Area III: In 1996, Area III, near the eastern end of the site, was tested, revealing a large ash deposit but no architecture. In addition, an el-Khiam type projectile point, suggestive of the earlier PPNA, was recovered, as were a large number of bladelets. Available radiocarbon determinations, however, indicate a contemporaneity with the rest of the site (see "Chronology" below). This posed an interesting question, thus we continued to investigate this area, expanding upon the previous excavation. As with the rest of the site, this area is now more complex than anticipated. The ashy deposits continue, but a stratified series of at least three plastered floors, in very bad condition, also was exposed, as were fragments of walls. The function of these is as of yet unclear.

Immediately to the north of this area some additional architectural elements are visible on the surface, including one that appears to be ovoid in morphology. A 5 x 5m unit was excavated here, better defining some of the walls visible on the surface. However, the structural remains were poorly preserved and relatively shallow. We excavated 80m² in Area III.

Area IV: As with Area I, Area IV was initially excavated during the 1993 season, revealing a dense, but seemingly rather shallow, concentration of architectural remains. Area IV is located near the northern edge of the site. In 1997/8, we removed a series of balks that had been left in place since 1993. Material here was extremely rich, and once the balks were removed, the architectural plan was much clearer. In addition, depth is much greater than indicated by the 1993 excavations. It is this area of the site that contains most of the most intriguing aspects of Ghuwayr I, both in terms of architecture and human remains. A total of 325m²

were excavated here.

Area V: Area V consists of three 5 x 5m units (75m²) between Areas II and IV. These were only excavated through the first level of fill, resulting in the rough outline of walls. Time considerations, and the complexity of other areas already opened, precluded additional excavations.

Area VI: Area VI is located between Areas III and IV, nearly adjacent to the former. During the summer of 1998, J. Cole and associates conducted a brief Ground Penetrating Radar (GPR) study of Ghuwayr I, and their results suggested considerable depth and/or major wall features in the area examined. During the 1998/99 and 1999/2000 seasons, we excavated 50m² (two 5 x 5m units) to test these results. These excavations revealed a thick and deeply buried wall precisely in the area indicated by the radar. Ironically, however, this is a portion of the site with limited architectural remains, beyond the wall, and seems to have functioned primarily as a trash deposit.

Geological Tests: Finally, on the northern low terrace of the site, where some Roman remains are visible, we excavated two 1 x 1m units as geological test pits. These were over a meter deep and assisted the site geomorphologist in determining the deposition sequence of wadi deposits.

Stratigraphy

As noted above, portions of Ghuwayr I exceed 5m in depth. All these deposits appear to be PPNB. There are only hints of later occupation, most of it small, intrusive features. Three major architectural phases, and several sub-phases, compose the principal stratigraphic sequence during the ca. 500 year Neolithic occupation at Ghuwayr I. This has allowed us to observe internal evolution in the local architectural forms, which clearly reflect development dictated by the changing socio-economic needs of this village community. We note, however, the micro-stratigraphic analysis has not yet been undertaken, thus the chronological separation of these phases is undetermined. What may be reflected here is simply remodeling and renovation of structures as part of annual community activity. There is no stratigraphic evidence for any gap in occupation between any of the phases.

With this caveat in mind, the earliest phase (Phase I) is tentatively called the "Large Room Phase." It is identified in Areas I, II, III, IV, and possibly VI. Structures in this phase consist of large (ca. 10 x 10m) rooms. The second phase (Phase II) is provisionally termed the "Square Room Phase."

During this time, the large rooms were frequently subdivided by means of partition walls into four 4 x 4m rooms. This phase is well-documented in Areas I and IV. The third and final phase (Phase III) is the "Cell-Plan Phase". This is so far represented in Areas I and IV. During this phase, many rooms appear to have consisted of houses with small attach cell-like (often only ca. 1 x 1m) storerooms.

A small sounding in Area II nearly adjacent to the base of the mountain forming the southern edge of the site also has contributed to our stratigraphic understanding of Ghuwayr I. Excavation here revealed artifacts, but not architecture, to a depth of ca. 2m, at which point bedrock was encountered.

Architectural Features.

The excavations have revealed unanticipated architectural variability. In particular, the architectural complexity of Ghuwayr I is readily apparent, and the site's configuration now has taken on a distinct "village layout". Despite this, however, only a few rooms have been completely excavated, thus we have an unclear understanding of individual structural configuration. Nonetheless, several important features have been exposed, and these have helped to better define the site's internal structure. A variety of building materials were used at Ghuwayr I, but stone was the primary architectural element. There is no evidence for the use of mud-bricks.

Habitation Features

Phase I: We have the least amount of thorough information available for Phase I, since later

phases have used Phase I structures as foundations. Regardless, the large Phase I structures are built of stone and mortar. Construction materials consisted of both rough and semi-shaped wadi cobbles of varying sizes. Oftentimes, stone-lined and occasionally plastered silos are associated with these rooms. The floors of these rooms were of compacted earth. In certain places, small slabs of limestone or sandstone were used to pave portions of the floors. Area IV has the largest exposure of Phase I remains, and it is here that the outline of at least one 10 x 10m building was revealed. In Areas I and II there also are hints of large rooms, but the depth in these areas made complete excavation of Phase I impractical. In Area III, architectural remains are poorly preserved, but appear to relate primarily to Phase I.

In Area II, excavation revealed a remarkable degree of wall construction and rebuilding. Over five meters of at least 33 separate walls/building

episodes were recorded. Much of the matrix was extremely ashy, indicating its intermittent use as a trash disposal area. At the bottom on the excavation, footed upon an apparently sterile yellowish clay matrix, Phase I is represented as the deepest portion revealed at Ghuwayr I. Here a large room was partially exposed, consisting of large wadi cobbles with a sealed-in doorway. At the packed earth floor of this structure was an intact work area, with a hearth, large and flat stones that apparently functioned as "chairs", and numerous ground stone artifacts occurred *in situ*, suggesting an intact work surface. On the floor of this we also recovered impressions of mats, indicating the type of floor covering.

We also excavated a small sounding below the work surface/floor into the yellow matrix. Immediately below the floor was an intact circular hearth. We excavated below this area as well, but this area was sterile. This suggests, however, that bedrock is far below the cultural deposits in this portion of the site, despite surface appearances to the contrary, where the natural contour of the hill is not indicative of great depth. Thus what is especially significant about the excavations in Area II, limited as they were, is that during the Phase I occupation of the site, it seems that the occupants of Ghuwayr I may have cut into bedrock to achieve a terracing effect. Although continued excavation in Area II would help clarify this situation, the depth and loose nature of the structural remains made it too dangerous to continue.

Phase II: Phase II represents some of the most intriguing architecture at Ghuwayr I, and is also among the best preserved. During this phase, large rooms from Phase I were subdivided by means of partition walls into roughly 4 x 4m rooms. There is a noticeable shift to the use of shaped brick-like sandstone slabs in some of the rooms, resulting in very fine masonry. These also were used to form the gently curved corners common in many Phase II room. The floors and walls were plastered with lime plaster, some of it painted red.

Highlights of Phase II occur in both Areas I and IV. In Area I, the 1993 excavations revealed a complex series of architectural remains reflecting all phases of occupation at the site. Our renewed effort in Area I concentrated on a curious Phase II structure that we have termed "Room 1". Room 1 was initially exposed in 1996 and now has been completely excavated, down to its first plastered floor level. Room 1 is an unusually shaped structure, roughly square, but with a "jog" in the western wall (Fig. 3). The walls are ca. 60 thick. Some re-

modeling is suggested. The southern wall contains at least 3 large (ca. 60 x 40 x 20cm) niches, the western wall has a blocked-in doorway with a passage leading to the west that was later inserted into the blockage. The western wall also has a small niche, a plastered bench, and a window-like feature. Preliminary indications suggest that at least two of the "niches" may in fact have functioned as vents, as they are "hollow" up the length of the walls.

Immediately in front of the bench and directly on the floor was a group of four projectile points, three long blades, and a ground stone bowl, suggesting a primary use context. Unfortunately, most of the interior of the room's plastered floor has been damaged by roof fall, thus there are few intact features. Despite this, we know that Room 1's main plaster floor was replastered at least four times. The wall was plastered as well, although this is poorly preserved. Along the southern wall were the remnants of a subfloor feature in the form of a partially slab-lined pit. Excavation of this revealed it to be empty, but did indicate the presence of additional, earlier walls under the plastered floor.

In summary, we know that Room 1 was an unusually complex structure for the PPNB period. The presence of several niches and other wall features suggests a special-use function, possibly cultic, of the room.

Additional excavation was undertaken adjacent to Room 1 in an attempt to better understand its context. Excavation included the eroded western edge of the site and was to the approximate levels of Room 1. This has exposed a complex of structures in which Room 1 appears to be a core from which surrounding rooms expanded off (Fig. 4). It appears that several of these rooms may have been additions to the original Room 1 and thus extended

into Phase III. Many of these are small bins, several with connecting passageways. Rather than follow typical rectangular arrangements, however, these are arranged less symmetrically. Eight bins were excavated, in arrangements of four, three, and one contiguous units. Most had plastered floors.

In addition to these small "cells", portions of other Phase II structures also have been exposed in the vicinity of Room 1. This included a large rectangular structure that shared the row of four "cells" described above. Another, more amorphous, structure was contiguous to Room 1, but erosion has destroyed much of this room. However, some fragments of wall plaster showed a geometric design executed in red. In point of fact, plaster, much of it painted red, was quite common on several of these structures, frequently extending up the walls as well as covering the floors.

In Area II, we have already described the complex series of architectural remains, and it is difficult to isolate these as to phases. However, the bulk of building activity here likely occurred during Phase II. In section, one standing wall (toppled at the top) reaches a height of ca. 3.6m. Some of the walls are massive, and in one portions, remains are suggestive of a "tower", although this remains unverified, due to the limited extent of the excavation.

Area IV contains impressive Phase II remains. Area IV was extensively excavated in 1993, and as with other portions of the site, all three building phases are represented. After the construction of the large Phase I room, Phase II reduced individual buildings into smaller rooms, and finally, during the third phase, was further divided into small units that may have been the lower storage units ("basements"?) of a two-story building. Our excavations here have revealed a complex series of primarily Phase II architectural remains consisting of a series of linked rooms forming roomblocks.



3. Room 1 in Area I. Note niches (left side) and possible ventilation shafts (upper corners).



4. Room 1 complex in Area I.

These rooms were well-constructed, and at least two narrow "streets" or "corridors" separates individual roomblocks. Only one 5 x 5m unit, to the far west of Area IV, to where the post-occupational wadi has destroyed portions of the site, had no room structures associated with it, at least to the depth of our excavation. This indicates that this is the western extent of a roomblock.

Of particular note was one room within a roomblock that clearly served a special function. This room was linked to another by an open doorway. It also had been subsequently remodeled with smaller "cell" rooms during Phase III that contained no entrances to the main room. The main room also contained a cobble lined pit near its western corner, and the northern walls of the room contained small connecting "windows" to an adjacent room. What is important is that this room contained a "cache" of several goat and cattle skulls laying nearly directly on a plastered floor. Analysis of these is not yet completed, so we do not know how many animals are represented, although there are at least four goat skulls and one *Bos* skull, including a splendidly preserved horn core. In addition to the skulls there was a cache of chipped stone blades and points, a polishing stone with malachite imbedded into it, several malachite pendant "blanks", ground stone, and other rare objects, all directly on the plastered floor. There also was another cache of blades located within one of the sealed "cell" rooms; we cannot determine if this cache was deposited when the main room was occupied, or if the cache is related specifically to the Phase III cell room. Finally, beneath the floor was an intact burial (of an infant), the first for the site (see "Human Remains" below). These data indicate that this was a very special room, undoubtedly with some ceremonial or ritual significance.

Another Area IV feature of particular interest is the presence of two sets of internal stairs in one structure, immediately to the south of the room with the burial, supporting the interpretation of at least two stories in many of the buildings. These dual stairways are located in narrow corridor-like features flanking a large room that is linked to the corridors by small entry-ways. This room also may have served a special function, as it contains two large semi-circular corner "benches".

To the west of this roomblock is an intriguing outdoor feature that may represent a public area (see "Non-Habitation Architectural Features" below). Also of interest is that to the east of this roomblock, there is a large structure that appears not to have been occupied into Phase III. Instead,

the fill of this room appears primarily to consist of trash deposits, similar to what is seen nearby in Areas III and VI.

Phase III: The last major architectural phase at Ghuwayr I is best represented in Areas I and IV. The distinguishing characteristic of this phase is the further subdivision of several rooms into smaller "cells". These are well-constructed, often made of rather small, shaped slabs. They directly overlay Phase II structures with no signs of discontinuity. Indeed, as mentioned earlier, much of this phase represents either remodeling of earlier structures or additions. In several areas, cell rooms were joined by long walls, thus forming blocks separated by narrow streets or passageways. It seems that at least some of the houses consisted of a ground floor containing the cell-like storerooms and upper floor that provided living space. The thickness of the walls, often exceeding 90cm, certainly could have supported a second floor. There are hints of two story buildings during Phase II as well, as exemplified by the dual stairway in Area IV.

The cells were often interconnected by means of small, window-like openings, but these were too narrow to have served as doorways. Furthermore, no openings to the cell rooms were found in the external walls, thus we believe that access to these small rooms could only have been through hatches in the upper, living floors. Although few complete structures have been exposed, it appears that the number of cells per house varied between five and six.

The real function of these installations are still uncertain, and whether the cells were "cellars" or were under-floor air spaces to raise the floor above the ground level for ventilation purposes is unclear. Most of the plastered floors of the cell rooms lack much cultural material, giving the impression that before finally abandoning the houses, the inhabitants of Ghuwayr I took the effort to neatly clean them. Despite this, however, in a few instances chipped stone caches were recovered from cell-room floors, as were disturbed burials. The latter, however, could be intrusive from a period when the houses had already been deserted.

One interesting Phase III structure that may have ritual significance is a "D-shaped" structure near Room 1 in Area I. This room had originally been exposed during the initial investigations in 1993, and we only conducted limited additional excavation. What is curious about this room, beyond its shape, is that a large flat burned stone is incorporated into one of the walls. Immediately in front of this installation, on a rough floor, was a

small burnt area that might best be described as a casual hearth. Adjacent to this was a small clay animal figurine. The juxtaposition of these features suggests that this may have been some sort of small "altar" with an offering. That this room is separated from "Room 1" by only a narrow corridor again suggests that this portion of the site was perhaps devoted to ritual activities, although we must be careful in suggesting the separation of "sacred" and "profane" activities during the Neolithic, when in fact it may well be that such events occurred in the same physical space.

Phase III represents the last major building phase at Ghuwayr I. We do not see any deterioration of structures or style during this phase. Rather, the additional of small cell rooms to several existing structures probably reflects changing economic or social needs.

Finally, we have limited information on how structures were roofed during any of the phases. Clear post-holes are lacking in nearly all structures. In all likelihood, the roofs of most structures were flat and probably consisted of timber and other perishable materials, although stone also could have been used. There is some indication, primarily during Phase II construction, of arch-ways, which might suggest that some structures were domed. This evidence, however, is equivocal. It is in the form of standing architectural profiles that appear to angle inward in their upper extremes. While this could suggest the use of arches, it also may simply be indicative of the post-occupational slumping of walls.

Non-Habitation Architectural Features

Several architectural features at Ghuwayr I were non-habitational. Their situation within individual phases is unclear, although they probably were constructed during all phases. The more significant of these are described below.

Certainly the most intriguing non-habitational feature is located in Area IV, immediately adjacent and to the west of the roomblock described above that contains internal stairs and the infant burial. This area is where wadi erosion has removed some deposits, but it appears to be outside of the roomblock in an open plaza. Excavation here revealed a large set of step-like stones that initially appeared to form either a major outdoor stairway or, perhaps, some sort of "theater" or public gathering area. These "stairs" lead down to a level open area of hardpacked earth (Fig. 5).

To fully interpret this feature required additional excavation, and as luck would have it, during the winter of 2002, one of us (Najjar) was

working in the vicinity during intense flooding. This flooding destroyed some of the area surrounding the feature, and Najjar conducted limited emergency excavations that have clarified, but not resolved, the configuration of this unusual structure. Based on current data, it is unclear if the stones continue upslope, as stairs, perhaps linking different areas of the village, or continue downslope, possibly leading to Wādī al-Ghuwayr, although in section, there is no evidence to support such continuations. The flooding and subsequent emergency excavations, however, revealed that the "stairs" do not continue to the west in some sort of "seating" arrangement. Rather, they appear to be well circumscribed and their width is in fact not much greater than what was first exposed in 2000. It is unclear when this elaborate feature was constructed: it may have been in place as early as Phase I.

Thus this feature appears to resemble a stairway rather than a formal "theater," although it could have functioned in both capacities. Additional excavation is required to clarify the function of this area, but it clearly was an elaborate feature. Whether it functioned as a public gathering place or a large stairway, it still represents a community feature, attesting to the architectural, and by implication the social, complexity and sophistication of the builders of Ghuwayr I.

In Area II, there is a complex series of crude walls, many of which were massive and parallel, running laterally across the site (east-west); these are visible from the surface and probably relate to Phase III. One of these walls was excavated to the west for ca 10m. To the north of this wall is a series of additional walls or buttresses, but we did not expand upon these. In addition, once Area II had been excavated to the remarkable depth described previously, a massive wall, forming the southern, upslope, portion of the excavation unit, was revealed.



5. Stair or "theater" complex in Area IV, possibility representing a public area.

All of these structures run parallel to the natural slope of the hill on which Ghuwayr I is located. Our belief is that these structures may have been erected as water-control devices, perhaps to channel water that could have washed down from denuded slopes above the site.

This interpretation is supported in Area III as well. Although erosion has been substantial here, excavation revealed extremely ashy deposits, probably reflective of trash areas, as well as the stratified series mentioned earlier. There also are some erosion "gullies", cutting through the floors, that may have been intentionally cut into this area, perhaps to channel water. Small walls also occur in what may be a natural erosion channel, suggesting attempts to block water.

Finally, in Area VI, where GPR suggested massive walls, we have a curious portion of the site. Excavation here supports the GPR findings, having partially exposed a series of large, undressed stone walls. Again, these may have been erected to protect the settlement from landslides or slope-wash. This portion of the site, as well as Area III, initially seems to have contained a series of presumably residential units, but after these were abandoned, this eastern portion of the site appears to have been used as a massive trash dump.

Architectural Summary

In summary, despite its small size, Ghuwayr I represents a bewilderingly complex series of architectural features. These include residential, ritual, and possible public installations. Three major architectural phases have been defined, but the chronological separation between them is uncertain. They are primarily defined by stratigraphy, but based on radiocarbon determinations, the site was only occupied for ca. 500 years. Thus each phase, and subphases, may well simply represent a remodeling or renovation stage.

One somewhat curious point is that internal hearths are lacking in nearly all rooms, residential or otherwise. A few have been documented, but their paucity is puzzling, especially considering that such hearths are common in other PPNB sites, including nearby Baydā (Byrd 2000: 76-77). Likewise, there is limited evidence for post-holes that would imply roof supports.

We have described Ghuwayr I's phases based on their primary architectural features, but we do not have conclusive evidence that these features occurred throughout the site during any particular phase. For example, the earliest phase, the "large room phase", is best characterized by a 10 x 10m room in Area IV. Whether similarly large rooms

occurred elsewhere at the site during Phase I is unclear, as is the extent of the site during Phase I. For example, only partial structures were revealed in Area III, and we cannot precisely phase them. Based on current exposures, it is difficult to estimate when the zenith of occupation occurred at Ghuwayr I, but certainly most of the site's area was occupied during Phase II, whose remains are ubiquitous throughout the site, except in Areas III and VI, which appear to have been used as trash disposal areas during Phases II and III. During Phase III, the village appears to have continued to cover most of the site's area, although there are intriguing hints of the construction of water control features that ultimately may have had something to do with Ghuwayr I's final abandonment.

Material Remains

Chipped Stone

The abundant chipped stone materials from Ghuwayr I reflects a typical PPNB assemblage, with an unusually large number of projectile points, primarily Byblos types. The systematically collected assemblage from the new seasons consists of nearly 64,000 artifacts. A thorough study of the materials from the 1997/98 and 1998/99 seasons has been completed (Gervasoni 2000). **Table 1** illustrates the breakdown of major classes of chipped stone, including the final season.

While the categories used are consistent with the system proposed by Gebel and Kozłowski (1994), we have further defined two other classes. These are "massive trimming blades" (MTBs) and "massive trimming flakes" (MTFs). These artifacts are large blades and flakes with two of three dimensions exceeding 100cm in length, 50cm in thickness, or 25 cm in thickness. Many are crudely retouched and thus are technically "tools", but for purposes of cross-site comparisons we prefer to tally them separately. The function of these artifacts is as of yet unknown, but one suggestion is that they may have been used in trimming building stones in architectural construction. A wide variety of cores is present, including numerous naviform types (**Table 2**).

As is clear from **Table 1**, all aspects of chipped stone reduction are represented at Ghuwayr I. Blades are especially abundant, and exceed flakes. We recovered three caches of finely made blades, confirming their importance the ratio of blades (including core trimming elements) to flakes (including core tablets) is 1.02:1. If bladelets are added to blades, this ratio increases to 1.35:1. Note that the massive trimming blades and flakes are not in-

Table 1. Summary of Chipped Stone Assemblage from *Ghuwayr I*, 1996-2000.

Class	Number	Percent	R%*
Tools	5,179	8.1	12.6
Debitage--			
primary flakes	1,272	2.0	3.1
secondary flakes	5,338	8.4	13.0
tertiary flakes	6,798	10.7	16.5
primary blades	344	0.5	0.8
secondary blades	3,688	5.9	9.0
tertiary blades	9,180	14.4	22.3
bladelets	4,517	7.1	11.0
core trimming elements	590	0.9	1.4
core tablets	142	0.2	0.3
massive test flakes	401	0.6	1.0
massive test blades	143	0.2	0.3
Other Waste--			
Microflakes	2,101	3.3	5.1
Bifacial trimming flakes	29	0.1	0.1
Burin spalls	251	0.4	0.6
Cores	1,176	1.8	2.9
Debris--chunks	10,749	16.9	--
Debris--chips	11,689	18.3	--
Hammerstones	127	0.2	--
Total	63,714	100.0	100.0

*Excludes debris (chips and chunks) and hammerstones

cluded in these ratios.

The presence of so many bladelets suggests that a microlithic technology was still important to the residents of the community. Although Wilke and Quintero (1994) have provided convincing evidence that bladelets are a by-product of naviform core reduction, the presence of both bladelet cores and numerous microlithic tools (primarily retouched bladelets) indicates that bladelets were a desired tool blank.

The ratio ofdebitage (that is, usable tool blanks) to cores is a high 27.10:1. If this is representative, it suggests a very efficient core reduction strategy. The majority of the raw material is locally available, and no exotic (e.g., obsidian) artifacts have yet been recovered.

A large variety of tools are present, which should be expected from a village site (Table 3). After removing the ubiquitous "retouched blades

Table 2. Core Typology for *Ghuwayr I*.

Type	Number	Percent
Flake-material test	21	1.8
Flake-single platform	124	10.5
Flake-multidirectional	115	9.8
Flake-globular	85	7.2
Flake-bidirectional	1	0.1
Flake-opposed platform	18	1.5
Flake-pyramidal	10	0.9
Flake-discooidal	23	2.0
Flake-90 degree	13	1.1
Flake-sub-pyramidal	12	1.0
Flake-subdiscooidal	34	2.9
Core on flake	39	3.3
Blade-single platform	53	4.5
Blade-naviform	58	4.9
Blade-opposed platform	19	1.6
Blade-90 degrees	11	0.9
Blade-multi-directional	2	0.2
Core on blade	1	0.1
Bladelet	52	4.4
Tabular	2	0.2
Spheroidal	22	1.9
Bifacial	1	0.1
"Akrotiri" type	1	0.1
Exhausted	63	5.4
Indeterminate	5	0.4
Hammerstone/core	16	1.4
Fragment-flake	244	20.7
Fragment-blade	38	3.2
Fragment-bladelet	34	2.9
Fragment-indeterminate	59	5.0
Total	1176	100.0

and flakes", however, projectile points are the dominant artifacts, representing 12.8% of all tools. This is unusual, given the sedentary nature of the site. Perhaps even odder is the high number of microliths (primarily simple retouched bladelets). This indicates that the production of bladelets was intentional, and not simply a by-product of naviform core reduction. Other tool classes include a large

Table 3. Summary of Tool Classes from Ghuwayr I, 1996-2000 Excavations.

Class	Number	Percent
Projectile Points	661	12.8
Piercing Tools	270	18.0
Scrapers	138	2.7
Burins	148	2.9
Notches	269	5.2
Denticulates	40	0.8
Serrated Pieces	87	1.7
Knives	19	0.4
Sickles/Glossed Pieces	103	2.0
Truncations	137	2.6
Tanged Pieces	161	3.1
Backed Pieces	115	2.2
Microliths	360	6.9
Retouched Blades	1,650	31.8
Retouched Flakes	762	14.7
Axes	37	0.7
Bifaces	10	0.2
Unifaces	10	0.2
Varia	62	1.2
Tool Fragments	140	2.7
Total	5,179	100.0

number and variety of perforating implements (5.2%). Scrapers (2.7%), burins (2.9%), and truncations (2.6%) are nearly equally represented. A wide variety of sickles and glossed pieces (2.0%) also occurs.

The large number of points is surprising (Powell 2001; Powell and Gervasoni 1999). Most are of Byblos varieties, although a wide range of types is represented (Table 4). Within major types, such as Byblos, there is a large amount of variability ("variants" in Table 4). This is reflected primarily by distinctions on tang morphology and retouch, representing gradients between Byblos, Jericho, and 'Ayn Ghazāl types. Of interest is the relatively large number of points manufactured on bladelet blanks, which we have termed "miniatures". Other types represented include, curiously, seven el-Khiam like points (although 5 are unnotched variants). Initially, this was thought to possibly reflect an earlier, PPNA occupation of Ghuwayr I, but ra-

Table 4. Projectile Point Typology from Ghuwayr I.

Type	Number	Percent
Byblos	208	31.5
Byblos-Variant 1	80	12.1
Byblos-Variant 2	14	2.1
Byblos-3 (asymmetrical)	24	3.6
Byblos-Variant 4(offset)	4	0.6
Byblos-miniature	78	11.8
Byblos-spear	5	0.8
Byblos-other	21	3.2
Jericho	26	3.9
Jericho-Variant 1	23	3.5
Jericho-miniature	16	2.4
El-Khiam-notched	2	0.3
El-Khiam-unnotched	5	0.8
'Ain Ghazal	78	11.8
'Ain Ghazal-miniature	12	1.8
Amuq	8	1.2
Cached points	22	3.3
Others	19	2.9
Fragments/unidentifiable	16	2.4
Total	661	100.0

diocarbon determinations do not confirm this. It is, perhaps, more likely that el-Khiam point simply continued to be made in small quantities. Conversely, we note the presence of a PPNA site, WF-16 (Mithen *et al.* 2000) less than half a km to the west of Ghuwayr I, and it is possible that the points were curated from that site.

Of particular interest was the discovery of a cache of finely worked and large points that initially were classified as "Ghuwayr Points" (Fig. 6). These were located in a small (ca. 1 x 1m) cell unit attached to Room 1 in Area I. We have now decided against this terminology, however, wishing to avoid the proliferation of new types based on site names. What this cache appears to represent is a grouping of large, unused points that share the basic morphology of Byblos and Jericho points. Whether these had ceremonial significance or simply were nearly complete "blanks" awaiting further reduction into final point forms is presently unclear. The artifacts, however, are quite thin and

fragile, perhaps arguing against utilitarian function.

The context of this cache, as with the others found at Ghuwayr I, is interesting. All these materials were lying flat on the plastered floor of rooms. They may have originally been in some sort of container hanging on the wall that ultimately fell to the floor. The point cache differs from the other caches found at Ghuwayr I in that it is composed primarily of points, while the latter are primarily unworked but fine blades.

Ground Stone

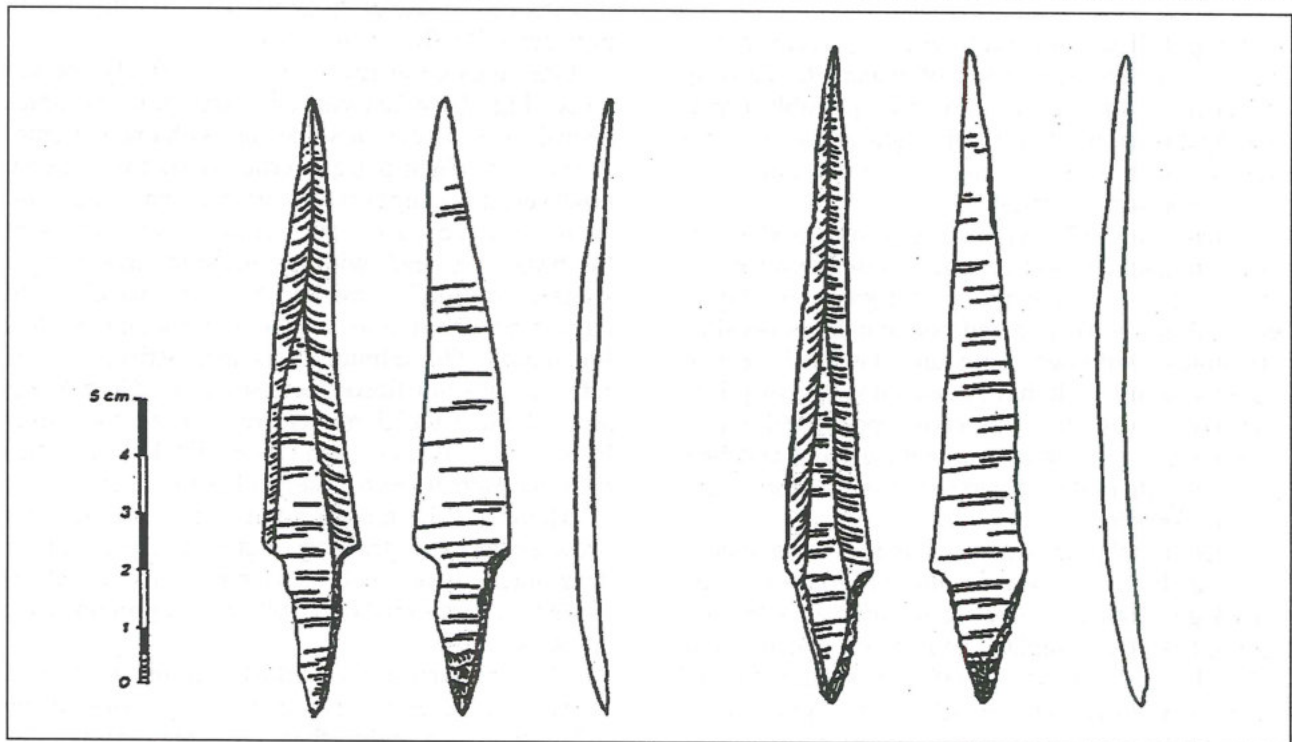
The ground stone assemblage from Ghuwayr I is quite large and diverse. A detailed study of this material by Ms. C. Woodman is nearly completed. It includes numerous milling implements as well as items that were probably not typically used as part of a milling activity. "Washes" were taken from several of these artifacts yielding intriguing economic data (see below). The following preliminary comments are based on the 1997, 1998, and 1999 seasons, during which 2,489 ground stone artifacts from all six areas of the site were analyzed (Table 5; this tally does not include a few artifacts that had been removed from the assemblage for illustration or other purposes) (Woodman n.d.). Of these, 1,007 are milling implements (40.5% of the total assemblage). Included in this tally are items such as pebble mor-

tars and palettes whose size would preclude them from use in a conventional, subsistence-related milling activity.

Handstones dominate the milling implements in terms of quantity, comprising 20.9% of the total ground stone assemblage ($n=521$). Many ($n=240$) of these, however, are expedient tools. Querns or slabs comprise 6.7% of the total assemblage. Mortars and pestles are also represented: 8.7% of the assemblage consists of mortars; however, half of these (109) are pebble mortars. It is unlikely that these were used in household food processing activities due to their small size. Pestles comprise 3.8% of the assemblage; eight of these are small enough to have been used with the pebble mortars.

Items that are not classified as milling implements, excluding 321 unidentifiable artifacts, comprise 47.0% of the assemblage ($n=1,161$). The diversity of their types suggests the occurrence of an equally diverse array of activities at Ghuwayr I. Some of these items cannot be classified with Wright's (1992) comprehensive typology.

Vessels are numerous, comprising 25.6% of the assemblage. Most of the identifiable vessels are globular bowls ($n=289$). Pounders are well-represented; 153 were recovered, comprising 6.1% of the assemblage. Polishing pebbles are relatively numerous (3.4%). Six shaft straighteners were recovered as well as nine slab abraders and eight palettes. One mace head, classified as such by virtue



6. Two of the points from the Area IV cache. Originally referred to as "Ghuwayr Points" now classified as Byblos variants.

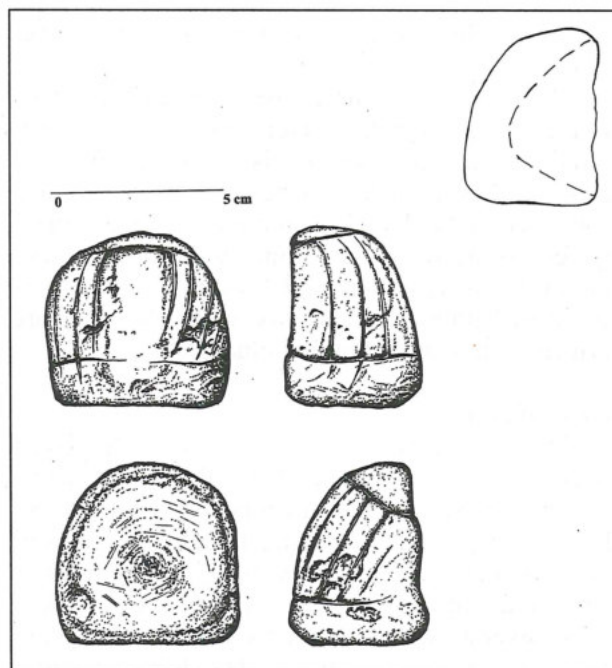
Table 5. Summary of Ground Stone Artifacts from Ghuwayr I.

General Type	Number	Percent
querns/slabs	166	6.7
handstones	521	20.9
mortars	217	8.7
pestles	95	3.9
vessels	636	25.6
pounders	153	6.1
Other Miscellaneous-		
polishing pebbles	84	3.4
shaft straighteners	6	0.2
palettes	8	0.3
mace head	1	--
axes/celts/mauls	13	0.5
gaming boards	3	0.1
weights	17	0.7
various others	248	10.0
unknown/unclassifiable	321	12.9
Total	2,489	100.0

of being drilled from end to end, was recovered as well as another item made of malachite showing evidence of drilling on both ends, possibly representing a mace head preform. Eight ground spheres were recovered as well as two ground half discs and two perforated discs.

There were 17 weights recovered. Sixteen of these are counterpoise weights, while the other is a loom weight. Counterpoise weights are asymmetrical and have one end perforated, as possible handholds. Although these are classified here as weights, some could have been some sort of grinding tool, given that the ends opposite the perforation are sometimes smoothly ground and polished. An alternate interpretation is that they were animal "hobblers".

Four complete ground axes and six ground celts were analyzed as part of the ground stone assemblage (others were categorized with the chipped stone assemblage and are not added to this tally). Three mauls are identified as such, but could not be classified using Wright's typology, since it lacks such a category. They exhibit battering on both ends and are "waisted" around the center.



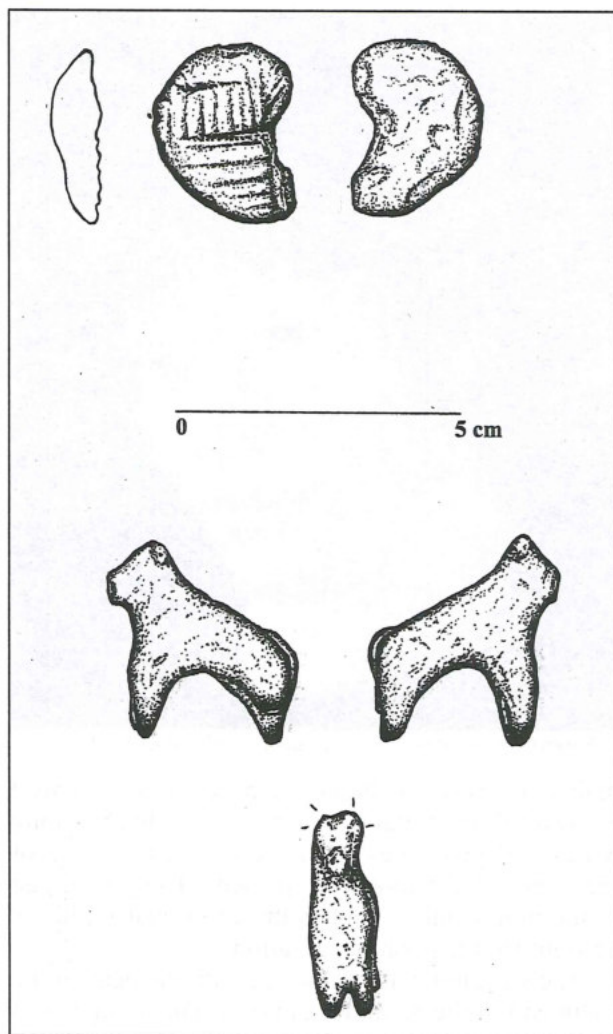
7. Incised stone-possible "mask."

Among items not covered by Wright's typology are three artifacts referred to here as gaming boards, due to their similarity to items referred to as such recovered from Baydā and 'Ayn Ghazāl. A boulder with cupholes was also recovered, but the cupholes are not regularly aligned. A slab with a single cuphole was also recovered. Other rare or unusual artifacts include two probable phallic representations, possible "tokens", and "palettes" with pigment still adhering to them.

One unusual artifact is a small, finely incised piece (Fig. 7). When viewed laterally, it resembles a small bowl or cup of some sort with one extremely flat end. When placed vertically on the flat end, however, it is suggestive of the back part of a composite figurine bust. The artifact could represent the back of a head, with the incisions indicating a stylized "hairdo"; a molded face or "mask" could have been fitted into the hollow formed by this foundation. This admittedly is speculative, but it is a tantalizing functional reconstruction. On a larger scale, human facial masks are known from other PPNB sites, such as 'Ayn Ghazāl (Rollefson 1998) or Nahal Hemar (Bar-Yosef and Allon 1988).

Many (6.1%) items are not formal artifacts but show evidence of grinding, a groove, a perforation, or a notch. Items that could not be identified included 321 artifacts, or 12.9% of the ground stone artifacts.

Though many of the artifacts exhibited traces of ochre and several were completely covered by ochre, there are eight other items that are not visibly ground but were classified as ochred cobbles/



8. Token (top) and figurine (bottom).

pebbles based on the presence of ochre. A ground piece of ochre was also recovered.

Ground stone reduction debris is highly infrequent. Evidence of early stages of ground stone tool production include 13 pecked preforms, five flake cores, and one flake. The paucity of reduction materials may be due to sampling bias, since ground stone "debitage" often is difficult to distinguish from colluvium.

Figurines

While several stone figurines, or figurine fragments, have been recovered from Ghuwayr I, they are not as abundant as at other PPNB sites. In the earlier (1993) excavation, two anthropomorphic stone figurines and five clay zoomorphic figurine fragments were recovered. In 1996 an additional animal (jackal or mountain goat without horns, or with broken horn?) figurine was retrieved (Fig. 8). During the last season (1999/2000), two female forms also were recovered. These are interesting in

that both are without their heads.

Various Small Finds

A wide variety of finds typical to PPNB settlements has been recovered from Ghuwayr I. These finely produced mother-of-pearl pendants (one perforated at both ends and in the center) and probable earrings, stone and marine shell beads, other miscellaneous jewelry fragments, probable spindle whorls, and scant quantities of carnelian ornaments. Of particular interest was a clay "token" or "stamp seal" with a primitive linear pattern (Fig. 8).

A relatively large amount of marine shell was recovered, much of it worked. This material is under study by D. Bar-Yosef, and preliminary results indicate both Red Sea and Mediterranean Sea sources.

Also of interest is the limited amount of copper or "malachite" material recovered from the site. Ghuwayr I lies barely 2km to the southeast of the Faynan copper mines exploited during the Bronze Age and later. The proximity of the village to these copper sources allowed its occupants to experiment with this metal in a number of ways. Several malachite fragments were recovered, as were a few beads, pendants, and, of particular interest, a large "macehead" that was partially perforated. Significantly, limited amounts of pottery have been recovered, suggesting either a later Pottery Neolithic component or early experimentation with ceramic technology. The recovered materials are very thick, crude, and friable. A Pottery Neolithic occupation seems unlikely, given no other evidence for this and the fact that the potsherds recovered from Ghuwayr I do not fit within established Pottery Neolithic typologies. It is interesting to note, however, the presence of a Pottery Neolithic site (Tall *Wādī Faynān*) some 5km to the west of Ghuwayr (Najjar 1992, Najjar *et al.* 1990; Simmons and Najjar 2002). The presence of pottery at Ghuwayr I, as well as at other supposed "pre-pottery" sites in the Levant, leads one to question the appropriateness of the term "Pre-Pottery Neolithic".

Human Remains

One of the most curious aspects of Ghuwayr I is the relative lack of burials. Most PPNB sites, whether large communities or small villages, contain human burials. These often are found in what is a wide-spread PPNB mortuary practice: the deceased is buried in a flexed position beneath the plastered floor of a house and is decapitated, with the mandible representing the only part of the skull. At Ghuwayr I, however, we have no such internments.

A total of 10 individuals (or portions thereof) have been recovered. One is clearly intrusive. It is a Roman interment, completed with Roman ceramics, that was excavated into a room in Area IV. This burial was exposed during the 1993 season at the site. The other remains have come from the renewed investigations, and, with one exception, consist of poorly defined interments.

Some of the human remains recovered do not, in fact, represent proper "burials". One such individual was from Area I, in upper fill above Room 1. This consisted primarily of portions of a badly preserved cranium and a few long bone fragments. It appears to have been of an "elderly" female. Of note was the presence of a projectile point imbedded within the jaw. Whether or not this was intentional or simply a fortuitous situation cannot be determined, as these remains were badly disturbed and in poor primary context.

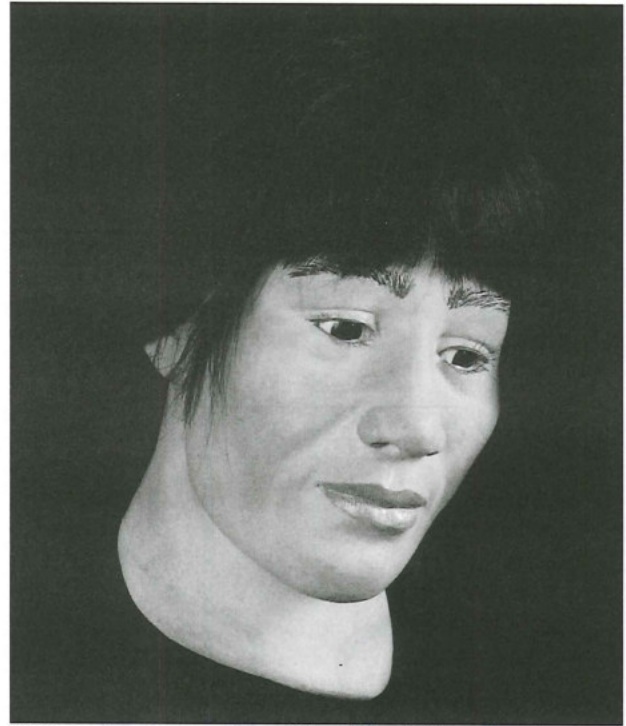
In Area II, another partial burial was recovered, but this was even in worse shape than that in Area I, consisting primarily of portions of a skull. Again, this was badly disturbed and its context is unclear.

During the 1999/2000 season, three burials in better context were recovered. These, however, are not "typical" PPNB interments (that is, subfloor and decapitated). They were all adults buried in crude, cobble-lined graves within the rubble of rooms. They occurred in both Areas I and IV. The bodies were all flexed but with no fixed orientation. While they contain their crania, the subcranial materials are poorly preserved.

Two of these burials consisted of single individuals (both in Area IV). The burial in Area I, however, was multiple, containing portions of four individuals, including one adolescent. While these may represent secondary burials, small bones, such as phalanges, were present, indicating great care in movement. The skull of one of these individuals, a female approximately 25 years old, has been forensically reconstructed, giving us a rare glimpse of an occupant of the village (Fig. 9).

Certainly the most significant burial at Ghuwayr I is associated with the particularly rich room in Area IV that was previously described. This is to date the only "typical" PPNB burial at the site, in that it is located in a pit beneath a plastered floor. It is, however, far from common, in that the occupant of the grave is an infant. This individual is presently being studied by J. Thompson, and the following preliminary description has been provided by her.

Beneath the southwest corner of plastered floor of this room a partial skeleton of an infant. The re-



9. Forensic reconstruction of female burial from Area I.

mains consisted of the skull and dentition, as well as several post-cranial elements, including long bones and phalanges from the left hand. None of the bones of the foot were present. The young age of the individual as well as the damp matrix, likely account for the poor preservation.

The skeleton was positioned with the head at the south end of the pit and legs north. The torso was in the prone position but the pelvis was shifted onto the left innominate to allow the legs to be arranged in a flexed position. Thus the left leg was positioned inferior to the right in slightly damper soil and this might account for the lack of preservation of the distal bones. Surprisingly, the skull was positioned with the head facing directly downward. Several developing teeth were found immediately below the occipital. Several vertebral bodies were found immediately below the foramen magnum next to the mandibular fragment. Little of the face remained and it likely was destroyed due to compressive forces. Based on dental development (following Brothwell [1981]) the infant was approximately 9 months of age at death.

This is a curious burial for many reasons. Infant burials, while relatively rare, certainly do occur in the Levantine Neolithic, especially the PPNB (e.g., see Kuijt 2000a: 145; Goring-Morris 2000 for general discussion). Some are "proper" subfloor interments, such as at Yiftahel (Hershkovitz *et al.* 1986); and some have been interpreted as possible "foundation deposits" or dedicatory offerings (e.g.,

Jericho, Kuijt 1996 ; 'Ayn Ghazāl, Rollefson *et al.* 1992; Rollefson 2000) or in some other ritual contexts (Kuijt 2000a: 147).

What makes the Ghuwayr I infant stand out so much is the apparent association of burial offerings. A mother of pearl necklace or earring was directly associated with the cranium, but other items were not directly in the grave, but rather on the plastered floor above the grave (see previous discussion on "Architectural Features"). Grave goods are relatively rare in the PPNB (cf. Kuijt 2000a), although there are exceptions, such as Wādī Shu'ayb (Roler Durand in Simmons *et al.* 2001: 26-4). The fact that so much material was on the floor above the burial certainly suggests that the Ghuwayr infant was very special. This is the only room thus far excavated that contains such an elaborate suite of material directly on the floor. Thus, it is unlikely that it is simply a coincidence that the only "proper" burial occurs in this room; it seems far more apparent that these materials were placed above the burial as a form of offering. The position of the infant's skull also is curious, and suggests that the neck was broken. Whether this was post-mortem, or was the cause of death, has not been determined. It is, however, tempting to interpret this burial as either a child sacrifice or the unexpected death of a very important individual, or, more likely, an individual belonging to an important family. In either scenario, the implications of this for social stratification at Ghuwayr I are significant.

Paleoeconomic Remains and Environmental Inferences

Faunal and botanical analyses were directed towards both reconstructing the economy of Ghuwayr I's residents and, along with geomorphological information, providing paleoenvironmental data. Both faunal and botanical materials were recovered from Ghuwayr I, although the latter were not abundantly preserved, despite a thorough program of flotation. These analyses are currently on-going, thus the following observations are preliminary rather than definitive statements. Much of the information presented below is summarized from Powell *et al.* (2003). Botanical information was derived from both macrobotanical analyses from flotation, conducted by R. Neef, and by pollen, phytolith, and starch (obtained primarily from residue washes on ground stone) conducted by L. Scott Cummings.

The results from charcoal analyses (Neef 2003) do not show the degraded vegetation seen today. Most of the charcoal belongs to Phoenician Ju-

niper and Pistachio. In addition, the wood used for building also appears to belong to these two species. Willow (*Salix* sp.) is abundant in the charcoal, an indication for the fresh water and perennial stream of Wādī al-Ghuwayr (Danin 1983: 121). This possibly suggests that the environment during occupation may have been somewhat more humid with less temperature extremes than today.

Recovered cultivated plants include an abundance of barley, emmer wheat, einkorn wheat, and pea. Seeds and fruits from shrubs and trees include abundant fig and pistachio. Caper and date palm occur in less abundance. The date palm stone is amongst the earliest ever found in the Near East, but based on only one sample its significance is difficult to assess. Wild herbs include rye-grass, indeterminate leguminous species, fenuogreek, and Wall scorpion tail, as well as smaller amounts of other varied materials (Neef 2003).

Pollen suggests that the aster family was moderately abundant in the local vegetation. The recovery of moderately large quantities of *Cheno-am* pollen may indicate the use of this resource as greens and/or seeds in the diet. *Cheno-ams* produce small seeds relatively high in protein and lower in carbohydrates than many other seeds. Plantain also is present in most samples, and appears to reflect local vegetation. The presence of a variety of starches indicates the grinding of starchy foods, which appear to have included both seeds and roots or tubers. Fairly sparse tree pollen is present, including pine, pistachio, Cypress, and olive. These are probably reflected in the Mediterranean forest on the plateau above the site. The presence of olive pollen is somewhat curious, and could suggest that this species was cultivated nearby, although this is a tenuous conclusion. In short, the pollen record points to the availability of numerous native and/or weedy plants that might have been exploited by Ghuwayr's residents as dietary or medicinal resources. These include palms, umbels, members of the aster family, mustards, *Cheno-ams*, sedges, legumes, mints, chicory tribe, members of the lily family, plantain, grasses, dock, amongst others (Scott Cummings 2002a, b).

Two caprine teeth also were examined, and they did not contain sufficient pollen or phytoliths to obtain a count. However, 25 starches were recovered that fall into two basic categories. One is a "gumdrop" category, probably representing a root. The other, which encompasses most of the recovered starches, is a generic grass type. A lenticular starch consistent with barley also was recovered. These data suggest that the caprine diet included at least barley, other grass seeds, roots and/or tubers (Scott

Cummings 2002a).

These data suggest that the vegetation surrounding Ghuwayr I appears to have been mixed between Steppeland and Plateau species. The flora is consistently richer during the PPNB occupation of Ghuwayr than present conditions. It should be noted, however, that the count for Cheno-am points to a possible desiccated condition. These results suggest that Ghuwayr I was located in an ecotonal situation in which several different environments were exploited along the wadis and on the slopes (Powell *et al.* 2003).

The faunal assemblage is quite large and of variable preservation. The following comments are based on preliminary results of on-going detailed analysis by P. Croft and D. Powell (Powell *et al.* 2003). Nearly 3000 bones have been identified (Table 6), with 76.1% belonging to sheep and goat. An additional 8.0% are gazelle, and 4.7% are cattle. Birds comprise 4.5%. We realize that NISP figures can be quite biased, but these figures provide an indication of the composition of the faunal assemblage.

These figures suggest that domesticated caprines were the primary source of meat for the occupants of Ghuwayr I. Based on the epiphyseal fusion, many of these animals were slaughtered when they were between 2 to 3 1/2 years old, before they reached full maturity. Bones from all portions of the body were found in roughly equal proportions, suggesting that these animals were slaughtered in or close to the settlement. No clear intentional fragmentation was observed, burning was limited, and only a few bones had direct signs of butchery. This may suggest that the residents of the community were not concerned with extracting every possible nutrient from the animals, a pattern similar to that noted by Twiss (2003) in the nearby PPNB Wadi Faynan I assemblage.

Taken together, the botanical and faunal data have provided us with valuable information on both the diet and the environment of Ghuwayr's residents. These data point to an environment somewhat richer than the impoverished one that exists in the region today.

Chronology

We presently have 22 radiocarbon determinations from Ghuwayr I (Table 7). Overall, these indicate a mid to late seventh millennium BC (uncalibrated) occupation of the site, suggesting a somewhat early Middle PPNB placement (cf. Rollefson 2000: 166). Of course, an older occupation into the eighth and even ninth millennium BC is indicated when the determinations are calibrated.

Table 6. Preliminary Identifications of Ghuwayr I Fauna.

Taxa	NISP	Percent
Amphibians	8	0.3
Birds	133	4.5
Cattle	137	4.7
Canid (Jackal?)	4	0.1
Caprines (sheep/goat)	2228	76.1
Equids	40	1.4
Fox	67	2.3
Gazelle	233	8.0
Hare	1	-
hedgehog	6	0.2
Hyaena	1	-
Pig	21	0.7
Reptiles	12	0.4
Rodents	11	0.4
Small mammals	27	0.9
Total	2929	100.0

Most of the determinations fall within "Phase II" by virtue of their location within Phase II structures; several of these, however, could represent somewhat later (i.e., Phase III) fill.

By area, the radiocarbon range is as follows: Area I-8,880-8,390 BP; Area II-8,710-8,570 BP, Area III-8,755 BP, Area IV-8,620-8,510 BP, and Area VI-8,570 BP. These ranges show considerable overlap and perhaps suggest that Area I witnessed the longest occupation. This, however, must be viewed cautiously, since Area I also has the largest number of radiocarbon determinations.

The range for the entire site is 9710-8510 BP. In examining this range, an occupation of some 1,300 years is suggested. We feel, however, that the primary period of occupation was much shorter. There are only two dates in the 9,000 BP range, both from Area II. One, 9,027 BP, is stratigraphically inconsistent with other dates from the same phase, which range from 8,570-8,754 BP. More intriguing is the site's oldest date, 9,710 BP. This is in a stratigraphically correct position, being at the deepest portion of the excavations. On the other hand, a date of 8,690 BP is from virtually the same stratigraphic location (although taken from a floatation sample). Thus, it may be that the two older dates may not accurately reflect the site's occupation. If,

Table 7. Radiocarbon Determinations for *Ghuwayr I*.

Conventional	Calibration	Laboratory	Provenience
R/C Age*	(2 sigmas)		
8390 + 50	7560-7335 B.C.	Beta 140757	Area I, bin, upper Lv. 6
8620 + 50	7740-7570 B.C.	Beta 140758	Area I, bin, base Lv. 6
8610 + 50	7730-7570 B.C.	Beta 140759	Area I, bin, base Lv. 6
8754 + 52	7929-7592 B.C.	DRI 3256	Area II, 15S05W, Lv. 3
8755 + 311	8484-7033 B.C.	DRI 3255	Area III, 00N40E, Lv. 4
9027 + 116	8345-8297 B.C.	DRI 3253	Area II, 15S05W, Lv. 3
	8273-7881 B.C.		
	7810-7711 B.C.		
8806 + 52	8007-7693 B.C.	DRI 3251	Area I, 00S35W (Room 1-Lv 5)
	7661-7636 B.C.		
8880 + 117	8083-7592 B.C.	DRI 3252	Area I, 00S35W (Room 1-Lv 5)
8659 + 178	8035-7411 B.C.	DRI 3254	Area I, 00S35W (Room 3-Lev 6).
	7399-7377 B.C.		
	7368-7309 B.C.		
8812 + 61	8015-7660 B.C.	Hd 17219-17541	Area I, 10S40W "early phase"
	7670-7620 B.C.		
8627 + 46	7865-7815 B.C.	Hd 17220-17550	Area I, 05S35W "late phase"
	7705-7530 B.C.		
8528 + 89	7840-7825 B.C.	Hd 17221-17359	Area IV, 30N10E
	7700-7420 B.C.		
8590 + 70	7750-7540 B.C.	ISGS 4325	Area II, 15S05W, Lv. 4
8870 + 70	8250-7750 B.C.	ISGS 4330	Area I, 00S35W, Room 1, west wall, Niche 4
8510 + 70	7610-7480 B.C.	ISGS 4331	Area IV, 30N10E, Lv. 2
8570 + 70	7730-7530 B.C.	ISGS 4332	Area II, 15S05W, Lv. 2
8620 + 70	7780-7550 B.C.	ISGS 4333	Area IV, 25N10E, Lv. 5, Feature 17
8530 + 100	7750-7450 B.C.	ISGS 4365	Area IV, 25N10E, Lv.5
	7390-7370 B.C.		
8690 + 70	7960-7580 B.C.	ISGS 4364	Area II, 15S05W, Lv. 16
8570 + 100	7800-7480 B.C.	ISGS 4365	Area VI, 15N30E, Lv. 4
9710 + 150	9580-9570 B.C.	ISGS 4366	Area II, 15S05W, Lv. 16
	9390-8690 B.C.		
1590 + 70	330-620 A.D.	ISGS 4324	geological test pit, first terrace
*conventional radiocarbon age, 13C/12C corrected			

for argument's sake, these are deleted, the range of occupation is from 8,880 to 8,390 BP, suggesting a much shorter occupational span of some 500 years. Finally, we noted earlier the presence of el-Khiam projectile points, plus the abundance of bladelets, possibly suggesting an earlier, PPNA, occupation of the site. This is not, however, confirmed by the radiocarbon determinations. On the other hand, playing Devil's Advocate, if the two early determinations discussed above are in fact accurate, we could be nearly within the range of the PPNA. This issue must, at present, remain unresolved.

Conclusions

The results of the renewed investigations at *Ghuwayr I* were beyond our expectations. Even though it is a small site, *Ghuwayr I* was an exceedingly complex village located on the edge of the Levantine Corridor. We conclude with several observations relating to our original research design.

One of the first points to make is that perhaps the peripheral nature of the environment surrounding *Ghuwayr I* was, in fact, more apparent than real. While considerable more paleo-environmental data are required, it is apparent that

Wādī Faynān system was capable of supporting substantial human occupation for millennia, starting with the Neolithic. Thus, while this is an extremely harsh, marginal environment today, we should not *a priori* assume that it was so in the past. Unresolved, at this point, is whether or not the Neolithic or later occupants of the region contributed to the present degradation.

Another important point relates to exactly where Ghuwayr I falls within the wider Neolithic world of the Levant. The settlement appears to have been founded somewhat earlier than most of the documented "mega-sites" and was abandoned as many of those sites entered their fluorescence. This is a critical observation, since for a "core/periphery" model to work both large and small sites must be contemporary. We believe that there was a degree of overlap in occupation between sites such as Ghuwayr I and "mega-sites", but radiocarbon evidence indicates that the smaller community was founded earlier. This, of course, leaves open the question of whether or not the residents of these small communities were founding populations for the "mega-sites" (cf. Simmons 2000; 2001). At present, this is an unresolved issue.

What is clear is that, like the majority of Neolithic communities documented in Jordan, both large and small, Ghuwayr I was abandoned after the Neolithic. However, unlike "mega-sites" such as 'Ayn Ghazāl and Wādī Sh'ayb, for example, Ghuwayr I was abandoned after the PPNB; it contains no transitional PPNC phase or subsequent Pottery Neolithic occupation. What were the reasons for the abandonment of Ghuwayr I? Can these be tied to models suggestive of ecological degradation posed for some of the "mega-sites" (e.g., Kohler-Rollefson 1988; Kohler-Rollefson and Rollefson 1990; Rollefson 1996; Simmons 1997)? There is some tantalizing evidence supporting such a conclusion in the form of the large non-habitational walls that apparently surrounded part of Ghuwayr I. Could these have been erosional retarding features to protect the site from avalanches of colluvial, perhaps accelerated by soil erosion brought on by both increased, torrential precipitation and human-induced vegetative destruction (e.g., Davis *et al.* 1990; Simmons 1997)? Again, this requires more research, but it seems possible that Ghuwayr I's size contracted through time, as evidenced by these parallel walls. Perhaps the contraction reached a point when continued occupation of the site was no longer viable.

Our understanding of the Levantine Neolithic has expanded dramatically over the past several years. While the documentation of major centers,

or "mega-sites" has radically challenged our perceptions of the Neolithic, one might argue that smaller sites remained the "backbone" of Neolithic society. Current research on such communities, of which Ghuwayr I is a prime example, have complemented our knowledge of the range of Neolithic settlements.

Within a broader regional context, Ghuwayr I has contributed to an expanding corpus of data regarding Neolithic life in the southern Levant. One research question posed for the Ghuwayr I project was examining the site's role as a possible "peripheral" site within a wider Neolithic universe, and determining its relationship to the larger "core" settlements. We now have to perhaps re-evaluate this issue. Indeed, the significance of the core settlements remains unclear, with some scholars questioning the concept that the large sites were regional centers (e.g., Hole 2000), noting that considerable complexity occurs at smaller settlements as well.

Certainly our investigations at Ghuwayr I support the conclusion of immense complexity, and perhaps even elite status, at compact communities. The elaborate architecture indicates building sophistication, and several structures appear to have served other than residential functions. While we make no claim for Neolithic "temples," as has been suggested at 'Ayn Ghazāl, for example (Rollefson 2000), it is clear that architectural diversity was common at Ghuwayr I. The presence of a possible outdoor "theater" or village stairway suggests the presence of communal activities beyond the household level. Certainly there are hints of this as early as the PPNA: the tower of Jericho is perhaps the most famous, but even smaller PPNA sites, such as Jurf al-Aḥmar (Stodeur 2000) contain evidence of communal structures. By the PPNB, special-use structures are common, especially in Anatolia (e.g., Hole 2000; Rosenberg and Redding 2000; Voigt 2000). Thus it comes as no surprise that Ghuwayr I should exhibit architectural diversity. On the other hand, this very diversity of style at Ghuwayr I is all the more striking when one considers the often monotonous "cookie-cutter" architecture at many of the "mega-sites".

Another curiosity at Ghuwayr I is the relative lack of burials, especially so-called "typical" sub-floor internments. To date, the only such burial is of an infant, who was interred in a room with a substantial amount of apparent offerings. Such an elaborate treatment of an infant is rare in the PPNB, and again supports Ghuwayr I's complexity, and argues against it being a mere outlier.

Of course, Ghuwayr I is not unique in these fea-

tures. For example, recent investigations at the small community of Ba'ja, near Petra, also indicate an amazing complexity at that site, including stairways and a possible "charnel house" burial structure (Gebel and Bienert 1997; Gebel and Hermanson 1999; 2000).

It appears that Neolithic developments in the southern Levant exhibit a huge range of settlement diversity. Much of this may be regionally based, where, for example, a model of "mega-site" population aggradation and dispersal may be relevant for Central Jordan, (e.g., Simmons 2000), whereas we may be looking at an entirely different pattern in southern Jordan, where one might argue that ecological conditions were more confining. This does not, of course, negate the role that communities such as Ghuwayr I may have played within the wider Neolithic world. We remain convinced that these small communities did interact with the larger "mega-sites" (if, in fact, they were contemporary). However, the nature of this interaction is probably more complex than originally thought. Certainly Ghuwayr I was no "frontier outpost". The complexity of the site suggests that it was every bit as sophisticated as its larger neighbors. Given the sophistication of the settlement, Ghuwayr I it may well have functioned as its own regional center within southern Jordan, interacting with both other small sites as well as the "mega-sites". Only future research will clarify this. What is clear is that our understanding of not only settlement diversity, but also social organization, identity, and ritual behavior (e.g., Kuijt 2000b) during this tumultuous period is far more complex than originally thought.

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