

AL-GHUWAYR I, A PRE-POTTERY NEOLITHIC VILLAGE IN WADI FAYNĀN, SOUTHERN JORDAN: A PRELIMINARY REPORT OF THE 1996 AND 1997/98 SEASONS

by

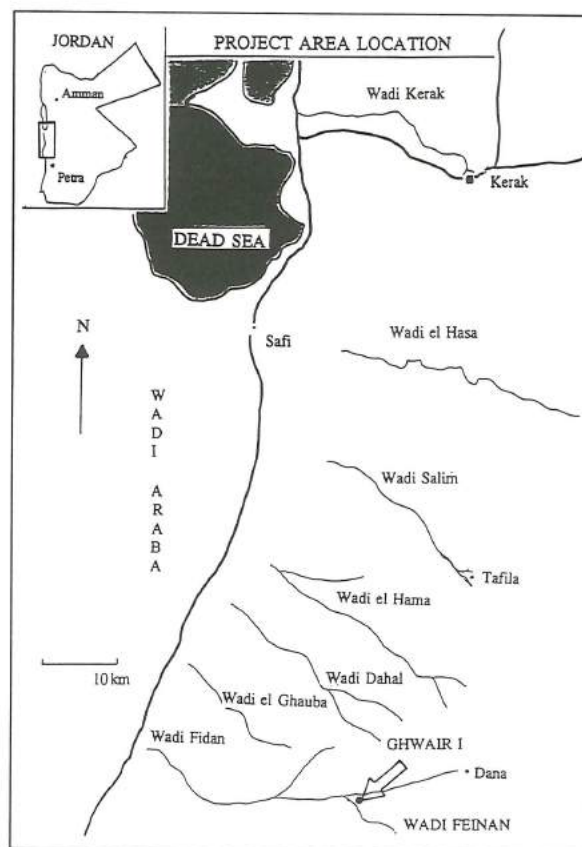
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Introduction

The Wādī Faydān, which drains to the larger Wādī Faydān, has only recently come under systematic archaeological investigation (e.g., Barnes *et al.* 1995; Levy and Adams 1997), despite early hints of its richness (e.g., Raikes 1980). The most intensive studies thus far have been conducted by the Archaeometallurgical Investigation Project, which demonstrated that the Wādī Faydān/Faydān region was a major copper source that figured prominently in trade networks from perhaps as early as the Chalcolithic onward (Hauptman 1990). While this study focused on metallurgy of later period sites, it also revealed the incredible wealth of well-preserved archaeological materials in the region, with occupation from at least the Epipaleolithic (Finlayson and Mithen 1996) through the Islamic period. This included the recording of al-Ghuwayr I (Fig. 1), a Pre-Pottery Neolithic B (PPNB) settlement, the subject of this report.

In the Wādī Faydān and the adjacent Wādī Faydān, both Pre-Pottery and Pottery Neolithic villages are known (Adams 1991; Najjar 1992, 1994; Raikes 1980). These, including al-Ghuwayr I, appear to be relatively small settlements, although the Pottery Neolithic site, Tall Wādī Faydān, is believed to be quite large (Najjar *et al.* 1990; Najjar 1992).

Al-Ghuwayr I is an exceptionally well-preserved Pre-Pottery Neolithic B village that was first test excavated in 1993 (Najjar 1994). In 1996, a limited season was conducted to assess the site's potential for additional investigation; this was a joint project between the University of Nevada at Las Vegas and the Department of Antiquities



1. Map of southern Jordan, showing the location of al-Ghuwayr I.

(Simmons and Najjar 1996). The results of that brief season were positive, leading to the first field phase of more detailed studies. This was completed in December 1997 and January 1998.

Summary of 1993 Excavations at Al-Ghuwayr I

Al-Ghuwayr I is located on a hillslope at an elevation of 290-320 m asl with a commanding view of Wādī al-Ghuwayr/Faydān (Fig. 2). A limited study in 1993 (Najjar 1994) excavated at what we now call Areas I and IV, and cleaned an exposed section in Area III. Rich findings indicating a PPNB



2. Overview of al-Ghuwayr I, facing south. Photograph shows excavated areas.

affiliation demonstrated the site's potential for more intensive investigation.

The site is small, covering an estimated 1.5 acres. In 1993, at least four architectural phases were present in over 3 m of deposit. The well-preserved architecture, especially in Area I, where a wadi has cut through the western portion of the site, is certainly the most spectacular aspect of the site, with walls containing windows and doorways preserved to over 2 m high. Structures are generally typical of the PPNB, although many are irregular. Rooms, often sub-divided and grouped around a courtyard, have red plastered floors enclosed by rectangular, oblong, or rounded stone walls. Reuse has obscured precise architectural techniques. Most of the exposed rooms are small, and some may represent storage "basements." A few larger rooms (ca. 4 x 4.5 m) in Area IV were later converted into smaller units; at least one of these had a flagstone pavement instead of a plastered floor. Due to this later construction, no complete rooms were uncovered.

Some of the exposed walls give the impression of tower structures. One small circular structure in Area I contains a niche with a flat, polished granite slab, possibly an altar. A stone figurine was found on the floor not far from the niche and may indicate that this structure was a special pur-

pose room (Najjar 1994:79). No burials were encountered, but the plastered floors were not removed—burials commonly occur beneath the floors as well as outside of structures at PPNB sites.

The abundant artifacts that were recovered included a large chipped stone assemblage that is typical of the PPNB. Ground stone also was abundant, and small finds included spindle whorls, beads made of bone, stone, anthropomorphic and zoomorphic figurines, and marine shells. Significantly, five potsherds were recovered, suggesting either a later Pottery Neolithic component or early experimentation of ceramic manufacture.

Summary of the 1996 Test Season

During the fall of 1996, a brief (ca. one month) project was undertaken (Simmons and Najjar 1996). The goal was to complement data retrieved in 1993 and to better formulate precise research questions in anticipation of a larger-scale project. In particular, we wished to determine the settlement's boundaries, investigate a large ash pit on the eastern boundary, and determine if large structures were present in addition to the numerous small rooms exposed in 1993. To achieve these goals, we excavated at three separate areas of the site. One area was particularly promising in that a partial-

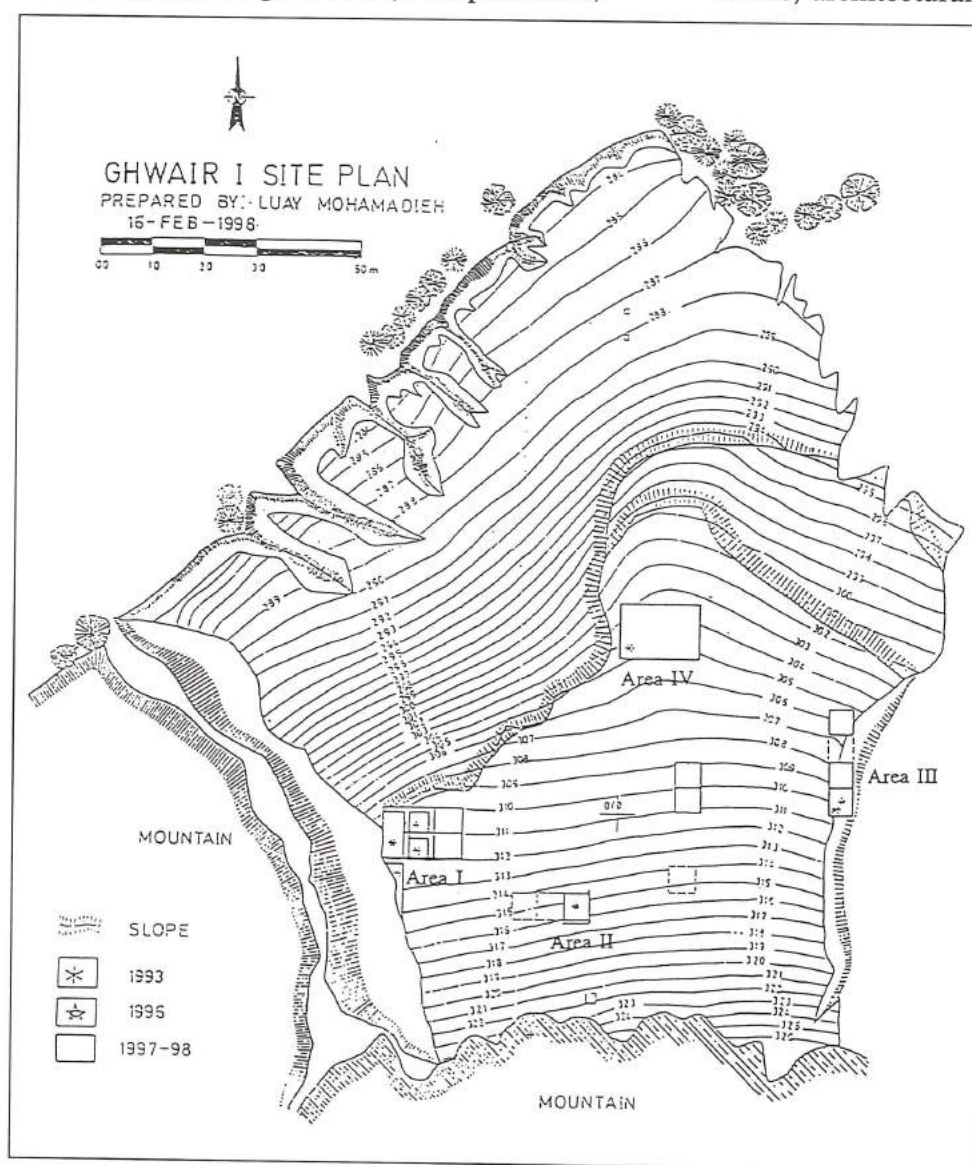
ly excavated room, containing several niches, hinted at a ritual or ceremonial function. In addition, we made a detailed contour map using a total distance station supplied by the Department of Antiquities; this was completed during the 1997/98 season (Fig. 3).

These investigations set the stage for more intensive excavations conducted in 1997/98. This report summarizes the preliminary results of both the 1996 and the more extensive study.

Research Strategy

One of the project's major goals is to investigate Neolithic "core/periphery" relationships (cf. Algaze 1989). In particular,

we wished to examine whether al-Ghuwayr I, located in the periphery of the Neolithic world, functioned as a "frontier outpost" with minimal amenities, or if it was an elite, but small center. We wanted to compare small settlements such as al-Ghuwayr I with larger Neolithic core centers, such as 'Ayn Ghazāl, Wādī Shu'ayb, or Baṣṣa. Another project objective was to initiate paleo-environmental and paleoecological reconstruction, and determine if the occupants of al-Ghuwayr I contributed to environmental degradation. Finally, we wished to better determine the site parameters of al-Ghuwayr I, seeking to well define its boundaries, architectural layout and possible so-



3. Contour map of al-Ghuwayr I, showing excavated areas.

cial indicators, material culture, and chronology.

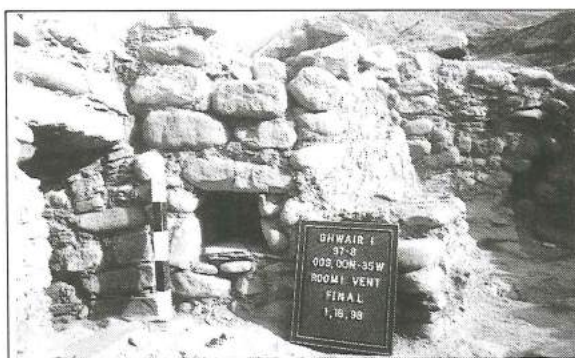
Areas Investigated

The 1997/98 excavations concentrated in four major areas of the site that had been previously defined; we also opened up new areas for future study. The preliminary results of our investigation are discussed below.

Area I

This is the principal area of the site, where architectural remains exceeding a depth of three metres have been previously defined. In 1996, a large room containing several niches was partially excavated, and a major goal of the 1997/98 season was to complete this room, designated as "Room 1". Room 1 was completely excavated down to the first clear plaster floor level. We now know that this is an unusually shaped structure, roughly square, but with a "jog" in the western wall (Fig. 4). Some re-modelling is suggested. The southern wall contains at least 3 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 (Fig. 5). 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. Finally, in the upper fill of the room were the remnants of a burial.



5. Room 1 in Area I. Close-up of one of the possible vent features.



4. Room 1 in Area I. Note niches (left and right), possible vent (left-centre), and entry (centre).

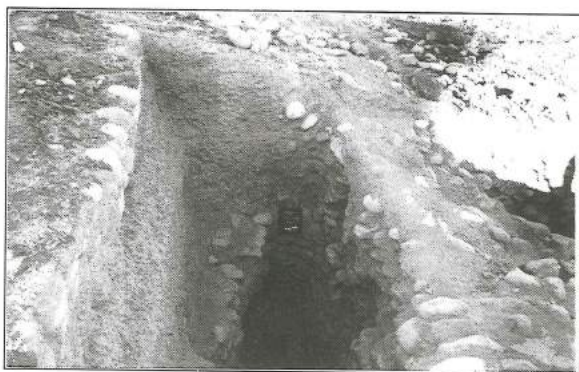
Unfortunately, this has been badly disturbed and is in poor context. Thus, we cannot tell if it is Neolithic or intrusive.

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 of the room. Additional study in the vicinity of Room 1 during the next season should clarify its function.

In addition to Room 1, two adjacent 5x5 m units were partially excavated. Architectural features were apparent only a short distance below the present ground surface. These will be additionally investigated in subsequent seasons.

Area II

In 1996, a 5x5 m unit revealed a complex series of walls, 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 considerable. 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 four metres below the present ground surface (Fig. 6). These results indicate a much more complex stratigraphy and building sequence in this area than expected.



6. 1997/98 excavations in Area II, showing depth of cultural deposits.

The large east-west wall exposed in 1996 was further followed to the west for ca 10 m. To the north of this wall is a series of additional walls or buttresses, but we did not expand upon these.

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. 2 m.

Area III

In 1996, this area, near the eastern end of the site, was tested, revealing a large ash deposit but no architecture. In addition, an al-Khiyām type projectile point, suggesting the Pre-Pottery Neolithic A period, was recovered, as were a large number of bladelets. Available radiocarbon determinations, however, indicate a contemporaneity with the rest of the site (see 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 more complex than anticipated. The ashy deposits continue, but a stratified series of at least three plastered floors, in very bad condition, was also exposed, as were fragments of walls. The function of these is as yet unclear.

There also appear to have been some erosion "gullies" 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. This channel cut through the previously mentioned plastered floors.

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 5x5 m unit was started here, better defining some of the walls visible on the surface. Here

another partial burial was recovered, but this was even in worse shape than that in Area I, consisting primarily of portions of a skull. This human material appears to not be *in situ*, and we cannot at this point determine if the individual was Neolithic or not.

Area IV

Area IV was initially excavated during the 1993 season and is located near the northern edge of the site. It consists of five 5x5 m units that have revealed a complex series of architectural remains, as well as one intrusive Roman burial. 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. As with other portions of the site, there appear to have been at least three building phases. What is striking here is that the earliest phase seems to have included a very large room, approximately 10 m on each side. This was subsequently reduced during the second phase into a much smaller room, and finally, during the third phase, was further divided into small units that may have been the lower storage units of a two story building.

New Areas

Several new areas of the site also were gridded out for subsequent investigation. This included a portion on the north-west slope of the site, where abundant architectural remains are visible on the surface. We also laid out two 5x5 m units between Areas II and IV (labeled Area V) and excavated these down through the first level of fill. Finally, on the northern low terrace of the site, where some Roman remains are visible, we excavated two 1x1 m units as geological test pits. These were over a metre deep and assisted the site geomorphologist in determining the deposition sequence of wadi deposits.

ARTIFACTUAL REMAINS

Chipped Stone

The original 1993 excavation at al-Ghuwayr I recovered a considerable chipped stone assemblage typical of the PPNB. Blades and blade-based tools, including projectile points (primarily Byblos-types), borers, and sickle blades, predominated in this collection, and points were abundant; naviform cores also were noted. Najjar (1994:80) felt that the closest parallels are to Bayda IV-V, but the assemblage also resembles materials from the Neolithic sites in nearby Wādī Faydān (Adams 1991; Raikes 1980).

During the 1996 and 1997/98 excavations, a huge quantity (exceeding 30,000 pieces) of chipped stone material was systematically recovered, as expected (Table 1). These are presently undergoing a tho-

Table 1. Chipped stone summary from 1996-1997/98 seasons at al-Ghuwayr I.

Class	Number	%	R%*
Tools	1,140	3.6	6.7
"Massive Tools"--blades	167	0.5	--
"Massive Tools"--flakes	30	0.1	--
Debitage--			
primary flakes	572	1.8	3.4
secondary flakes	2,088	6.6	12.3
tertiary flakes	3,580	11.	21.1
primary blades	123	0.4	0.7
secondary blades	1,133	3.6	6.7
tertiary blades	4,285	13.6	25.2
bladelets	2,421	7.7	14.2
core trimming elements	159	0.5	0.9
core tablets	45	0.1	0.3
Microflakes	1,157	3.7	6.8
Burin Spalls	99	0.3	0.6
Cores	198	0.1	1.2
Debris--chunks	6,406	20.3	--
Debris--chips	7,940	25.1	--
Hammerstones	38	0.1	--
Total	31,581	100.0	100.1

* Excludes debris (chips and chunks), hammerstones, and "massive tools--blades and flakes."

rough typological and technological analysis following parameters established by Gebel and Kozłowski (1994), and the following comments should be considered as initial impressions of this assemblage.

Based on our sample, it is likely that all stages of chipped stone reduction occurred on-site. This is suggested by both the high number of debris, or shatter, often indicative of initial reduction, as well as by the large number of tertiary elements and microflakes, usually indicating final reduction stages and tool manufacture and/or re-sharpening. What is apparent, and somewhat unusual, is that there is a large number of microlithic elements present at the site, not in the form of tools, but rather as bladelets. This could suggest an earlier (Pre-Pottery Neolithic A?) occupation, a proposition supported by the presence of an al-Khiyām PPNA-like point (see above), as well as an apparent PPNA (WF 16) site located nearby (Finlayson and Mithen, *in press*). However, bladelets occur frequently in all areas of the site, not just in Area III where the al-Khiyām point was recovered. Thus, the high number of bladelets may more likely be related to the specialized blade technology utilizing naviform cores, where Wilke and Quintero (1994:40) have demonstrated that bladelets are a by-product.

The assemblage is clearly blade-oriented, although flakes also occur in abundance. By and large, the blades are well-made, long, and thin. Metric analyses, however, have not yet been completed. The ratio of flakes to blades is 1.13:1, indicating a nearly 50% proportion of these types of debitage blanks. If, however, bladelets are added to blades in the formula, blades actually predominate, with a proportion of flakes to blades of 0.79:1.

Another aspect of the assemblage relates to the amount of cortex on debitage, as reflected in primary and secondary blades and blades (i.e., those containing some cortex)

as opposed to tertiary elements. This variable may well relate to reduction stage and/or reduction efficiency. When all debitage (excluding specialized forms such as core trimming elements, core tablets, and bladelets [most of which are tertiary]) is examined, 33.2% contains cortex, while 66.8% is tertiary. This figure may, however, mask some technological variation. When debitage is divided into blades and flakes (again excluding those elements noted previously), the percentage of blades with cortex is only 22.7%, while for flakes this figure is 42.6%. This suggests that tertiary blades were perhaps a desired end product. As analysis progresses, it will be interesting to see the preference of debitage blanks for tools.

Cores are not overly abundant at al-Ghuwayr I. Although the typology has not yet been completed, there are several naviform types. This may, as suggested above, account for the high number of bladelets. The ratio of all debitage to cores is a very high 72.76:1. If our sample is representative, it suggests a relatively high degree of blank production per core, and an implied technological efficiency. Given that so little of the site has been investigated, however, these figures may be misleading. A few very massive "cores" (not tallied in Table 1) also were recovered. The function of these is not known, although they could have served as raw material tests.

The tools have not yet been analyzed, but are consistent with materials previously recovered. The range of tools is typical for a PPNB assemblage, and includes projectile points, burins, scrapers, retouched pieces, and drills/perforators. A large number of both drills and projectile points was recovered. While many of the points are Byblos types, a variety of other types also is represented, including some very small forms (including the al-Khiyām point).

One somewhat unusual class of tool occurs at al-Ghuwayr I. We have termed

these "Massive Tools." They are in the form of both blades and flakes, and are clearly, but crudely, retouched. They are large, exceeding 50 x 25 cm in at least two dimensions. Their function is as yet undetermined, but they may relate to architectural construction. They could have served either as large stone building block trimming tools, or perhaps they are the results of trimming the wadi cobbles used in building construction. Alternatively, these implements could have been used in ground stone manufacture.

Ground Stone

A rich ground stone assemblage is present at al-Ghuwayr I. Artifacts of numerous varieties, including mortars, grinding slabs, trough querns, a variety of stone vessels, more unusual forms, such as a large perforated weight, were recovered. These are presently under detailed analysis.

Other Finds

A variety of other materials were recovered. During the 1997/98 season, these included some beads, a mica or mother of pearl pendant perforated at both ends and in the center, and a beautifully manufactured bone pendant. Two additional crude pottery sherds (from Area I) also were recovered. Unlike previous seasons, however, no complete clay figurines were recovered. In 1996, for example, an animal (jackal or mountain goat?) figurine was retrieved, and in 1993, two anthropomorphic stone figurines and five clay zoomorphic figurine fragments were recovered. Other small finds from the earliest seasons include jewellery fragments, copper/malachite fragments and an incised baked clay "token."

Specialized Studies

Fauna Paul Croft (Lemba Archaeological Research Center, Cyprus) is presently conducting the analysis of the faunal remains. Thus far, a variety of economic forms have

been identified. These include caprines, cattle, pig, a small carnivore and one or more species of bird. Of particular interest is the presence of the partial remains of at least two cats in one of the niches of Room 1. These fall within the size range of modern domestic cat (*Felis catus*), but given their context they could represent either wild cat (*F. sylvestris = lybica*) or the smaller sand cat (*F. margarita*). Whether or not this is a fortuitous circumstance has yet to be determined.

Paleobotany. Reinder Neef (Deutsches Archäologisches Institut, Berlin) floated several liters of fill material and recovered a large amount of well-preserved materials. These included abundant and identifiable charcoal, barley, emmer wheat, pea and pistachio.

Phytoliths David Rhode (Desert Research Institute, Reno) collected samples for phytolith and pollen analysis, which will be conducted in the United States.

Geomorphology Rolfe Mandel (University of Kansas) conducted a preliminary geomorphological analysis of the site. 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 al-Ghuwayr from the south. It was this wadi that initially exposed several meters of architecture at the site. A lobe of the fan extends out onto the high Pleistocene terrace. The PPNB horizon is sealed beneath ca. 1 m 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 -150 cm 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 al-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 40 cm) of slope wash that covers the terrace surface.

Mandel's 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 al-Ghuwayr caused severe environmental stress, as has been suggested for larger Neolithic core settlements, such as 'Ayn Ghazāl (e.g., Rollefson 1997).

Chronology

Thus far, six radiocarbon determinations are available for the site. These are summarized in Table 2. They are stratigraphically consistent and indicate an early Middle PPNB placement.

Table 2. Radiocarbon determinations for al-Ghuwayr I, Jordan.

Date B.P.	Calibration	Laboratory	Provenience
8812 ± 61	7950-7870 B.C.	Hd 17219-17541	SW--Area 1, 10S40W
	7815-7705		"early phase"
8627 ± 46	7690-7660 B.C.	Hd 17220-17550	SW-Area 1, 05S35W
	7635-7540 B.C.		"late phase"
8528 ± 89	7575-7485 B.C.	Hd 17221-17359	NE-Area 4, 30N10E
8754 ± 52	7929-7592 B.C.	DRI 3256	SW-Area 2, 15S05W (Lv 3)
8755 ± 311	8484-7033 B.C.	DRI 3255	NE-Area 3, 00N40E (Lv 4)
9027 ± 116	8345-8297 B.C.	DRI 3253	SW-Area 2, 15S05W
	8273-7881 B.C.		(Lv 3)
	7810-7711 B.C.		
8806 ± 52	8007-7693 B.C.	DRI 3251	SW-Area 1, 00S35W
	7661-7636 B.C.		(Room 1-Lv 5)
8880 ± 117	8083-7592 B.C.	DRI 3252	SW-Area 1, 00S35W
			(Room 1-Lv 5)
8659 ± 178	8035-7411 B.C.	DRI 3254	SW-Area 1, 00S35W
	7399-7377 B.C.		(Room 3-Lv 6).
	7368-7309 B.C.		

Conclusions

Renewed investigations at al-Ghuwayr I have proven extremely successful. We now know that the site is far more complex than previously believed. Its relationship with a wider early Neolithic "interaction sphere" is yet to be determined, but it clearly functioned as an important settlement. In particular, it will be interesting to compare this small site with the numerous large Neolithic "mega" settlements with near "urban" characteristics that have recently been documented in both central (e.g., 'Ayn Ghazāl-Rollefson *et al.* 1992; Simmons *et al.* 1988, Wādī Shu'ayb-Simmons *et al.* 1989) and southern (e.g., Baṣṭa-Nissen 1990; Nissen *et al.* 1991, aṣ-Ṣifiyya-Mahasneh 1997, 'Ayn Jammān-Waheeb and Fino 1997, and perhaps 'Ayn Ḥammām-Rollefson and Kafafi 1985). The latter are all the more remarkable due to the marginality of the environment in the south and their occurrence on the fringes of the so-called "Levantine Corridor" (cf. Bar-Yosef and Cohen 1989).

At al-Ghuwayr I, the architectural sophistication indicates that it was more than a simple "outpost." There is a considerable amount of architectural variety at the site, even though it covers a relatively small area. In addition, the depth of deposits far exceeds what was anticipated. The artifact assemblage is varied and rich, and the preservation of both faunal and botanical remains is very good. These latter data sources will provide us with specific information of early Neolithic adaptive strategies within a marginal ecological setting. In short, the new investigations at al-Ghuwayr I have provided us with several questions that remain to be answered. These will be addressed in subsequent seasons.

Acknowledgements

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References Cited

- Adams, R.
1991 The Wadi Faydan Project, Jordan. *Levant* 24:181-183.
- Algaze, G.
1989 The Uruk Expansion: Cross-Cultural Exchange in Early Mesopotamian Civilization. *Current Anthropology* 30:571-608.
- Bar-Yosef, O. and Belfer-Cohen, A.
1989 The Levantine "PPNB" Interaction Sphere. Pp. 59-72 in I. HersHKovitz (ed.) *People and Culture in Change*. BAR Int. Ser. 508. Oxford.
- Barnes, H., Flender, M., Ruben, I., Shafiq, R. and McQuitty, A.
1995 *Wadi Faydan Project, 1994-1995*. Report on file at the British Institute for Archaeology and Ancient History, Amman.
- Finlayson, B. and Mithen, S.
in press The Dana-Faydan (south Jordan) Epipaleolithic Project: Report on Reconnaissance Survey, 14-22 April, 1996. *Levant*.
- Gebel, H. and Kozlowski, S. (eds.)
1994 *Neolithic Chipped Stone Industries of the Fertile Crescent. Studies in Early Near Eastern Production, Subsistence, and Environment I*. Berlin: Ex orient.
- 1994 Ghwair I, a Neolithic Site in Wadi Feinan. *The Near East in Antiquity* 4: 75-85.
- Hauptmann, A.
1990 The Copper Ore Deposit of Feinan, Wadi Araba: Early Mining and Metallurgy. *The Near East in Antiquity* 1: 53-62.
- Levy, T. and Adams, R.
1997 *Excavations in the Wadi Fidan, Jordan (1997 Season)*. Paper presented at the annual meeting of the American Schools of Oriental Research, Napa, California, November 21.
- Mahasneh H.
1997 A PPNB settlement at As-Sifiyya in Wadi Al-Mujib. Pp. 227-234 in *SHAJ VI*. Amman: Department of Antiquities.

- Najjar, M.
 1992 Tell Wadi Feinan/Wadi Araba: a New Pottery Neolithic Site from Jordan. *The Near East in Antiquity* 3 : 19-28.
 1994 Ghwair I, a Neolithic Site in Wadi Feinan. *The Near East in Antiquity* 4: 75-85.
- Najjar, M., Abu Dayya, A., Suleiman, E., Weisberber, G. and Hauptmann, A.
 1990 Tel Wadi Feinan, the First Pottery Neolithic Tell in the South of Jordan. *ADAJ* 34: 27-56.
- Nissen, H.
 1990 Basta: Excavations of 1986-89. *The Near East in Antiquity* 1: 87-94.
- Nissen, H., Muheisen, M. and Gebel, H.
 1991 Report on the excavations at Basta 1988. *ADAJ* 35:13-40.
- Raikes, T.
 1980 Notes on Some Neolithic and Later Sites in Wadi Araba and the Dead Sea Valley. *Levant* 12:40-60.
- Rollefson, G.
 1997 The Neolithic Devolution: ecological Impact and Cultural Compensation at 'Ain Ghazal, Jordan. Pp. 219-229 in J. Seger (ed.) *Retrieving the Past*. Mississippi State: Cobb Institute of Archaeology.
- Rollefson, G. and Kafafi, Z.
 1985 Khirbet Hammam a PPNB Village in the Wadi el-Hasa, Southern Jordan. *BASOR* 258:63-69.
- Rollefson, G., Simmons, A. and Kafafi, Z.
 1992 Neolithic Cultures at 'Ain Ghazal, Jordan. *JFA* 19: 443-470.
- Simmons, A. and Najjar, M.
 1996 Current Investigations at Ghwair I, a Neolithic Settlement in Southern Jordan. *Neolithics* 2/96: 6-7.
- Simmons, A., Kafafi, Z., Rollefson, G. and Moyer, K.
 1989 Test Excavations at Wadi Shu'eib, A Major Neolithic Settlement in Central Jordan. *ADAJ* 33: 27-42.
- Simmons, A Kohler-Rollefson, I., Rollefson, G., Mandel, R. and Kafafi, Z.
 1988 'Ain Ghazal: A Major Neolithic Site in Central Jordan. *Science* 240 : 232-235.
- Waheeb, M. and Fino, N.
 1997 Evidence of Settlement Organization at 'Ain Jamman. Paper presented at the Symposium: *Central Settlements in Neolithic Jordan*. Wadi Musa, Jordan, July, 1997.
- Wilke, P. and Quintero, L.
 1994 Naviform Core and Blade Technology: Assemblage Character as Determined by Replicative Experiments. PP. 33-60 in H. Gebel and S. Kozlowski (eds) *Neolithic Chipped Stone Industries of the Fertile Crescent I*. Studies in Early Near Eastern Production, Subsistence, and Environment I. Berlin: Ex orient.